A systems perspective on the contribution of project portfolio management practices towards business and IT alignment

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Research dissertation presented in partial fulfilment
of the requirements for the degree of
Doctor of Philosophy at Stellenbosch University

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Degree of confidentiality: A **December 2019**

Declaration

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M.J. Butler December 2019

Abstract

Investment in information technology (IT) has significant implications for modern enterprises and requires careful management to ensure value delivery. Not only is the value of IT often transient in nature – as it may erode over time, requiring new investments and ongoing incremental IT enhancements – but it can also be entirely elusive. A further implication of IT investment is the complex management of the dynamic interdependence between operational IT assets, assets being deployed, and new IT systems being considered for future deployment.

A key challenge is to understand the impact of IT on the strategic posture of the organisation, and to plan suitable support for the execution thereof. IT influences the ability to execute strategy, as it shapes the value extended to customers and the operational capabilities to create this value. The basic premise of business and IT alignment (BITA) is that organisations are able to reinforce their competitiveness and improve performance only if IT and business strategies are aligned.

The continued academic interest in BITA is the result of several studies, with contradictory findings, on the relationship between IT investment and corporate performance. Authors agree that the collaborative development of IT and business strategy is fundamental to ensure BITA. This suggests a dynamic process – similar to managing an active portfolio of interdependent projects – known as project portfolio management (PPM).

This research focussed on the contribution of PPM practices to BITA and the gaining of insights from a qualitative system dynamics diagram. Given the lack of universally-accepted BITA success factors and PPM practices, an inductive approach was used to perform two systematic literature reviews to identify BITA success factors and PPM practices. This was followed by the application of the deductive approach to probe the presence of PPM practices and the impact on BITA during in-depth interviews.

Qualitative system dynamics diagrams were constructed based on interviews with 23 purposefully sampled senior managers with significant IT experience in the South African financial services industry. Their experiences and observations were captured in causal loop diagrams. The final stage of the research was a validation of the diagrams with six prominent IT researchers who approved of the methods used, and supported further research into IT value using system dynamics. Analysis of the diagrams provided insights about the impact of PPM practices on BITA success factors as well as points of leverage to improve BITA.

Six high-level success factors were identified, namely: *collaborative planning*, *effective communication*, *IT credibility*, *shared knowledge*, *executive commitment* and *user involvement*. Three PPM practices had a direct influence on alignment; these are, *strategic alignment*, *portfolio optimisation* and *resource management*. Another four PPM practices were found to have a moderate or low influence on BITA, and one practice had no influence.

The research confirmed the importance of certain leverage points well established in IT research, such as risk management, appropriate IT leadership roles, joint planning, knowledge sharing and user involvement. A novel perspective that emerged – not well documented in IT literature – was the importance of acknowledging and resolving IT failures and the significantly positive impact that this had on IT credibility. Conversely, the effect of more modern agile and iterative deployment methods of IT assets, did not feature as strongly as expected, given their current prominence in IT practitioner literature.

Key words: business-IT alignment; causal loop diagram; IT value; project portfolio management; system dynamics.

Acknowledgements

Rika, Petrea and Thomas, my heartfelt appreciation for giving me the space and time to complete this task. Thank you for understanding and bearing with me for extended periods of emotional and physical absence. I appreciated every mug (of coffee) and hug.

Dirk and John, thank you for patience, guidance, understanding and interesting conversations that added value beyond what can be captured in a document. John, I appreciate the scientific rigour that you added to my work. Dirk, your necessary practitioner perspective and small drops of wisdom made a big contribution.

Mias, thank you for being pragmatic when it was necessary.

My sincere appreciation for the encouragement from every academic colleague from Stellenbosch University and beyond. Your support when the energy levels dropped kept me going.

Many students for whom I provided study guidance over the last 11 years helped to shape my own thinking through their work and during our conversations; what an honour to work with the calibre of students that we have at Stellenbosch University Business School.

Oupa Tiny, jy sou so trots gewees het. Ma, Pa, Edwin, Gerrie – die pad was lank, maar ek is daar!

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List of acronyms and abbreviations

APM	Association for Project Management
BISMAM	Business and Information Systems MisAlignment Model
BITA	Business and IT alignment
BITC	Business and IT Co-evolution
CEO	chief executive officer
CIO	chief information officer
CLD(s)	causal loop diagram(s)
COBIT	Control Objectives for Information and related Technologies
CPM	Critical Path Method
CSF	critical success factor
DSM	Dynamic Synthesis Methodology
ERP	enterprise resource planning
ICT	information and communication technology
IPI	information product industries
IPMA	International Project Management Association
IS	information system
IT	information technology
ITIL	Information Technology Infrastructure Library
ITO	information technology organisation / IT Department)
ITPM	information technology portfolio management
KBV	knowledge-based view
KSC	key success criteria
HIS	health information systems
MBV	market-based view
MIT	Massachusetts Institute of Technology
PERT	Programme Evaluation and Review Technique
PM	project management
PMBOK	Project Management Body of Knowledge
PMI	Project Management Institute
PPI	physical product industries
PPM	project portfolio management

RBV	resource-based view
ROI	return on investment
RQ	research question
SaaS	Software as a Service
SAM	Strategic Alignment Model
SAMM	Strategic Alignment Maturity Model
SD	system dynamics
SSM	Soft Systems Methodology
STROIS	Strategic Orientation of Information Systems (Model)

CHAPTER 1
INTRODUCTION

1.1 RESEARCH AIM

Over the last 30 years, extensive research has been done on the contribution of information technology (IT) towards organisational performance; however, it remains a key challenge for organisations (Luftman, Lyytinen & Ben Zvi, 2017, p. 26). More than two decades ago, Brynjolfsson (1993, p. 66) reasoned that the "relationship between IT and productivity is widely discussed but little understood". Mithas and Rust (2016, p. 223) maintained that appropriate IT investments remain an important consideration for modern organisations. This perspective is supported by practitioner literature (Khan & Sikes, 2014, p. 1). In fact, Bender, Henke and Lamarre (2018, pp. 2) suggested that the advanced deployment of IT to create business value is the most important challenge for modern enterprises.

It is widely acknowledged that creating value from IT requires alignment between the IT organisation (ITO), including the IT infrastructure and processes, and the strategic intent of the organisation (Chan, 2002, p. 98). This alignment is termed 'Business and IT alignment' (BITA) and it remains a complex challenge. BITA is conceptualised as the congruence between business strategy and IT's contribution through convergent intentions, shared understanding and coordinated processes (Papp & Brier, 1999, p. 3; Queiroz, 2017, p. 22; Reich & Benbasat, 1996, p. 56). BITA is key to unlocking the value of IT investments for organisations (Chumo, 2016, pp. 81), if not sufficient to encapsulate all forms of potential IT value for organisations.

While significant progress has been made to understand how to accomplish BITA, research on IT alignment is still plagued by several complications (Kijek & Kijek, 2018, p. 2). Multiple BITA models aimed at gaining a higher degree of alignment between IT investments and strategic intent have been proposed, yet none have to date found universal appeal within academia, nor have they seen widespread application in industry. In addition, these models often fail to account for the dynamic nature of BITA in modern organisations (Liang, Wang, Xue, Ge & Ransbotham, 2018, pp. 2-5).

In a complex, fast-paced business environment, BITA is more than a mechanistic return on IT investment; BITA represents a complex and dynamic set of processes to be managed within an organisation to continuously gain value from IT investments throughout their entire life cycle.

1.2 RESEARCH CONTEXT

1.2.1 Business strategy and performance

The intent of alignment, and the notion of BITA or IT value often found in the literature, all deal with the concept of business performance and strategic intent. Section 2.4.1 provides a synopsis of the evolution of strategy that is summarised in Table 2.13 together with the contribution of IT towards each of the multiple strategic management perspectives.

'Business' (when referring to business and IT alignment) represents the collection of business processes that constitute the implementation of the organisation's strategic intent. This includes all business activities within the organisation's value chain required to execute strategy. A 'business strategy' refers to a collection of guiding principles that leads to a desired decision-making behaviour when adopted within an organisation (Watkins, 2007, ¶ 2). Strategic intent thus guides decision-making and resource allocation to accomplish defined objectives. Watkins (2007, ¶ 2) defined it as guiding principles that delineates the actions "business should take (and not take) and the things they should prioritize (and not prioritize) to achieve desired goals".

Decisions about IT investments form part of the formulation of the strategy of the organisation, indicating the first level of complexity in BITA (planning for the impact of IT). A second level of complexity exists in terms of enabling the operational capabilities and enhancing IT value as supporting technologies (refer Figure 1.1). Therefore, IT both shapes strategy and plays an important role in the implementation of the strategy.

An important contribution to the strategic management literature is the work of Teece et al. (1997, p. 509), who argued that the ability to identify and exploit new opportunities is fundamental for the success of modern organisations; in fact, according to them, more so than 'strategizing'. Over time, this ability became known as 'dynamic capabilities' and are seen as essential to an organisation's success. Eisenhardt and Martin (2000, pp. 1106-1107) defined 'dynamic capabilities' as identifiable and specific routines which include: (i) integrating resources; (ii) reconfiguring resources; and (ii) gaining and releasing resources.

Although some strategic management authors are sceptical about the principle of dynamic capabilities (Winter, 2003, p. 991), there is "broad consensus in the literature that 'dynamic capabilities' contrast with ordinary capabilities by being concerned with change" (Winter, 2003, p. 992). The BITA challenge aligns strongly with the concept of a strategic dynamic capability, since it represents an ability to be developed for future exploitation and not just for current processes. This gives credence to a third BITA challenge beyond the strategic influence and operational execution ability, namely, the contribution towards identifying and exploiting new opportunities.

1.2.2 Investments in information technology

IT investments constitute a significant and increasing part of an organisation's discretionary expenditure and managers need to recognise the decision criteria to obtain value from their IT investments and resource allocations (Mithas, Tafti, Bardhan & Goh, 2012, p. 205). As the relative levels of investment in technology have accelerated, IT scholars searched for empirical evidence about the value of IT. Research under the general theme of the *Productivity Paradox* dominated the IT value discourse for a significant period after the seminal work of Brynjolfsson (1993, pp. 66-77), who was one of the first authors to explore the complexity of achieving alignment. Although the literature uses the term 'IT value', the principle concerned is actually the multiple levels of business value gained by the deployment of IT.

The academic literature mostly uses the terms IT and IS interchangeably. However, information systems (IS), when used appropriately, refer to information technology from a systems perspective, and include the people and processes and not just technology resources. This is an important distinction when dealing with IT investments, since a significant cost is associated with process changes and human capability development when implementing new technology. Nonetheless, this study standardised on the term IT (as opposed to IS or ICT) and only explicitly makes the distinction where warranted by the argument. However, when using the term 'IT investment', it includes the complete set of activities required to deploy the IT assets in an operational manner, including processes and employees, activities that often require significant funding and resource allocation.

Authors searching for empirical support of IT value often published conflicting results, either confirming or questioning the strategic value of IT investments. Efforts to address the conflicting messages *inter alia* led to systematic reviews by Lim, Richardson and Roberts (2004) and later by Polák (2017) in attempts to consolidate the literature on IT value, without significant success or new insights. Chae, Koh and Prybutok (2014, p. 305) presented the diverse perspectives of different authors who either provide support for the value of IT, or question the value of IT investments due to a lack of empirical evidence.

As a result, it is common for researchers and practitioners to be confronted with contrasting studies. For example, whereas Mithas et al. (2012, p. 205) concluded, after studying the data from more than 400 firms, that IT has a positive impact on profitability, Kijek and Kijek (2018, p.2) in turn struggled to find conclusive evidence from empirical research, or even theoretical explanations, of productivity increase within organisations, business sectors or economies following IT investments.

Conflicting evidence about IT value has led to new insight that IT value is not necessarily realised at industry or firm level, but rather within the portfolio, or individual components of the portfolio of IT investments (Rahrovani, Kermanshah, & Pinsonneault, 2014, pp. 31-32). The search for IT value should thus be more granular than looking at the total investment and rather focus on conditions of success that may be present, or not, within the firm or investment itself. For example, two firms may implement the same software, yet only the performance of one of the firms may improve. At the project level, two different IT investments within the same firm may have directly opposite organisational value contributions (Kohli & Grover, 2008, p. 26). The value derived from IT investments thus requires insight into the multiple firm and project level factors.

Seeking insights on the determinants of IT value require an emphasis on the different IT investments and management decisions made throughout the life cycle of such investments (Liao, Wang, Wang & Tu, 2015, p. 46). These IT investments are not executed in isolation of each other and the interdependency over time leads to dynamic complexity. Senge (1997, p. 56) described dynamic complexity as environments where the cause (in this instance IT investments) and effect (potential IT value) are elusive and where the effects of interventions are present but not obvious over time, exactly the arguments made by authors questioning IT value. Recent practitioner literature also argued the complexity brought about by the dynamic nature of aligning IT with the rest of the organisation and the importance of dealing with this complexity (Khan, Reynolds & Schrey, 2017).

Senge (1997, p. 56) posit that 'dynamic complexity' arises when "the same action has dramatically different effects in the short run and long run". This occurs in a complex situation where there are many possible interconnections between the different parts of a system. Importantly, these connections also change over time, leading to the sometimes perplexing results of interactions within dynamically complex systems. From a system dynamics point of view, dynamic complexity occurs where cause and effect are subtle and where the effects of interventions over time are not obvious.

According to Neiger and Churilov (2004, p. 98), being dynamic, tightly coupled, governed by (often nonlinear) feedback, history dependent and policy resistant most real-life business systems appear in the class of dynamically complex systems. Hanseth and Lyytinen (2010, p. 2) proposed an entire new way to design IT infrastructures in the presence of dynamic complexity, since following traditional top-down designs will pose a "chicken-egg problem for the would-be designer that has been largely ignored in the traditional approaches".

In Martin's (2013 ¶ 4) opinion dynamic complexity, heightened by any subtlety between cause and effect, is fundamental to explaining why some overhyped tools do not deliver on their promised value. Given the contrasting views in the IT research, and especially the term overhyped used by Preston and Karrahanna (2009, p. 3), IT investments does seem to fit the mould of overvalued investments from time to time.

Brynjolfsson (1993, p. 73) characterised the mismanagement of information and technology as one of the fundamental drivers of the productivity paradox. He described mismanagement as "something in its nature that leads firms or industries to invest in it when they should not, to misallocate it, or to use it to create slack instead of productivity" (Brynjolfsson, 1993, p. 73). It is reasonable to assume that the factors required to address this mismanagement could differ for diverse IT investments within the same firm. Again, the salient nature of value derived from IT investments leads to dynamic complexity as the cause and effect is often not that evident, or dependent on the interaction between multiple parts of a complex system (Neiger & Churilov, 2004, p. 98).

Central to the argument in this research is the premise that IT value does not emerge from the application of a uniform set of rules applied to all IT investments. When dealing with the dynamic complexity of BITA faced by modern organisations, new insight on the systemic issues prevalent in socially-constructed investment decision-making processes is required. Supporting the notion that the power of IT does not reside within the technology itself, nor at the firm level, is research indicating that organisations with the highest relative expenditure on IT do not necessarily outperform their peers (Kearns & Sabherwal, 2007, p. 130).

1.2.3 IT value and management decisions

The mismanagement described by Brynjolfsson (1993) requires further scrutiny. The origin of the IT value debate can be traced back to the work of Drucker, who published an article in a leading practitioner management journal entitled '*The manager and the moron'* more than five decades ago (Drucker, 1967). The central premise of this article was that the "computer is a moron. And the stupider the tool, the brighter the master must be" (Drucker, 1967, p. 173). Drucker (1967) argued that is it important for managers to think carefully about their IT investment, as well as operational decision-making. Brynjolfsson (1993) mirrored this belief nearly three decades later. Five decades hence, authors like Luftman et al. (2017) and Leidner, Milovich and Preston (2017) still presented arguments about the relative importance of the management decisions associated with IT investments.

Drucker (1967, p. 173) argued that "a computer makes no decisions; it only carries out orders. It is a total moron, and therein lies its strength. It forces us to think, to set the criteria." Although Drucker (1967) has been criticised often by authors like Tapscott (2001, p. 34) for failing to see the impact of IT or the internet specifically on strategic intent, the fundamental principle of the argument essentially remains intact. With the increasing power of IT, Drucker's (1967) omnipresent 'moron' is carrying out (human) orders at unprecedented rates and has thus become a key factor in the success of modern organisations. The extent of investments in IT clearly requires managers to be prudent in their decision-making concerning the use of information technologies (Karpovsky & Galliers, 2015, p. 137), or in Drucker's terminology, organisations need to clearly set both investment and operational criteria for IT investments and efforts.

BITA is a prominent theme in literature addressing the business value of IT. The importance of aligning the objectives and contributions of an organisation's IT function with the requirements of the broader organisation has been widely recognised over an extended period (Lederer & Mendelow, 1989; Henderson & Venkatraman, 1993; Kearns & Lederer, 2003; Campbell, Kay & Avision, 2005, p. 653; Silvius, 2009; Cumps, Viaene & Dedene, 2012; Mithas & Rust, 2016, p. 223). This discourse has grown in importance as the expenditure on IT has become a significant cost driver in modern enterprises.

1.2.4 Business and IT alignment

BITA cannot be discussed before dealing with the concept of alignment. Chorn (1991, p. 20) presented 'alignment' as a descriptor of strategic fit that "considers the degree of alignment that exists between competitive situation, strategy, organisation culture and leadership style". Alignment also refers to the *appropriateness* of the multiple elements to one another, but significantly, IT is not included as part of Chorn's (1991) alignment argument.

The notion of alignment can be best described by using a vector diagram (Figure 1.2). When two aspects are completely aligned, no effort is wasted to move in the intended direction, i.e. the arrows are parallel (or coincide). Any indication of a lack in alignment leads to inefficiencies as an additional vector (effort) that does not contribute towards the common objective. Various studies on the proper alignment of complex systems, which can be useful to define the concept, have been undertaken and are covered in the comprehensive systematic review (see Chapter 4).

In the IT literature, one view on 'strategic alignment' is the fit between business strategic orientation and IT strategic orientation (Chan et al., 1997, p. 125). BITA is an extremely complex construct, as is evident from the different models presented in Section 2.2.4. It is not merely concerned with aligning the IT organisation (ITO) with the business, since there could be a lack of alignment within the IT organisation. In fact, it is conceivable that IT goals and objectives may be aligned with those of the business (indicative of good alignment), but at the operational or structural level, IT activities and infrastructure are not aligned with their own goals. Alignment is a dynamic concept and not an end state of achievement (Liang et al., 2017, p. 868).

The impact of a resilient link between IT investments and business strategy is well documented in academic literature and it is accepted that business and IT alignment (BITA) is a top priority for organisations (Bender et al., 2018, p. 2; Khan & Sikes, 2014, p. 1). Ensuring that IT activities are carried out in accordance with the business needs of the organisation has been the locus of discussion in the BITA literature (Coltman, Tallon, Sharma & Queiroz, 2015, p. 92). Although authors differ as to the proposed objectives and domain of alignment, the common premise is to foster a productive and successful relationship between IT and the business.

Numerous authors (Chan & Reich, 2007, p. 298; Cumps et al., 2012; Holmes, 2007, p. 103; Maes, Rijsenbrij, Truijens & Goedvolk, 2000; Venkatraman & Henderson, 1993, p. 5) have confirmed that achieving strategic alignment between business and IT is essential to improve organisational performance. These authors reaffirmed that BITA should remain an important objective for any organisation with significant IT exposure and acknowledge that alignment is required on multiple levels. One of the dimensions of alignment is aligning business strategy with IT strategy and both practitioners and researchers have been grappling with this challenge for a considerable time (Brown & Motjolopane, 2005; Kearns & Sabherwal, 2007, p. 130; Mithas & Rust, 2016, p. 224).

The increasing strategic role of IT as well as the need for integration between systems to support business processes and provide managers with quality information (Section 1.2.2) makes the alignment challenge increasingly complex in both the execution of business processes and in the creation of customer value. It is thus important to, at a high level of abstraction, define the challenge for managers and academia to comprehend the impact thereof.

Berman and Bell (2011) coined the phrase 'The Digital Transformation' to define the transformational power of IT in practitioner literature. They argued that this transformation occurs by both reshaping the operating model or *value delivery focus* and reshaping the customer value proposition or *value proposition focus* of modern enterprises (Figure 1.1), thus providing a high level yet clear overview of the dimensions of IT value. Ensuring that organisations leverage technology in *how* they execute their business as well as in *what* they deliver to their customers (see Figure 1.1), requires coordinated balancing of IT initiatives.

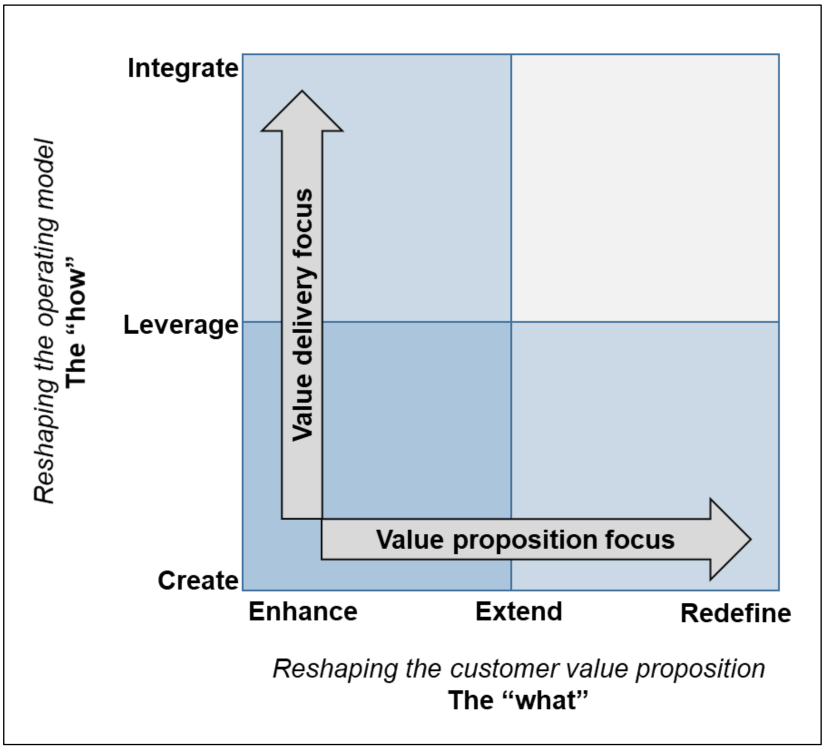

Figure 1.1: Elements of the Digital Transformation

Source: Berman and Bell (2011, p. 5).

This simplified view of a business model already highlights the potential challenge of alignment, since strategy consists of a complex set of capabilities (see to Section 2.4.1). However, how value is created and perceived is also influenced by technology, often referred to as the process perspective in BITA literature (Schwartz, Kalika, Kefi & Schwarz, 2010, p. 57). The challenge is more complex than presented by some authors: It is not merely IT that needs to align to strategy, but also strategy that is digitally transformed by IT investments (McAdam, Bititci, & Galbraith, 2017, p. 7170).

Ensuring that organisations leverage technology in *how* they execute their business as well as *what* they deliver to their customers, requires careful prioritisation and management of IT initiatives. The productivity paradox essentially focussed on how value is created, not necessarily what value is created and the customer value (what) is less prevalent in the literature. In addition, some very narrow value definitions are unfortunately not helpful to define IT value.

Mithas and Rust (2016, p. 223), for example, presented IT value as (i) decreased cost, (ii) increased revenue, or (iii) a simultaneous decrease in cost and increase in revenue. This rather one-dimensional, financial view loses sight of a more contemporary concept of value as being significantly more than a financial return on investment (ROI) (Iandolo, Barile, Armenia, & Carrubbo, 2018, p. 1247). Arguing that IT value only manifests at the financial level is not sufficient; as acknowledged by Töhönen, Itälä, Kauppinen and Männistö (2015, p. 163), who maintained that the business value of IT is a challenge that includes the multiple dimensions of value (beyond a financial ROI) as well as the broad impact that IT can have within the organisation. Töhönen et al. (2015) argues for not just a broad definition of value, but also moving beyond the productivity paradox as value may be outside the traditional operational efficiency mind-set prevalent in early literature. According to Töhönen et al. (2015), the multiple fragmented interpretations of IT business value do not make it easier when asking the value question, again raising the importance of dealing with the complexity inherent in defining IT value.

While authors have acknowledged that achieving BITA is complex, few seem to strive for methods and techniques outside the IT domain designed specifically to deal with this complexity. System dynamics is one of the techniques suited to deal with both complexity (Haraldsson, 2004, pp. 16-17; Vermaak, 2007, pp. 182-183) and dynamic relationships (Haraldsson, 2004, pp. 20-22; Sales & Barbalho, 2019, p. 2); two key factors that are limiting the current value of BITA research.

Although it is acknowledged that the entire productivity paradox debate is from an era of maximising shareholders' return, any modern debate on the value of IT and strategic alignment needs to consider the entire value contribution of IT to strategic intent and not only to an organisation's financial performance, further increasing complexity of IT value. Section 2.2.1 deals in detail with the key arguments about IT value.

1.2.5 Alignment actions and measurements

The factors contributing towards a higher degree of alignment have been actively researched. There are limitations in the research, for example Luftman et al. (2017, p. 26) laments the fact that most alignment models approach "alignment as a static relationship in contrast to analysing the scope and variance of activities through which the alignment is (or can be) attained". However, the measures taken to achieve alignment are mostly known, or at least, part of the current active research agenda. Chapter 4 provides an analysis of the literature and list of alignment factors used in this research.

A significant part of the current academic discourse in BITA continues to uncover new factors, sometimes for a particular context, or to redefine known factors that assist with BITA, the so-called critical success factors (CSFs). Teo and Ang (1999) first established a list of factors that are widely recognised to be the antecedents for alignment of IT and business strategy, as acknowledged by Chan and Reich (2007, p. 306).

Prominent BITA authors (De Haes & Van Grembergen, 2005; Gunasekaran & Ngai, 2007; Peffers, Gengler & Tuunanen, 2003; Silva & Hirscheim, 2007) have extended the initial work of Teo and Ang (1999) and an extensive, if not coherent, body of literature currently exists on BITA success factors (Amarilli, Van Vliet & Van den Hooff, 2016, pp. 1-2). Coltman et al. (2015, p. 92) confirms the lack of coherence in both how BITA is conceptualised, measured and even the actions required to attain alignment.

In addition to defining CSFs, researchers, and practitioners in particular, are also interested in measuring the degree of alignment. The methods to measure alignment lack a generally-accepted terminology in the literature, the most common being *success criteria*. In this research the term 'key success criteria' (KSC) refers to the alignment measurement (size of the angle in Figure 1.2) that is used to determine the success of alignment efforts at a particular instance in time. According to McAdam et al. (2017, p. 7168) authors acknowledge the dynamic nature of these factors and they suggest using *Dynamic Capabilities Theory* (see Section 2.4.1) as a theoretical model to improve the alignment between business strategy and technology strategy.

Figure 1.2 indicates the actions and processes, commonly called CSFs in IT research, that bring IT effort and strategic intent together (actions to improve alignment) and thus improve firm performance. Despite the distinction made by some authors, others move between CSF (actions and processes to be done correctly) and KSC (measures of successful alignment) in the literature without acknowledging the difference between these two concepts. Figure 1.2 was created to explain the difference, at times not clearly distinguished by researchers, based on the distinctions made by Teo and Ang (1999) as well as Smaczny (2001), although they did not visualise this as indicated below.

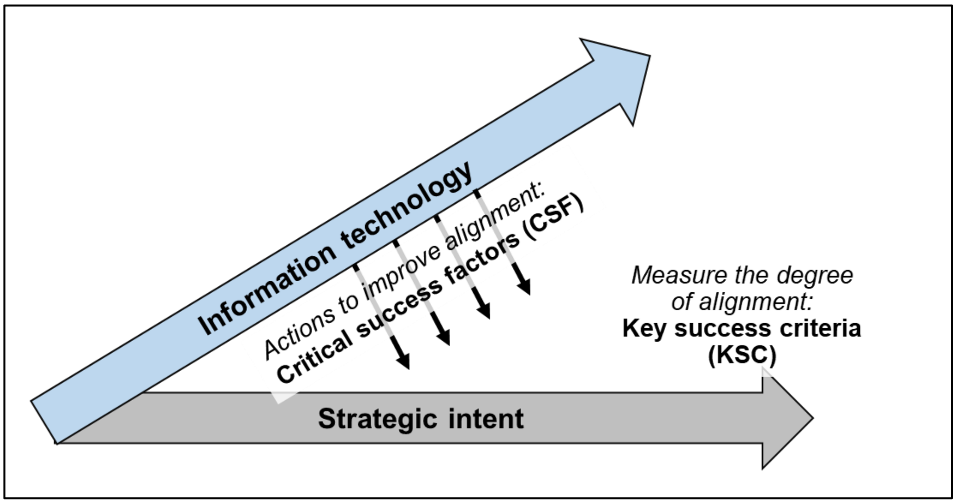

Figure 1.2: Business and IT alignment: Understanding CSFs and KSC

Source: Adapted from the terminology used by Teo and Ang (1999) and Smaczny (2001).

The two vectors in Figure 1.2, Information technology and Strategic intent, present the business (collectively) and the IT utilisation, or work effort vector. The size of the angle between the arrows indicates the lack of alignment, i.e. the degree of inefficiency resulting from poor alignment. The larger the angle, the smaller the contribution vector from IT directly towards business. In reality, BITA is significantly more complex than the diagram suggests due to the various levels of alignment (see Section 2.3) and the fact that business consists of multiple functions that could each have different degrees of alignment. However, the diagram serves as a basic visual representation to illustrate the two different aspects of BITA.

In addition, alignment consists of processes (in BITA the CSFs) as well as a particular outcome (for BITA the KSC) that provide insight on both what should be done to improve alignment and how it can be measured (See Section 2.3.2 and 2.3.3). CSFs are those elements of the organisational processes and IT implementation and operation that are crucial for the successful realisation of the goal of alignment. The practitioner wishing to gain maximum value from investments in IT should continuously focus on managing the CSFs, whilst using the KSC to gauge the degree of alignment (or lack thereof), and hence the impact of the CSFs, at a particular point in time. In the simplest form, it can thus be argued that organisations should execute the CSFs properly and use the KSC to determine the effect of the CSFs over a period of time. This approach embraces the dynamic complexity inherent in the BITA endeavours of organisations.

Strategic intent in the modern organisation is a fluid concept. Section 2.4.3 contains details about the agility of strategic intent in modern business environments and the challenges associated with using a term like *business* in business and IT alignment. Although Figure 1.2 shows strategic intent as a fixed position to measure the lack of alignment via KSC, in reality IT is required to align with a moving target when dealing with the dynamic capabilities perspective of strategy (Liang et al., 2018, p. 2; McAdam et al., 2017, p. 7169).

Since BITA is a dynamic process, measuring the KSC provides only a snapshot indication of the current state of alignment, which typically varies over time. CSFs, however, are ongoing management actions with the aim of reducing the size of the angle (as measured through the KSC), i.e. to improve alignment. In this research the dynamic nature of the alignment challenge is modelled using tools from system dynamics to determine the complex and dynamic relationships that make the execution of the CSFs challenging. Establishing the systemic effects that underpin the successful execution of the CSF is different from static BITA models presented to date.

1.2.6 Lack of alignment between IT and strategic intent

Prior research (Chan, 2002, p. 98; Coltman et al., 2015, pp. 95-97) offers multiple explanations why investments in IT do not align with the strategic intent of organisations. Smaczny (2001, p. 797), for example, stated that IT projects are often prioritised based on technical imperatives (determined by the IT department) rather than business necessities, an argument strongly supported in the academic literature. Jorfi and Jorfi (2011, p. 1608) believe that when business executives cannot clearly articulate IT requirements, or when IT staff have inadequate business vision or knowledge, IT investments are likely to be costly and yield low returns.

Sharma and Queiroz (2015, pp. 91-97) provided an overview of 25 years' of BITA research containing a myriad of BITA factors from academic and practitioner literature. Unfortunately, their work fails to deal with the difference between CSFs and KSC, making it of limited value for practitioners, yet interesting for academics who need an overview of the debate since the seminal article by Henderson and Venkatraman (1993).

More recently, Marnewick (2016, p. 748) argued that information systems “are not reaching their full intended potential and do not contribute to the implementation of the organisational vision and strategies” because organisations are not reaping the benefits of IT projects. This leads to high-potential IT applications that may not be recognised as such, as well as managers with valuable technology-related ideas who are not allowed sufficient opportunity to turn ideas into action.

Although nearly all authors deal with alignment as a construct, and argue reasons why there is a lack of alignment, a limited number of authors define the problem as ‘misalignment’. Aversano, Grasso and Tortorella (2012, p. 464) presented a Business and Information Systems MisAlignment Model (BISMAM) to understand, categorise and manage misalignments, based on the earlier work of Carvalho and Sousa (2008, p. 104). Carvalho and Sousa (2008, p. 105) argued that the traditional BITA approach “addresses the alignment concern seeking an answer to how organizations can achieve alignment, but with little contribution on how to identify and correct misalignments”. Their research addressed alignment by arguing that BITA is an intentional state that organisations aim to achieve, whereas misalignments are the aspects that organisations face in their routine business operations, i.e. normal operational issues that lead to a lack of alignment. Aversano et al. (2012) and Carvalho and Sousa (2008) proposed conducting research focussed on the study of misalignments as the appropriate approach towards achieving alignment.

Further scrutiny of these misalignment factors revealed that they map very closely to alignment factors from prior research, just stated in the opposite and often with different levels of granularity or using different terminology. However, important from the work by Carvalho and Sousa (2008, p. 104) is the explicit mention of the premium paid by organisations as a result of a lack of alignment (Figure 1.3) or as they contend, misalignment.

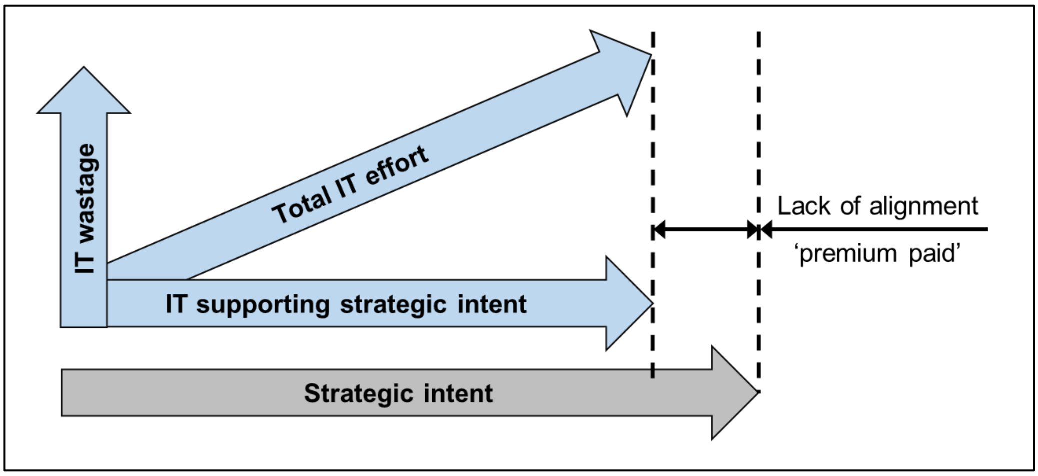

Figure 1.3 Business and IT alignment: The lack of alignment premium

Source: Author’s illustration based on the work of Teo and Ang (1999), Smaczny (2001) and Carvalho and Sousa (2008).

Figure 1.3 indicates the efficiency premium paid by organisations when there is a lack of alignment between the total IT efforts and the organisation's strategic intent. This premium is evident as a wasted effort within IT, lower return on IT investments, but also in terms of the efficient execution of the strategic intent at the organisational level. Wagner, Beimborn and Weitzel (2014) also introduced the important concept of social capital in achieving alignment, but also resulting from alignment. The premium paid could thus also stem from a lack of building social capital between business and IT, further impeding future alignment efforts.

Most definitions of alignment refer to achieving the correct relative positions of business and IT (Chorn, 1991, p. 20; Leonard, 2008, p. 561; Luftman & Kempaiah, 2007, p. 166). These definitions provide the first indication that alignment is not only about the position of IT efforts as measured against the business requirements, but rather a relative measure that also accounts for business goals and objectives relative to the capabilities of the ITO. The collective ITO effort in an organisation could represent a significant investment and it is possible that organisations have developed core capabilities due to this investment, which should be properly exploited by the business as well (Liang, Wang, Xue & Ge, 2017, p. 864). However, organisational strategy is not only about strategic intent, but also requires the presence of dynamic capabilities, as introduced by the seminal work of Teece, Pisano and Shuen (1997).

Liang et al. (2018) raised an important concern about the impact of IT on organisational agility. According to them, there is a real danger of alignment impeding agility and "tight alignment of a company's IT systems with its current strategy can hamper agility in fast-moving markets – unless the right social conditions are in place" (Liang et al., 2018, p. 2). Although absent in name, the essence of their argument is that alignment could actually reduce dynamic capabilities. Dutta, Lee and Yasai-Ardekani (2014, p. 762) provided the opposing view through the presentation of examples of firms with increased agility based on the investment in IT. This important aspect, the potential lack of agility, or increase in agility, based on IT investments is dealt with in more depth in Section 2.4.3.

Dutta et al. (2014) emphasised that the strategy of an organisation is not static and neither is IT deployed only to achieve the current strategic intent. Their research point out several studies that "explicitly consider the actions of competitors in determining the business value of digital systems, which is appropriate given contemporary business environments" (Dutta et al., 2014, p. 763). They argued that the deployment of IT is often intended to create the dynamic abilities required to attain future objectives, an important view endorsed by multiple authors (Chae et al., 2014, p. 305; Coltman et al., 2015, p. 91; Malta & Sousa, 2016, p. 889).

The deployment of IT in organisations is done through multiple initiatives and often this is managed as projects (White, Jones, & Beynon-Davies, 2018, p. 183). According to Gomes and Romão (2016, p. 489) most enterprises are engaged in numerous projects that create economic value, foster competitive advantage and generate business benefits, leading to growing recognition of the strategic importance of managing by project. The increased use of management by project is the result of challenges and opportunities brought about by technological developments, the changing dynamics of the macro environment, the shifting boundaries of knowledge, as well as by significant advances in organisational thinking on strategic direction (Badiru & Pulat, 1995, p. 3; Bredillet, 2005, p. 3; Too & Weaver, 2014, p. 1383). It is thus important to also deal with the value contribution of projects in general, and IT projects in particular, towards the strategic intent of organisations.

1.2.7 Project management contribution to business performance

Project management developed as a management discipline to assist with the efficient execution of once-off initiatives, referred to as projects. Munns and Bjeirmi (1996, p. 81) defined a project as "the achievement of a specific objective, which involves a series of activities and tasks which consume resources". According to Munns and Bjeirmi (1996) project management is the process of controlling the achievement of the project outcomes (the value) through the utilisation of organisational structures and resources.

A fast-growing body of knowledge and professional industry bodies, like the Project Management Institute (PMI), Association for Project Management (APM) and the International Project Management Association (IPMA), have led to the professionalisation of project management and the provision of guidance to practitioners, which have significant value (Morris, Crawford, Hodgson, Shepherd & Thomas, 2006; Sabini, 2014). In addition, knowledge in this field of study continues to expand at a rapid pace as a result of continuous research (Svejvig & Andersen, 2015, p. 274). The management of projects is viewed as of considerable economic importance and dramatic growth has occurred in project work as it has become an important way to structure work in organisations (Gomes & Romão, 2016, pp. 489-490; Svejvig & Andersen, 2015, p. 278).

Nieto-Rodriguez and Evrard (2004, p. 3) state that organisations often embarked on a transformation towards project management as part of their competitive advantage strategy. Project management assists organisations to execute strategic intent within the constraints of a finite shared resource pool. Organisations therefore have to find a way to maximise value through the selection and prioritisation of the correct combination of projects (Nicholas & Steyn, 2017, p. 605). They must also ensure that available resources are assigned to projects in the most effective way possible (Buys & Stander, 2010, p. 3). Included in the myriad of projects is also the deployment and operationalisation of IT initiatives.

The organisational maturity to reject projects and also terminate struggling projects is deemed important to ensure that the project portfolio is not filled with poor-performing projects (Campbell & Park, 2004, p. 27; Shepherd, Patzelt, Williams, & Warnecke, 2014, p. 514). Poor performance involves more than not meeting the traditional iron triangle criteria of time, cost and performance, and includes the contribution to the stated objectives in the business case (see Figure 1.4). This holds particular importance for IT projects that often deliver on the dynamic capabilities of organisations that could, due to the dynamic complexity, require agility and quick responses not necessarily evident in traditional project management practices.

In a complex environment, managing projects in isolation of each other does not provide the optimum use of an organisation's resources. In practice, projects have an influence on each other, have different priorities and could even be seen as less, or more, attractive at different stages in their life cycle due to changes in the strategic intent of the organisation. This is particularly true for IT projects with typically high levels of interdependence and at times low levels of clear cause and effect in terms of the contribution to business objectives (Bathallath, Smedberg & Kjellin, 2016, p. 68).

Projects are not executed in a vacuum and the challenges of managing projects in organisations and the systemic impact on other organisational aspects have seen a recent enrichment in the project management literature from authors like Morris (2013), Du Plessis (2014) and Davies and Brady (2016). There is a growing awareness in more recent project management literature that escaping from the well-known and published poor success rates is not possible by doing the same things better (Engelbrecht, Johnston & Hooper, 2017, p. 994). The discipline needs to move the traditional technical and quantitative based approach towards a more inter-disciplinary approach that acknowledges the potential knowledge contributions from other areas of research.

Multiple authors (Awazu, Desouza & Evaristo, 2004, pp. 73-77; Royer, 2003, p. 55; Shepherd et al., 2014, p. 514) have argued the importance of stopping poorly-performing projects. Awazu et al. (2004, p. 73) went as far as stating that IT projects often seem to take on lives of their own, consuming valuable organisational resources without ever reaching their intended outcomes. This implies a lack of alignment and thus wasted organisational resources and effort, the essence of the productivity paradox. This argument finds support in practitioner literature with Bloch, Blumberg and Laartz (2012, pp. 2-7), who stated that large IT initiatives often cost much more than initially planned and could even put the entire organisation in jeopardy.

Traditional measures of project success focussed on the well-known triangle of cost, time and performance. However, that merely provides a project-based view to indicate that project management was executed correctly. De Wit (1988, p. 166) is one of the first authors in the project management literature to support a rather important distinction between project success and project management success.

Project success refers to the achievement of the overall objectives of the project. De Wit (1988, pp. 164-165) argued that the degree to which these objectives have been met determines the degree of success or failure of a project. This is in line with the support of the strategic intent of an organisation, i.e. the alignment with and contribution towards strategy (Gomes & Romão, 2016, p. 490; Munns & Bjeirmi, 1996, p. 82). *Project management success* is the traditional measure of cost, time and performance. This view uses the 'within project' lens to look at project activities. Although it provides important management information on the effectiveness of activities under the control of the project manager, it provides no indication as to whether or not the project deliverables ultimately support the strategic intent of the organisation (De Wit, 1988, pp. 164-165; Munns & Bjeirmi, 1996, p. 82).

Marnewick (2016, p. 749) highlighted the fact that the focus of IT projects is often "on the delivery of project artefacts rather than the targeted benefits that often form the justification for such projects". He emphasised the importance of not only the project justification, but especially the systematic benefits expected to be realised from the project, i.e. project success. According to Marnewick (2016, p. 749) the "focus has moved away from delivering a purely technical solution to a solution that is technical in nature but delivering benefits to the organisation as a whole and underpinning the sustainability of the organisation in the long run". Not only does this support the notion of project success, it also acknowledges that BITA alignment is more complex than measuring financial return. Marnewick (2016) suggested a renewed focus to ensure that IT projects are scrutinised for the promised benefits as the major motivation for initiating an IT project. These benefits, if defined by the organisation, represent the measures of BITA success or KSC.

The concept of focusing on the project benefits and not the traditional project metrics, is strongly supported by Serra and Kunc (2015, pp. 53-54), who contrasted project management performance "mostly based on budget, schedule and requirements goals; with project success, which evaluates how well projects deliver the benefits required by business strategies in order to meet wider business objectives and to create value". They emphasised that, despite the important contribution of projects towards strategic intent, organisations still evaluate projects by their efficiency (time, cost and quality) and not by the organisational benefits delivered. Gomes and Romão (2016, p. 491) corroborated and stressed the importance of benefits management to ensure projects deliver business value.

This is an important argument since it emphasizes using the KSC to measure success and not using the extent to which CSFs have been executed, as measures of success. Gomes and Romão (2016, p. 491) agreed and believe that KSC, referred to as "project success criteria" in their research, should be specific to each project and should be determined by stakeholders at the start of each project in order to measure success at completion.

Munns and Bjeirmi (1996, pp. 84-85) made a distinction between the scope of project success and the scope of project management success (see Figure 1.4). Using Munns and Bjermi's (1996) diagram the challenge for organisations is not merely achieving project management success, i.e. delivering the project artefacts, but achieving project success, i.e. gaining the intended benefits from the initiative at the organisational level. For IT projects these benefits are measured by the KSC and each project that is successful should effectively have a positive impact on the BITA.

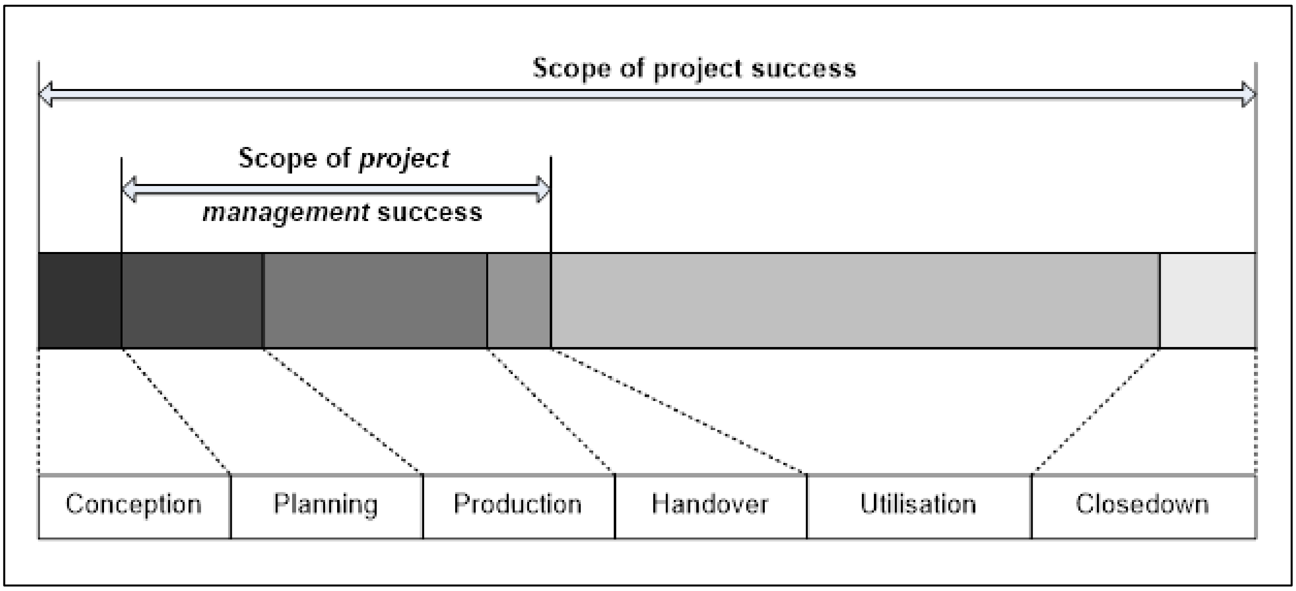

Figure 1.4: The scope of project management success

Source: Munns and Bjeirmi (1996, p. 84).

Project management literature, initially strongly influenced by the triple constraints of time, cost and performance, more recently started to acknowledge the importance of benefits realisation, i.e. project success in Munns and Bjeirmi's (1996) terminology (Derakhshan, Turner & Mancini, 2019, pp. 98-100; Marnewick, 2014, p. 11; Serra & Kunc, 2015, pp. 53-54). These authors emphasised the importance of project conceptions and stakeholder engagement during the conception phase. Marnewick (2014, p. 1) contended that "[b]usiness cases are an integral part of information technology (IT) projects, providing the linkage between the organisational strategies and the promised benefits". However, he argued that research about business cases, and especially IT-related business cases, is rather limited in academic literature and should receive more attention (Marnewick, 2014, p. 10). In essence the actual realisation of a business case contributes towards BITA, as long as there are no unintended consequences.

Serra and Kunc (2015, p. 54) acknowledged the foundation of project success as entrenched in project conception (also called initiation) or the business case. They argued that if conception fails, even a perfectly-executed project, achieving project management success could be deemed a failed project, since the project should never have been initiated in the first instance. Therefore, as emphasised by Marnewick (2014, p. 12), it is difficult to realise the intended project benefits if the business case does not align with the strategic intent in the first instance. This view is supported by Derakhshan et al. (2019, pp. 98-98), who believed it is due to a lack of appropriate benefits governance mechanisms. It also aligns strongly with the definitions of strategy presented earlier (Section 1.2.1) that defines strategy as guidance for appropriate decision-making.

However, by utilising the project artefacts, benefits for the particular investment are realised. Marnewick's (2016, p. 757) research on IT projects in South Africa and the Netherlands indicated that, although organisations are fairly mature in terms of managing benefits, they struggle to link the delivered benefits back to the defined business strategy. Part of the problem, according to Marnewick (2016), is how organisations measure and report project success. Although organisations agree that attainment of business benefits is important to measure success, they do not necessarily have defined criteria (the KSC) to measure whether the business benefits have been delivered (Marnewick, 2016, p. 757).

In measuring IT project execution, the tangible project management success metrics are often done properly, however, this could be at the expense of the more complex project success metrics. Zwikael and Smyrk (2012, p. 6) went as far as stating that "the conventional test of project performance is not only fundamentally flawed, but also irrelevant to decision-makers". In addition, project success metrics, or KSC, are often not measurable at project completion since it may not yet be possible, i.e. the product, service or capability developed will only deliver benefits in the future (Serra & Kunc, 2015, p. 54). It is only later during the project life cycle that these benefits can be measured (as shown in Figure 1.4).

The support of the strategic intent of the organisation by project objectives warrants further scrutiny (Kellar, 2002, pp. 3-5). Although it has been argued that project objectives may be well aligned at conception, in the modern competitive and rapidly-changing environment, it is likely that the strategic intent is updated soon after the objectives of a project is defined. It is thus conceivable for a project to initially meet the objectives and be successful according to De Wit's definition (1988, p. 166), whilst still failing to add significant value to the organisation at completion (Gomes & Romão, 2016, p. 490). This challenge is not unique to IT projects, but may be especially prevalent in a changing technological context at a time were strategic intent is fluid.

The challenge for organisations is to manage the interdependency between different projects competing for limited resources and the mutual contribution, or combined alignment, towards the strategic intent for the entire portfolio of projects, as well as benefits to be realised from these projects. The dynamic nature of a multitude of projects represents a challenge similar to that faced by BITA practitioners, namely, to ensure success of the project (contributing to strategic intent), and not merely successful delivery of the project artefacts.

1.2.8 Project portfolio management

The ever-increasing utilisation of projects to organise work in organisations necessitates effective management of multiple projects. This has resulted in a greater interest in the processes of project portfolio management (De Reyck, Grushka-Cockayne, Lockett, Calderini, Moura & Sloper, 2005, p. 524). Project portfolio management (PPM) is a management technique that assists enterprises in project selection, prioritisation and execution, in order to maximise the overall investment in projects, taking into account the limited availability of resources (Bathallath et al., 2016, p. 68; De Reyck et al. 2005, p. 529).

While project management is intended to provide optimal return for the resources allocated to a particular project, PPM intends to ensure the optimal return for the total of the organisation's resources deployed to all projects. Killen and Hunt (2013, p. 132) supported this perspective by stating that PPM is "a high-level capability in which managers engage with a range of processes, methods, and tools for ongoing resource allocation and reallocation among a portfolio of projects to maximize their contribution to the overall welfare and success of the enterprise". PPM thus deals with the coordination and control of multiple projects pursuing the same strategic goals and competing for the same resources, whereby managers prioritise among projects to achieve strategic benefits (Martinsuo, 2013, p. 795).

It took a while for academic literature and practitioner bodies to define PPM in a coherent way. In 2004, Marnewick and Labuschagne (2004, p. 288) stated that there was at the time "no internationally accepted standard for [project] portfolio management". Marnewick and Labuschagne (2004) also concluded that no consensus prevails concerning the definition of PPM. More recently, Young and Conboy (2013, p. 1089) provided a widely-used definition that defines PPM as "an emerging aspect of business management that focuses on how projects are selected, prioritised, integrated, managed and controlled in the multi-project context that exists in modern organisations". It is fair to argue that this project portfolio management includes value management as argued by Martinsuo and Killen (2014, p. 56), eluding to the implicit link between PPM and deriving business value from a portfolio of IT projects to contribute towards strategic intent.

Martinsuo (2013, p. 794) stressed the importance of understanding PPM in practice and questioned the value of a large body of academic research applying methods from other disciplines to PPM as an easy solution. She is of the opinion that many practical PPM challenges remain as yet unresolved due to a lack of research that deals with PPM challenges without transitioning from other theoretical perspectives. Mantinsuo and Killen (2014, p. 56) believe that PPM presents complex challenges to decision-makers, since numerous projects must be controlled and managed to enhance the long-term strategic value of the entire portfolio of projects, while considering multiple criteria and interdependencies.

According to Clegg, Killen, Biesenthal and Sankaran (2018, p. 762) project portfolio management is the important link between strategy and project management. They are of the opinion that traditional research in PPM has mostly dealt with the rational, top-down and structural aspects of strategising and in doing so, failed to emphasise the fundamental practices that are triggered by strategy and the implementation of strategic intent. It is these practices, inherent to PPM, which could potentially contribute towards understanding the dynamic complexity of BITA.

In Section 2.4.1, a detailed explanation is provided about the development of the strategic management domain from the more static resource and market-based views towards an acknowledgement that modern organisations contain a set of core competencies or organisational capabilities, but also dynamic capabilities (discussed in detail in Section 2.5.10). However, these dynamic capabilities required to succeed in a fast-changing business environment, are not as clearly defined and are also transient in nature (refer Section 2.4.1).

The dynamic capabilities of an organisation could benefit from the more agile and continuous nature of PPM practices. Traditional project management methodologies and selection practices are more geared towards the notion of a core competence, the strategic capability that requires the execution of a particular project. Killen and Hunt (2010, pp. 157-169) recognised the potential of PPM towards dynamic capabilities; in fact, their research could be "the first study that identifies PPM capabilities as dynamic capability, allowing existing research to be viewed through the dynamic capability lens and, more importantly, providing a theoretical underpinning that may influence future research and practice" (Killen & Hunt, 2010, p. 157). The work by Davies and Brady (2016, pp. 335-336) provided a foundation for this important emphasis of research based on their arguments of the dependency of an organisation's dynamic capabilities on PPM principles.

The practices that collectively describe PPM have evolved as a way to achieve continuous alignment among the projects executed within an organisation and the strategic intent (Clegg et al., 2018, p. 763). It is thus reasonable to expect that PPM practices could make a significant contribution towards BITA because project portfolio management attempts to ensure that the most appropriate IT initiatives are initiated, executed, and prioritised given the conflicting requests for organisational resources. At the same time, it also facilitates discontinuation of initiatives when required, which recognises the dynamic nature of BITA so often absent in alignment models found in the literature.

1.3 RESEARCH PROBLEM AND PURPOSE

The performance of organisations with high levels of alignment between business and IT has been demonstrated (Chae et al., 2014, pp. 305-307; Chan, Sabherwal & Thatcher, 2006), but remains a challenge to achieve (Liang et al., 2018, pp. 864-865). Since the alignment of IT with business strategy influence organisational performance it is a common managerial concern (Chan, Huff, Barclay & Copeland, 1997; Chan & Reich, 2007; Queiroz, 2017, pp. 21-22). It is therefore beneficial for organisations to be knowledgeable about the factors over which they have influence and that could assist with the alignment of IT with other organisational structures, processes and aims (Peak, Guynes & Kroon, 2005). To date this emphasis has been on static factors and did not include models dealing with dynamic complexity.

Moreover, BITA is not an end-state but a continuous process (Chan & Reich, 2007) and organisations need to have mechanisms in place to ensure continuous alignment. Simulary, PPM includes establishing processes within an organisation that continuously assess the contribution of every project, from inception to closure (Pennypacker & Cabanis-Brewin, 2003, p. 3). Although Killen and Hunt (2010, p. 165) found empirical evidence that links PPM practices to dynamic capabilities, it was not done specifically for IT investments. However, the dynamic capabilities perspective of Killen and Hunt (2010) represents a useful theoretical lens to understand IT value.

Drucker (1967) asked for astute management decision-making when investing in IT; Brynjolfsson (1993) for value from IT investments; Munns and Beijrmi (1996) for measuring project level success; Marnewick (2016) for focussing on the benefits, not artefacts, of IT projects; and Martinsuo (2013) argued for an integrative approach to manage the dynamic complexity of aligning individual value from business initiatives with organisational intent. In combination they emphasised the complexity and importance of managing IT value astutely in an increasingly complex, dynamic and fast-moving business environment. These are important, yet distinct, well-argued and credible academic views from a wide body of literature. However, it seems that a coherent view of how to achieve high levels of BITA, remains evasive notwithstanding a substantial body of research.

It is conceivable that system dynamics diagrams that include PPM practices could provide new insight on the alignment between IT and strategic intent. A recent study by Fang, Lim, Qian and Feng (2018, pp. 1303-1329) suggested the potential value of system dynamics diagrams, which have the ability to deal with the dynamic nature of IT use in organisations, in IT research to create new levels of insight. They see a potential value contribution through research embracing more dynamic methods when dealing with IT research.

Fang et al. (2018, p. 1303) concurred that system dynamics is a "tool capable of capturing the reciprocal and temporal causal mechanisms that underlie many complex and dynamic systems". The research problem arises from the fact that system dynamics methods have not yet been used to explore the dynamic complexity, nor the potential contribution, of PPM practices towards BITA. System dynamics has been used to provide a higher level of insight in other disciplines (Martinez-Moyano & Richardson, 2013, p. 103) and has seen limited application in IT research as argued and presented in Section 2.6.

Researchers of IT value at times reduce BITA to a rational process of delivering on the CSFs. By framing the BITA challenge differently, i.e. a dynamic process that requires different activities and recognises the dynamic complexity, it is possible to conceive that a management technique (PPM) that already encapsulates some of the CSF practices could make a significant contribution towards BITA. System dynamics techniques can be valuable to explore the contribution of project portfolio management practices towards improving business and IT alignment.

1.4 RESEARCH DESIGN AND QUESTIONS

An inductive approach was followed (see Figure 3.1) to gain new insights on BITA by conducting in-depth interviews with managers with significant IT management experience. The experiences and observations shared by the managers were intrepreted to create qualitative system dynamics (SD) diagrams representing how PPM practices contribute to BITA and also to understand the dynamic complexity embedded within the diagrams.

A system dynamics technique, namely causal loop diagrams (CLDs), was used to model the dynamic complexity and analyse the system structure to gain new insight. The use of CLDs was prompted by the literature highlighting the dynamic nature of alignment and lamenting the current typically static perspective on BITA. Using a method that embraces dynamic complexity and seeking new insights from within this complexity, was fundamental to the value of the research.

System archetypes present in CLDs reveal general issues hidden in dynamics of the system itself and the value of archetypes lies in the insights that they provide about the dynamic interaction between different variables in complex systems (Bureš & Racz, 2016, p. 1082). Using system dynamics diagrams and systems archetypes to understand a particular system's structure and behaviour "fosters communication and identification of high-leverage interventions for problematic complex system behaviour" (Bureš & Racz, 2016, p. 1082). These high-leverage interventions formed part of the contribution of the research and are presented in Chapter 6.

This research is interdisciplinary in nature as it sought a synthesis between the fields of strategy (in particular dynamic capabilities), information systems (focussed on IT value and BITA) and project management (in particular PPM) to explore potential value from practices prevalent within the one domain (PPM) to contribute towards an ongoing management challenge in the other (IT). In addition, methods not yet used to investigate BITA contributed new insight made possible by techniques to model dynamic complexity as proposed by Fang et al. (2018, pp. 1325-1326).

It was the **objective of the research** to determine the contribution of PPM practices towards achieving business and IT alignment and identify potential systemic leverage points for practitioners to gain maximum value from IT investments. In order to achieve this objective, a **primary research question** was defined as: What insights can be gained from system dynamics diagrams when modelling the influence of PPM practices on the alignment between IT investments and an organisation's strategic intent?

Four **subordinate questions** were required to answer the primary research question. Table 1.1 contains the four secondary questions and Chapter 3 deals with the detailed methods used to answer these questions.

Table 1.1: Subordinate research questions

Id	Question	Presented
SRQ1	What are the critical success factors that contribute towards business and IT alignment in the academic literature?	Chapter 4
SRQ2	What collection of practices defines PPM in academic and practitioner literature?	Chapter 5
SRQ3	What are the dynamic relationships between the PPM practices and business and IT alignment CSFs?	Chapter 6
SRQ4	What systems archetypes and leverage are prevalent within the qualitative system dynamics diagrams that depict the PPM practice and BITA CSF relationships?	Chapter 6

Chapters 4 and 5 can be read in isolation since they deal with subordinate questions 1 and 2 to provide insight on BITA CSFs and PPM practices respectively. However, Chapter 6 deals with both the BITA CSFs from Chapter 4 and PPM practices from Chapter 5 and depicts the relationships via a collection of qualitative system dynamics diagrams containing a full set of variables identified following the processes described in Chapter 3. Also presented in Chapter 6 are the systems archetypes, short narratives of the key insights, and the potential high-leverage to improve BITA following the analysis of each diagram.

Table 1.2 provides the final structure for the research report that is strongly influenced by the primary and subordinate research questions as well as the research design.

Table 1.2: Structure of the research report

Chapter	Content
1: Introduction	Explain the background, research context, research problem and research questions.
2: Literature review	Define BITA clearly. Review IT value and BITA literature. Review PM and PPM literature. Review SD and CLD literature and use of CLDs in IT research.
3: Research design and methods	Describe the research design, research process, research methods and research ethics.
4: Business and IT alignment	Define a comprehensive list of factors that can be tested for in the interviews to determine their existence as well as relationships to PPM practices.
5: Project portfolio management	Define PPM and create an instrument to test for the presence of PPM practices and gauge the influence on BITA CSFs. List the PPM practices as extracted from the literature and a description of each practice.
6: Interview research results	Provide the results of presence of PPM practices (interviews) and the relationships with BITA CSFs depicted as CLDs. Give the results of the interviews with practitioners and academics about the perceived value and ability to use the particular model. Discuss the findings of the study, i.e. insights from the diagrams
7: Conclusions, recommendations and future research	Provides a synthesis of the research, recommendations, the research contribution, research limitations and future research recommendations.

The next chapter deals with the literature review of the relevant fields of research as indicated in Figure 2.1. Given the use of system dynamics diagrams and the relative novelty of this approach, it was decided to include a thorough discussion of system dynamics and causal loop diagrams (CLDs) in this chapter. Section 2.6 contains this discussion as well as examples of prior use of CLDs in IT research. Section 2.6 effectively serves as a bridge between literature (Chapter 2) and methods (Chapter 3) since it covers the use of the CLD method as well as the value and limitations in detail.

Chapter 3 contains the details of all design decisions and presents the details of data gathering as well as data analysis that took the format of constructing CLDs to present the information from the interviews. The detailed process of constructing the diagrams from the data is explained as well as the processes followed to select the academic literature for the systematic reviews presented in Chapters 4 and 5. Chapters 4 and 5 contain the results of the systematic reviews on both BITA CSFs as well as PPM practices.

Chapter 6 presents the details of the in-depth interviews, including narratives from the interviews and the diagrams constructed from the relationships identified from the observations. This is followed by an analysis of each of the diagrams to identify leverage. Also included in Chapter 6 are the results of discussing the diagrams with academics in the IT domain to obtain a critical view of the potential value of the method followed as well as limitations due to the chosen design.

Chapter 7 concludes with a synthesis, research recommendations, research limitations as well as potential future directions for BITA research based on the new insights presented. The contribution of the research to address the limitations in current BITA models presented in this chapter is argued following the structure of Whetten (2001) to substantiate a contribution to the BITA body of knowledge.

CHAPTER 2
LITERATURE REVIEW

2.1 INTRODUCTION

As this research study is multi-disciplinary in nature, its theoretical foundation is from two different academic domains, i.e. Information systems and Project management. This chapter contains a literature overview of the domain of business and IT alignment (BITA), as well as project portfolio management (PPM). It also contains details of the modelling technique used, causal loop diagrams (CLDs) from the systems thinking domain (see Figure 2.1).

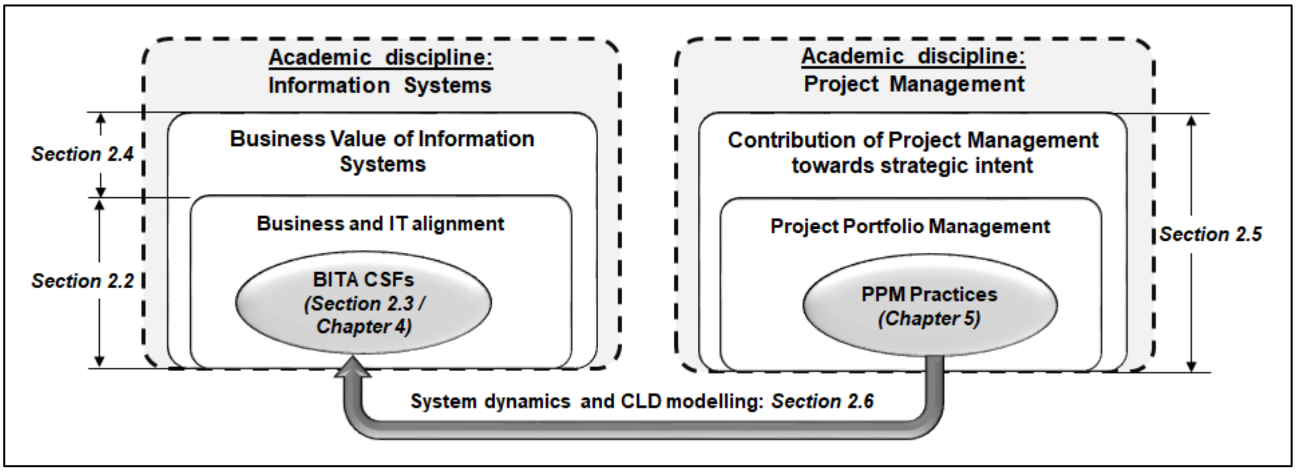

Figure 2.1: Structure of the literature review

Section 2.2 reviews literature on BITA. It covers the concept of IT value, defining BITA dimensions, and different BITA models. The section includes an overview of strategic management literature to describe the concept of 'business' to which the IT should be aligned and addresses in particular the IT value contribution to each of the more popular strategic management perspectives. The section finally acknowledges the more recent discourse about the impact of IT on organisational agility, as well as the relationship between IT investments and business risk. Risk and agility are complex factors that could be impacted negatively, or positively, by IT investments, as argued.

Section 2.3 discusses achieving and measuring BITA success. This section provides an overview of the factors that lead to alignment from the academic literature. Chapter 4 contains a systematic review to define the factors in a structured manner following an inductive approach. This section deals with previous studies about success factors and presents both the previous factors and confirms the complexity of multiple factors at different levels of granularity, often using different terminology.

Section 2.5 provides high-level background on project management literature followed by a more in-depth view on project portfolio management. The portfolio theory of Markowitz, the starting point for PPM, is introduced before PPM is covered in depth. This includes dealing with the benefits derived from PPM, tools and techniques, governance, limitations and finally, the link between PPM and strategic intent, in particular, the concept of dynamic capabilities.

Section 2.6 is an overview of system dynamics as a research area with an emphasis on the method used, i.e. causal loop diagrams. The construction of CLDs, archetypes prevalent in CLDs, the concept of leverage and challenges in using CLDs are presented. Some prior research findings using CLDs in IS academic literature are also presented in this section.

Certain knowledge areas pertinent to this research required more in-depth explorations of the literature in order to guide the fieldwork of the study. These were the subjects of separate chapters following the research methodology chapter (Chapter 3).

Firstly, given a lack of universally-accepted critical success factors (CSFs) for BITA, a systematic literature review was conducted to determine a robust set of CSFs to be used in the research. This is described in Chapter 4. Although Section 2.2 deals with alignment success factors, it is merely provided as context for the results of the systematic review presented in Chapter 4.

Secondly, with PPM practices not clearly defined by literature, yet required to conduct the interviews to probe for their presence and value, a second systematic literature review was performed to define a set of well-supported practices from the academic literature that constitutes PPM, and is presented in Chapter 5.

The complete literature basis for the research is thus found in Chapter 2, Chapter 4 and Chapter 5, although the later chapters are the results of systematic literature reviews with a clear focus.

2.2 BUSINESS AND IT ALIGNMENT

2.2.1 IT value

IT value research examines the organisational performance impacts of investments in IT. Most of the initial research (1980 to 1995) on the relationship between technology and productivity used economy-level or sector-level data within the USA and found little evidence of a positive relationship. Roach (1988, p. 389) maintained that, while computer investment per white-collar worker in the USA increased from 1977 to 1987, productivity did not increase discernibly. Berndt and Morrison (1995, p. 39) examined USA manufacturing industry data and asserted that the gross marginal product of high-technology capital (including information technology) was less than its cost. The remark from Solow (1987), “[Y]ou can see the computer age everywhere except in the productivity statistics”, became a common theme on pre-1995 IT value research, which could probably rather be themed *searching for IT value*.

However, by the early 1990s, new firm-level research started to deliver evidence that "computers had a substantial effect on firms' productivity levels" (Brynjolfsson & Hitt, 1998, p. 52). Coltman et al. (2015, p. 91) pointed to the seminal paper from Brynjolfsson and Hitt (1998) as the foundation for a whole new direction in the IT academic discourse. From the 1995s onwards, consensus started to build about IT value as empirical evidence grew about the value of investments in IT. Although multiple studies towards the end of the millennium provided empirical evidence of the value of IT investments, the biggest new challenge seemed to be that value did not universally emerge from all IT investments. Brynjolfsson and Hitt (1998, p. 52) pointed to the fact that, while the "average returns to IT investment are solidly positive, there is huge variation across organizations; some have spent vast sums on IT with little benefit, while others have spent similar amounts with tremendous success". They argued that the debate moved from *does IT pay off* towards h*ow can we best use computers?* In essence, it is not about investing in IT or not, but ensuring appropriate investments in IT, aligned with the organisation's strategic intent, to obtain business value.

This led into research over the last two decades not whether value exists, but rather the kinds of value that can be gained, followed by exactly how this value can be defined. Brynjolfsson and Hitt (2000, p. 23) suggested that, as IT becomes less expensive and more powerful, the business value of technology is limited less by processing ability and more by the ability of management of organisations to design new processes and organisational structures that leverage this capability. Academic literature focussed on defining the conditions and factors key to unlocking this value.

Researchers adopted multiple approaches to assess the mechanisms by which IT business value is generated, as well as to determine the extent and forms of value (Melville, Kraemer & Gurbaxani, 2004, p. 283). According to Kohli, Devaraj and Ow (2012, p. 1145), managers make informed information technology investment decisions when they are able to quantify how IT contributes to firm performance. When managers struggle to quantify how IT investments contribute value, it becomes rather difficult to argue the ROI made. It was not only academia that grappled with the IT value challenge. The value from IT also seemed illusive for many managers as indicated in practitioner literature (Agerback & Deutscher, 2010, p. 7-11; Bloch & Hoyos-Gomez, 2009, p. 29-35; Willmott, 2013).

For most firms, IT expenditure represents a major, and growing element in the overall firm budget (Ong & Chen, 2016, p. 137). The IT investment decision has significant operational and strategic impact on the firm's value chain (Melville et al., 2004, p. 284). Kobelsky, Richardson, Smith and Zmud (2008, p. 957) contended that environmental, organisational, and technological circumstances affect managers' budget decisions. Their research supported the value from IT findings since they provided empirical evidence that "IT budget levels are positively associated with subsequent firm performance and shareholder returns", a concept that is not unilaterally supported in the IT literature (see Section 1.2). Importantly, they suggested that IT's aggregate effect on performance is a weighted average of two very different components; "(i) context-driven IT budget levels" that deals with the firm's competitive positioning and what value is created and "(ii) idiosyncratic IT budget levels" that reflect the specific details of the organisation, it structure and the deployment of the IT assets. These two components are presented in Figure 1.1 using different terminology.

The work by Kobelsky et al. (2008) alluded to the fact that IT expenditure is both dependent on contextual factors changing an organisation's operational environment, as well as internal factors based on the deployment of technology, or not, within the organisation. It can thus be reasoned that, if an IT investment is dependent on both environmental and organisational factors, the potential value could also be derived from competitive positioning (externally) as well as organisational abilities and efficiencies (internally). While some research, like the work by Mithas and Rust (2016, pp. 223-246), is still narrow in focus by seeing IT value as a reduction in cost, increase in revenues, or both, most IT value research now acknowledges the principles argued by Melville et al. (2004) and Kobelsky et al. (2008) that potential value is distributed across the extended value chain.

Brynjolfsson and Hitt (1998, p. 52) were some of the first authors to argue that initial research focussed on the traditional attention to financial measurement to the observable aspects of output, like price and quantity, while overlooking the intangible benefits, such as enhanced quality, new products, better customer service and quicker delivery cycles. Similarly, research often focussed on the relatively observable aspects of investment, such as the cost of computer hardware and software, and disregarded the more significant, yet less tangible, investments in developing new products, services, markets, business processes and employee skills and capabilities (Brynjolfsson & Hitt, 1998, p. 52). Paradoxically, while investments in technology have significantly improved the ability to collect and analyse data, it has become increasingly difficult to measure both IT investments and value using conventional methods as both the extent of the investment and the multi-faceted nature of the value becomes increasingly complex.

Although standard growth accounting techniques provide a useful starting point for any assessment or for the contribution of IT, it became evident that a more inclusive view on IT value is required. Melville et al. (2004, p. 283), for example, provided evidence that firms do not appropriate all of the value they generate from IT, since value may be captured by other entities in the value chain or competed away and captured by the final customers as lower prices or better quality. On the other end of the spectrum, Kohli et al. (2012) found that the influence of IT investment on the firm is more pronounced and statistically significant on firm value, than exclusively on the accounting performance measures. They argued that "the overall impact of IT is better understood when accounting measures are complemented with the firm's market value" (Kohli et al., 2012, p. 1145). Ravichandran, Liu, Han and Hasan (2009, p. 205) provided strong evidence that IT investments often enable diversification. They content that the value gained from strategic diversification activities is not always traced back to the initial IT investments.

Another interesting contribution follows from the work of Chen, Su and Hiele (2017, p. 1), who claimed the potential IT value depends on the type of organisation. They researched whether a firm's industry type, in this instance, "information product industries (IPI) versus physical product industries (PPI)", has an effect on the relationships between business value and IT expenditure. Their analysis indicated a substantial difference on the IT impact between their classification of IPI and PPI firms. Clearly the dimensions and extent of IT business value depend on a variety of factors, including the type of IT, management practices, and organisational structure, as well as the competitive and macro environment in which firms operate (Melville et al., 2004, p. 283).

Managers make informed IT investment decisions when they are able to quantify how IT contributes to firm performance (Kohli et al., 2012, p. 1145). Unfortunately, the growing complexity of the academic discourse did not help practitioners searching for guidance in growing IT investments. Vermerris, Mocker and Van Heck (2014, p. 629), for example, acknowledged that obtaining value from IT investments remains a concern for executives and noted that it has been a key concern for IT executives for the last 30 years. Although it is generally accepted that investments in IT are essential to achieve business success (Bharadwaj, 2000, p. 169), organisations often find themselves heavily invested in IT that do not necessarily support their strategic objectives. Practitioner literature is filled with articles about IT value, including 'how to' guides or rules to follow, none of which is academically justified (Agerback & Deutscher, 2010, pp. 7-11; Carr, 2003, pp. 24-38; Horne, 2017).

One of the significant streams of the IT value discourse is business and IT alignment (BITA). Being able to define a concept that tries to encapsulate the complexity of both investment and value is important. It is widely recognised that IT and business resources need to be well aligned to achieve organisational goals (Wagner et al., 2014, p. 241). The value of alignment is well supported through several systematic literature studies that brought together the disparate views of individual studies. Some of the most recent of these meta studies done by Aversano et al. (2012), Ullah and Lai (2013), Jentsch and Beimborn (2014) and Spósito, Neto and da Silva Barreto (2016) found many examples of value from IT investments. Gerow, Grover, Thatcher and Roth (2014, p. 1059) specifically investigated conflicting prior research about the value of IT investments on organisational performance. Their research reaffirmed that appropriate investments in technology can prove immensely valuable and impact the performance of organisations, with the emphasis on appropriate or aligned, IT investments.

BITA represents a desired state in which the relationship between business and IT is optimised to maximise the business value of IT. The results of BITA research have shown that organisations that successfully align their business strategies with their IT strategies can improve their business performance (Preston & Karahanna, 2009; Schwarz et al., 2010, p. 57). Importantly, BITA processes can also assist to determine the potential role of IT in an organisation to ensure that the correct IT initiatives form part of the strategic intent (El-Mekawy, Rusu & Perjons, 2015, p. 1229).

2.2.2 Defining business and IT alignment

Alignment between IT and business is considered one of the most important conditions for superior IT service quality and is a key source of IT business value creation (Wagner et al., 2014, p. 242). Business enterprises are dynamic systems, in which all components need to be aligned to obtain results. Alignment has been defined in numerous ways; some definitions are overarching and general, while others are more specific. The term *alignment* has been conceptualised in the literature in numerous ways such as fit, coherence, harmony, integration, congruence, relationship, *gestalt*, synergy and linkage (Chunpir, Schulte, Bartens & Voß, 2019, p. 191).

Broad definitions such as “the fit between an organisation and its strategy, structure, processes, technology and environment” (Chan, 2002, p. 98) and “IT alignment is traditionally conceptualized as the extent of fit or congruence between business strategy and IT strategy” (Queiroz, 2017, p. 22) are common, as well as more descriptive ones, such as “convergent intentions, shared understanding, and coordinated procedures” (Chan, 2002, p. 98). One of the most cited definitions (1123 citations by April 2018) is that by Reich and Benbasat (1996, p. 56), who described strategic IT alignment as “the degree to which the mission, objectives and plans contained in the business strategy are shared and supported by the IT strategy”. An early definition that found broad appeal in the academic literature, was from Luftman, Papp and Brier (1999, p. 3), who defined BITA as “applying IT in an appropriate and timely way, in harmony with business strategies, goals and needs”. Although expressed in different ways, the essence of the alignment argument is still explained by Figure 1.3 that indicates the value from IT.

A widely-used definition of alignment is from Henderson and Venkatraman (1993, p. 5), who defined alignment as the “degree of fit and integration among business strategy, IT strategy, business infrastructure, and IT infrastructure”. In their systematic review of 115 academic papers, Ullah and Lai (2013, p. 7) also chose to use the definition from Henderson and Venkatraman that is, in their opinion, attractive for many reasons. Firstly, it highlights all alignment factors and secondly, it refers to the purpose of the included factors as well as their objectives. According to Ullah and Lai (2013), alignment consists of several basic concepts. From the business perspective it includes business planning, business strategy and the tactical and operational level execution. From the IT side, it includes IT planning, IT strategy and the tactical and operational level execution.

All these definitions are succinct in their meaning that alignment is the successful working together of business and the organisation (ITO) to realise the mission, strategies and goals of an organisation. The definitions do not make specific reference to these terms, but are nonetheless clear in what they are alluding to (Chan & Reich, 2007, p. 300). Although terminology differences and different levels of granularity when defining *business* is evident, all the definitions encapsulate how IT should be a helpful counterpart of business to achieve the intended aspirations of the organisation.

Alignment could also exist at different dimensions within an organisation. There are various dimensions of alignment, all of which have been in some part found to be pertinent to organisational performance and success. In the literature distinct dimensions can be found (Chan & Reich, 2007; Reich & Benbasat, 1996, p. 56), such as (i) strategic (some authors refer to intellectual); (ii) structural; and (iii) cultural. According to Chan and Reich (2007, p. 300), less focus is put on structural alignment in academic IT literature, although it has a significant impact on organisational performance. However, some authors subdivide structural alignment again into the structure of the business as well as the structure of the ITO and the efficiency and agility gained from, and impeded by, these chosen structures.

Schlosser, Wagner and Coltman (2012, p. 5053) stated that the literature on business-IT alignment has matured in the last two decades, but different definitions and conceptualisations persist. Several different dimensions like strategic, intellectual, structural, social and cultural alignment have been developed. Schlosser et al. (2012:5054) confirmed that there is not a cohesive and widely accepted classification and that it is inherently difficult to obtain this due to the overlap of potential categories defined by authors. They compared the existing dimensions of alignment and proposed three (new) distinct dimensions: (i) human dimension; (ii) social dimension; and (iii) intellectual dimension. Nonetheless, their suggested categorisation also overlaps and is really not distinct, negating their claim of the limitations of categorisations used by other authors.

Although multiple categorisations or dimensions of BITA exist (Leonard, 2008, p. 563; Liang et al., 2017, p. 865; Schlosser et al., 2012, p. 5054) the three dimensions provided by Reich and Benbasat (2000, p. 82) seems to be the most common categorisation used. The challenge in uniquely defining the categories is that various authors combine or split categories differently or use different levels of granularity; however, they still mostly fit into the categorisation provided by Reich and Benbasat (2000). It is thus necessary to briefly investigate the different dimensions of alignment in the next section, using the strategic, structural and cultural dimensions popularised by Reich and Benbasat (2000).

2.2.3 Dimensions of business and IT alignment

2.2.3.1 Strategic alignment

According to Reich and Benbasat (2000, p. 82), strategic alignment is “the state in which a high-quality set of inter-related IT and business plans exist”. Strategic alignment thus ensures plans for strategy execution, for both the business and IT, which are co-developed and interlinked. It will therefore be difficult for alignment to be realised if dedicated, but importantly interrelated, strategic plans for business and IT do not exist (Lederer & Mendelow, 1989; Vitale, Ives & Beath, 1986).

Limited research has been done to date to distinguish business-IT plan alignment from IT-business plan alignment, with the latter referring to the IT department's knowledge and understanding of the business strategy, while the former refers to the use of IT to realise business strategy (Chan & Reich, 2007, p. 298). It is mostly accepted in the literature that there is joint planning or even a single business plan highly influenced by IT. The most important aspect from this bi-directional planning and activities is a clear indication that achieving alignment is more challenging than merely getting the IT department to 'do the right things'. This is a common point of view in industry that the lack of alignment can be ascribed to 'dysfunctional IT processes' to be rectified from within the IT management domain or ITO. This clearly does not represent the full picture and is discussed in more detail in Section 4.3.1 when dealing with collaborative planning as a CSF.

Ullah and Lai (2013, p. 2) provided strong support for the multi-directional activities that underpin BITA when they argued that alignment is the degree to which business and IT depend on each other, and share their domain knowledge with each other, to achieve a common objective. This is clearly in line with the complexity of formulating business strategy, within organisations that should not be done separately from IT strategy, but rather as an interactive and integrated activity.

Figure 2.2, as opposed to Figure 1.2, indicates that CSFs are not merely actions to ensure that the IT arrow 'moves' in the direction of strategic intent. It has been stated in the literature that some CSFs also require the organisation to make better use of the technology resources deployed to improve BITA, hence the IT-business plan and business-IT plan argument by Chan and Reich (2007, p. 298), indicated in Figure 2.2.

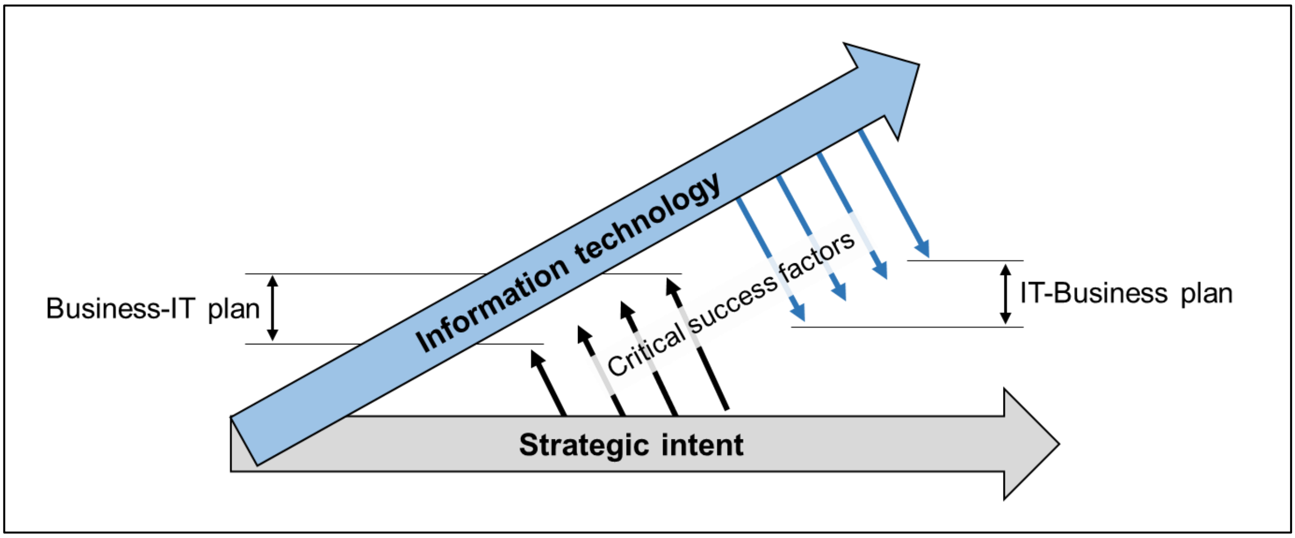

Figure 2.2 Business and IT alignment: Expanding the CSFs

Source: Author's own diagram based on the terminology of Chan and Reich (2007) and the arguments of Ullah and Lai (2013).

The work from Turel, Liu and Bart (2017, p. 118) elevated the importance for strategic alignment to the board-level. They emphasised that BITA should also be scrutinised by the board of directors. According to Turel et al. (2017, p. 117) board-level IT governance, defined as the board's actions to ensure that IT sustains and extends the organisation's strategies and objectives, "is an important practice that can positively influence organisational performance regardless of the IT use mode of organisations, organisation size, sales, and profit orientation of the organisation". According to Turel et al. (2017, p. 117), it is achieved by creating awareness regarding the strategic contributions of IT and providing IT governance training to directors.

Turel et al.'s (2017) research indicated that board-level IT governance is a driver of strategic alignment, and they suggested that up to eight percent (8%) of the variance in alignment can be explained by board-level IT governance. They concluded that boards have an important role to play in addressing the challenge of aligning IT with business via board-level IT governance since it is normally considered the responsibility of top management, not the board of directors (Turel et al., 2017, p. 130). It is suggested that the board can guide and monitor IT and business managers' actions to work together, to facilitate their joint planning, to ensure IT is aligned with business strategies and plans, supporting the Reich and Benbasat (2000) dimension of alignment.

2.2.3.2 Structural alignment

The literature describes structural alignment as the structure of IT resources and decision-making within organisations (Ullah & Lai, 2013, p. 2). Various organisations have benefitted from decentralised IT resources and decision-making as this creates a working environment where IT staff are not decoupled from the business activities that they should be supporting (Chan, 2008).

Conversely, the supporters of centralised structures argue better governance, better succession planning and more effective utilisation of extremely specialised resources. An example of structural alignment in human resources is a particular IT-intrinsic skill that may only be partially in demand within a specific business area, making it difficult to deploy it to that functional area since it is not fully utilised. It is possible to centralise the skill in a single person shared by two different business functions (Westerman, Tannou, Bonnet, Ferraris & McAfee, 2012, pp. 163-164). Although the new structure leads to potential conflict in priorities and deployment, it still creates access to IT capacity that may not have been possible with a different structure (Westerman et al., 2012, p. 164). Structural alignment is thus not about following a particular model, but rather deploying IT resources according to the particular situation, that could be inherently complex, especially in dynamic environments (Leonard, 2008, p. 564).

According to Malta and Sousa (2016, p. 889), misalignment emerges at different levels, for different components, or in complex situations such as acquisitions of business units by multi-business organisations. They argued for the use of models that can be shared between different structures as mechanism to achieve structural alignment. In their opinion, selecting a framework or reference model allows quick and proper articulation with performance indicators that provide a single status view, shared by all stakeholders in the organisation. Their research in using Enterprise Architecture (as a framework) suggest that organisations should consider models, such as the Zachman Framework, The Open Group Architecture Framework (TOGAF), or approaches, such as Business Process Management (BPM), as a way to ensure structural alignment. Each model, according to Malta and Sousa (2016, p. 889), has different elements that could assist with structural alignment.

Jonathan (2018, p. 337) believes that the empirical evidences suggest that organisations with suitable organisational structures, are more likely to implement the strategies which leads to BITA. Unfortunately, due to a lack of research on different organisational structures, little is known about how different organisational structures affect BITA. In the opinion of Jonathan (2018), the continuously changing business environment, and organisations' attempts to respond to these changes by ongoing structural improvements that lead to increased structural complexity, are contributing factors to poor BITA.

Although an appropriate organisational structure is not used in practice to improve BITA, the converse is true. Changes to organisational structure at times lead to a lack of alignment, the misalignment challenge described by Aversano et al. (2012, p. 464). Jonathan (2018, p. 337) contended that organisational structure definitely has an impact on BITA, but existing literature presents contradictory findings on the types of structures that have a beneficial impact on BITA. Structure of both the business and ITO clearly impacts BITA; however, the extent to which this is impacted, and which structures have a positive impact on alignment, remain elusive.

Chan (2002, p. 98) supported the notion of structural alignment as did Chan and Reich (2007, p. 301). An important observation from Chan's empirical work on structural alignment is stronger evidence for value from informal structural alignment than formal structural alignment (Chan, 2002, p. 110), which poses interesting questions in a dynamic and complex environment. In principle, designing alignment structures could be less effective than focussing on the principles of informal alignment. Although Chan (2002) referred to informal structural alignment, it could be the same principle that other authors refer to as cultural alignment, discussed in the next section.

2.2.3.3 Cultural alignment

Multiple authors (Avery & Bergsteiner, 2011, p. 5; Basile & Faraci, 2015; Luftman et al., 1999) agree that an organisation's leadership culture is a strong determinant of the degree of BITA. According to Reich and Benbasat (2000, p. 83), the cultural dimension needs to be understood and noted along with the strategic dimension, and only then can the nuances and difficulties of alignment be revealed. The cultural dimension, called the social dimension by some researchers, is defined in terms of "the state in which business and IT executives within an organisational unit understand and are committed to the business and IT mission objectives, and plans" (Reich & Benbasat, 2000, p. 82).

Again, as pointed out by Schlosser et al. (2012, p. 5053), the dimensions clearly overlap and are non-unique. The cultural dimension has success factors that influence the strategic dimension, with the prerequisite of a strong alliance between the business and IT executives being central (Chan & Reich, 2007, p. 301; Reich & Benbasat, 2000).

Cao (2010, p. 275) found strong support in numerous studies that view organisational culture as an important factor that may explain significant variations in IT business value. Ifinedo (2007) revealed that there is a positive relationship between large IT project success and a supportive, cooperative and collaborative organisational culture. Bradley, Pridmore and Byrd (2006) corroborated Cao's evidence that organisational culture is an important factor when studying IT success and explaining variations in IT success.

Support for the importance of the culture dimensions comes from multiple authors: Liang et al. (2018, p. 5) is of the opinion that, since every "IT change ripples through your entire company, no decision can be taken lightly or made without lengthy deliberation. Alignment, in other words, can produce inertia – unless it's accompanied by the right culture and the right norms of communication". According to Jonathan (2018, p. 382), dissimilar cultures create different norms of what is acceptable within a specific context. This could, for example, affect the credibility of the ITO from the perspective of the business and the resultant trust, or lack of trust, is often cited in research as a significant influence on BITA.

El-Mekawy and Rusu (2011, p. 1) investigated the impact of organisational culture on the maturity of BITA within organisations. Their results show a potential difference in how different elements of BITA are interpreted and implemented in different organisational cultures, but importantly, they contend that the influence of organisational culture on BITA is more complex than what is expected. They claim that this is especially evident on CSFs that require social interactions.

Cao (2010, p. 275) inferred from previous studies, that superior IT business value is more likely to be realised in a firm when IT is reinforced by the organisational culture. In addition to empirical evidence, there are conceptual studies seeking to explain the reciprocal link between IT and culture. For instance, Robey and Boudreau (1999, p. 168) concentrated on theories of organisational culture as a means to explain the contradictory IT consequences within firms.

Ullah and Lai (2013, p. 2) highlighted that the degree to which business and IT depend on each other and share their domain knowledge to achieve a common goal, is key in understanding cultural alignment. According to Walentowitz, Beimborn and Weitzel (2010, p. 72), the "the interface between business and IT, as well as strong connections of interface actors with their management and their unit, are advantageous for the creation of IT/business knowledge, solidarity between IT and business and the power of the interface actors between IT and business, and in this way are beneficial for business/IT alignment". All these authors either provide empirical evidence, or strong conceptual arguments about the value of cultural alignment.

The terminology and granularity challenges are evident when reviewing Preston and Karahanna's (2009, pp. 159-179) work on BITA alignment. Their work refers to social dimension and intellectual dimensions of alignment and the interdependency between the two dimensions. However, the descriptors of the dimensions align with the cultural alignment descriptor and social alignment and intellectual alignment could be subsets of cultural alignment, especially given the casual structure between social and intellectual dimensions presented by Preston and Karahanna (2009). However, it is evident from their work, as well as that of Jonathan (2018) and Liang et al. (2018), that structural alignment and strategic alignment are probably easier to describe and agree upon, than cultural alignment. None the less, the requirement to share knowledge is a strong driver of BITA. A shared understanding, or a meeting of the minds between business and IT, is critical to BITA success, whether it is called informal structural alignment by Chen or segmented as intellectual and social by Preston and Karahanna (2009).

Preston and Karahanna (2009) argued that, although several variables (CSFs) contribute toward the alignment between business strategy and IS strategy, the effect of these CSFs on IS strategic alignment is channelled through a shared vision about the IT value between the ITO top management and the organisation's top management. They suggested, and found strong support from other authors, that a meeting of the minds between IT and business top management on IT value propositions, is vital to align an organisation's IT strategy and its business strategy (Preston & Karahanna, 2009, p. 160). Importantly, Preston and Karahanna (2009) also suggested an iterative co-evolution of strategy between business and IT and that the organisational processes that influence alignment, should reflect the dynamic interplay between IT and business strategies jointly developed and implemented in unison. The concept of dynamic complexity is thus yet again in play in the arguments of these authors.

Authors like Baets (1992, p. 207) and Gerow, Thatcher and Grover (2015, pp. 465-491) developed BITA models. The models represent a step beyond the dimensions as they typically contain a higher degree of granularity and, at times, defined actions embedded within the categorisation used within the models. The next section provides a high-level overview of key BITA models found in academic literature.

2.2.4 Alignment models

Various alignment models that provide a holistic and prescriptive view of the alignment between IT and business exist in the literature. Some of the earliest, still widely cited, research in this domain was conducted at Massachusetts Institute of Technology (MIT) during the 1980s. The research focussed on the strategic use of IT and was the start of the academic discourse that led to the BITA field of research (Chan & Reich, 2007, p. 303).

A selection of alignment models that are deemed to be particularly influential in the BITA academic literature, or important for this research, are covered in this section:

- MIT90s framework by Morton (1991, p. 20) – see Figure 2.3.
- Baets model (1992, p. 207) – see Figure 2.4.
- Strategic Alignment Model (SAM) by Henderson and Venkatraman (1993, p. 476) – see Figure 2.5.
- Maes (1999) extension to SAM – see Figure 2.6 and Figure 2.7.
- BITA maturity criteria by Luftman and Kempaiah (2007, p. 67) – see Figure 2.7.
- Gerow, Thatcher and Grover's (2015, p. 470) alignment construct – see Table 2.1.

Although the work of Gerow et al. (2015, p. 470) is not presented in their research as a BITA model, it fits most of the criteria and is also one of the most comprehensive 'models' to date that encapsulates much of the prior work in BITA. Similarly, some other authors (Khaiata & Zualkernan, 2009, p. 140; Lee, Kim, Paulson & Park, 2008, pp. 1167-1181; Saat, Franke, Lagerstrom & Ekstedt, 2010, pp. 16-20) presented BITA 'models' that are excluded from this review. These models were reviewed but it was decided to exclude them since they either do not build on previous models, or, have a different intent or focus. An example is the Business and Information Systems MisAlignment Model (BISMAM) from Aversano et al. (2012, p. 464), not presented here, but dealt with in a different part of the literature review.

In the 1980s, IT started to move from its traditional supporting role to a more strategic role in organisations (Chan & Reich, 2007, p. 303) triggering research at MIT (in particular) that focus on strategic use of IT. The MIT90s framework (Figure 2.3) by Morton was developed which theorises that "revolutionary change involving IT investment can bring about substantial rewards as long as the key elements of strategy, technology, structure, management processes and individuals and roles are kept in alignment" (Chan & Reich, 2007, p. 303). Thus, if one of these elements is changed, the others will be affected. The initial elements of the MIT90s framework turned out to be relatively timeless with some of the latest models still referring to the initial elements from the Morton model.

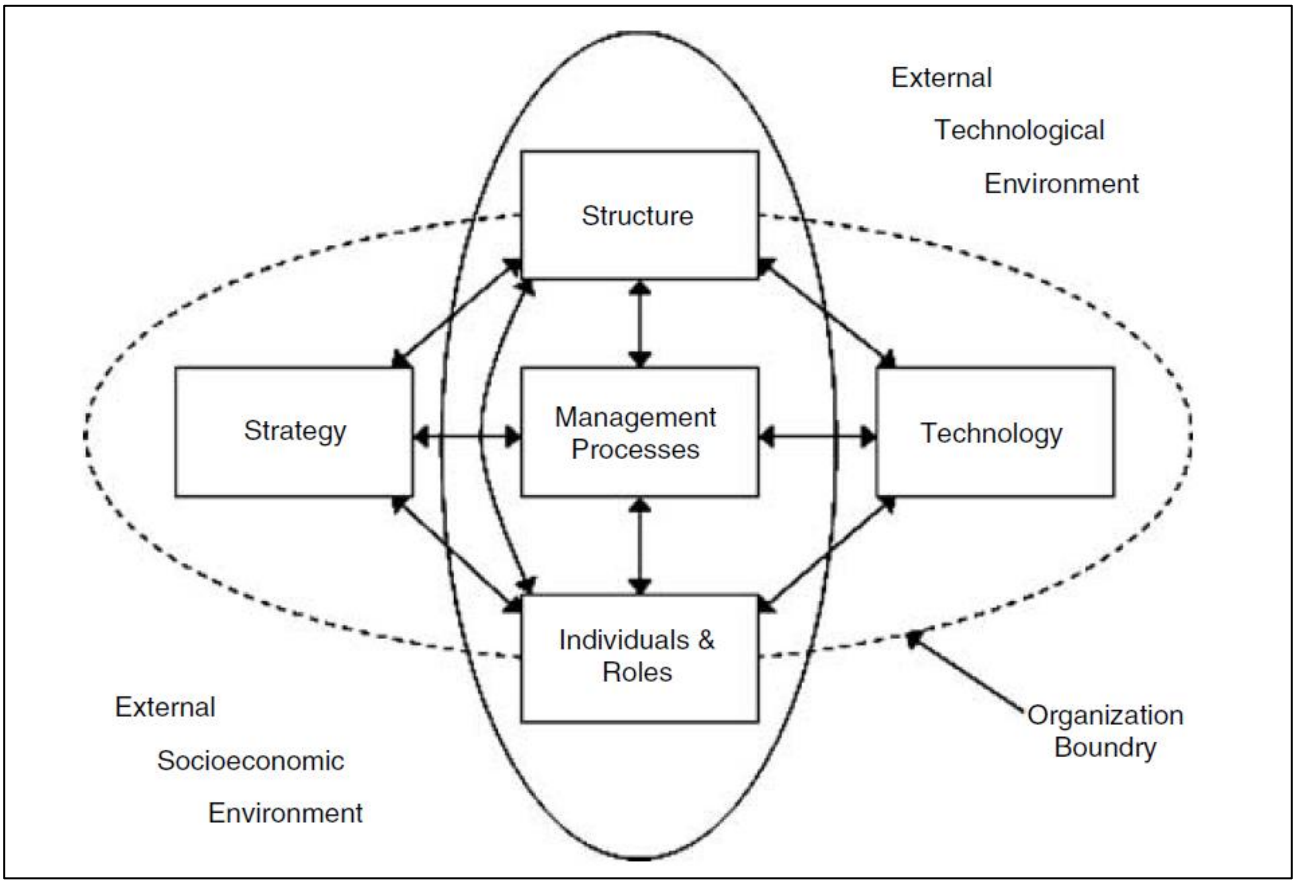

Figure 2.3: The MIT90s framework

Source: Morton (1991, p. 20).

The model was never presented as an IT and strategy alignment model, but rather as a model depicting the forces that shape organisations in the 1990s, a time when management became aware of the impact of IT and the start of the IT value debate. However, it was ground-breaking in that IT, up to that point always depicted as part of the resource-based view of the firm, became part of the contextual environment that also shapes business strategy.

Immediately following the work of Morton (1991), was a business and IT alignment model from Baets (1992), adapted from the alignment models of MacDonald (1991) as well as the enterprise-wide information model from Parker, Benson and Trainor (1988, p. 18). The Baets model (see Figure 2.4) depicts the interaction of business strategy, organisational infrastructure and processes, IS infrastructure and processes, and IT strategy supporting and extending the work by Morton (1991). Importantly, Baets' (1992) model also recognises that alignment takes place in a broader context and incorporates factors such as competition, organisational change, human resource issues, the global IT platform and IT implementation processes. However, in what can be seen as a step backwards (with hindsight) given the prominent role of people in modern models, presenting the individuals and roles that is distinct in the Morton model, with the organisational infrastructure and process as one dimension in the Baets model, is problematic.

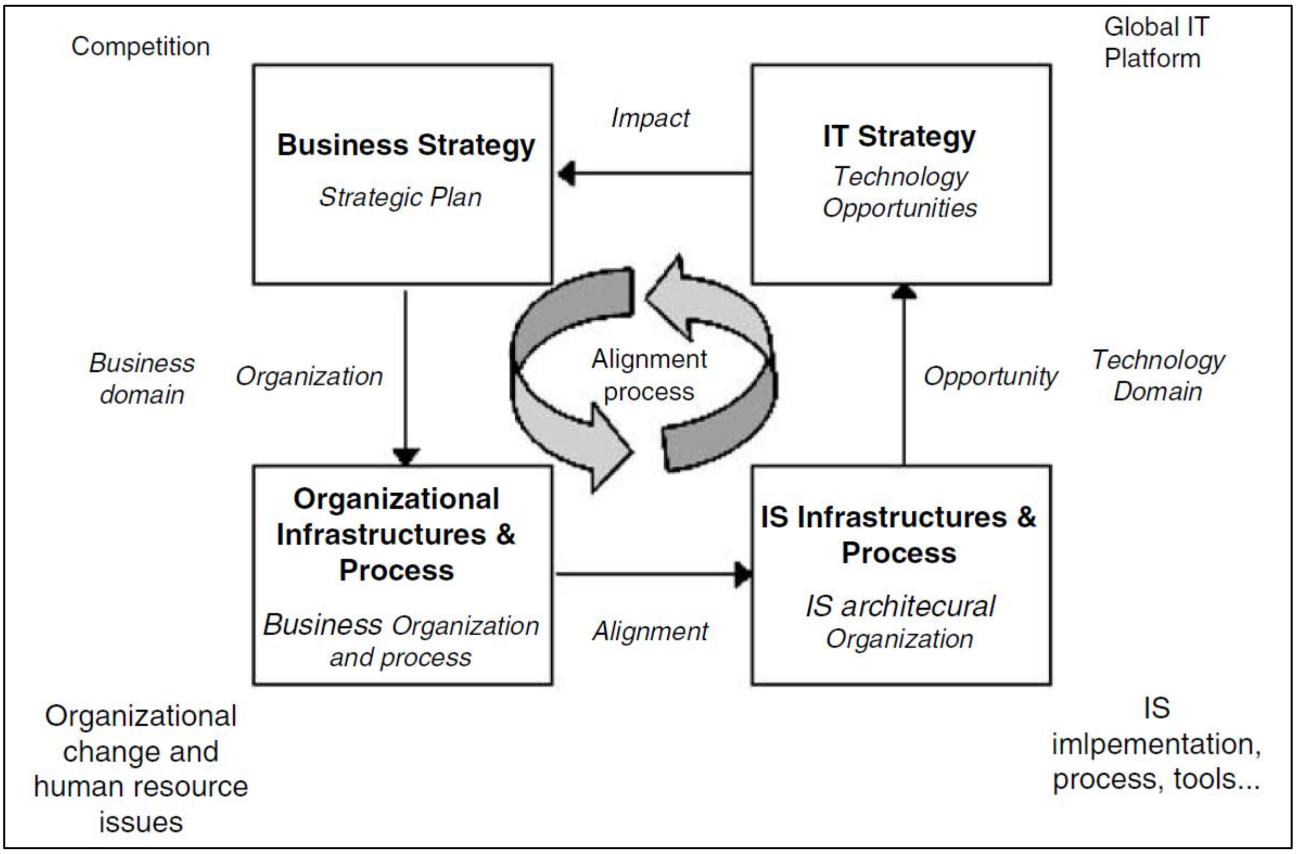

Figure 2.4: The Baets model

Source: Baets (1992, p. 207).

Baets (1992) challenged the assumption of participant awareness of the economic environment and the corporate strategy present in the Morton model. He argued that in some organisations, there is not a monolithic, widely-accepted strategy and "that most organizational members do not know the strategy" (Baets, 1992, p. 209). With the rapid development of the field of strategic management since the 1990s (see Section 2.4.1), as well as the internal use of IT to communicate, for example a strategy, within organisations, it is reasonable to argue that this is probably less of a challenge in modern organisations. Nonetheless, an important argument is embedded in the challenge from Baets. In modern organisations with fast-changing strategic imperatives, employees have to work towards a moving target, i.e. aligning to a strategy that is not necessarily well defined or well known, the type of conditions leading to dynamic complexity.

The challenge pointed out by Baets (1992), not having a clear vision of the strategy, is probably still prevalent today, but for a completely different reason. In the modern organisation dynamic complexity leads to frequent updates to strategic intent that also makes alignment a challenge as the communication overhead to share the changing strategic intent increase.

The work of Baets (1992) was followed by what remains to this day the most widely-cited BITA model in academic literature, the Strategic Alignment Model (SAM) by Henderson and Venkatraman (1993,

p. 8). It is not surprising that the Baets (1992) and the Henderson and Venkatraman (1993) models have strong similarities, since both are rooted in the MIT90s framework (Chan & Reich, 2007, p. 303).

Henderson and Venkatraman (1993) reported that continuously evolving strategic alignment will assist organisations to continuously maintain and increase their competitive advantage in the marketplace. According to Henderson and Venkatraman (1993), this competitive advantage is achieved by, firstly, the implementation of IT that enables the execution of the business strategy, and secondly, by using IT to improve the internal operational performance of the organisation when executing said strategy as indicated by Figure 1.1, the enablement of the value proposition as well as the ability to execute, the operating model.

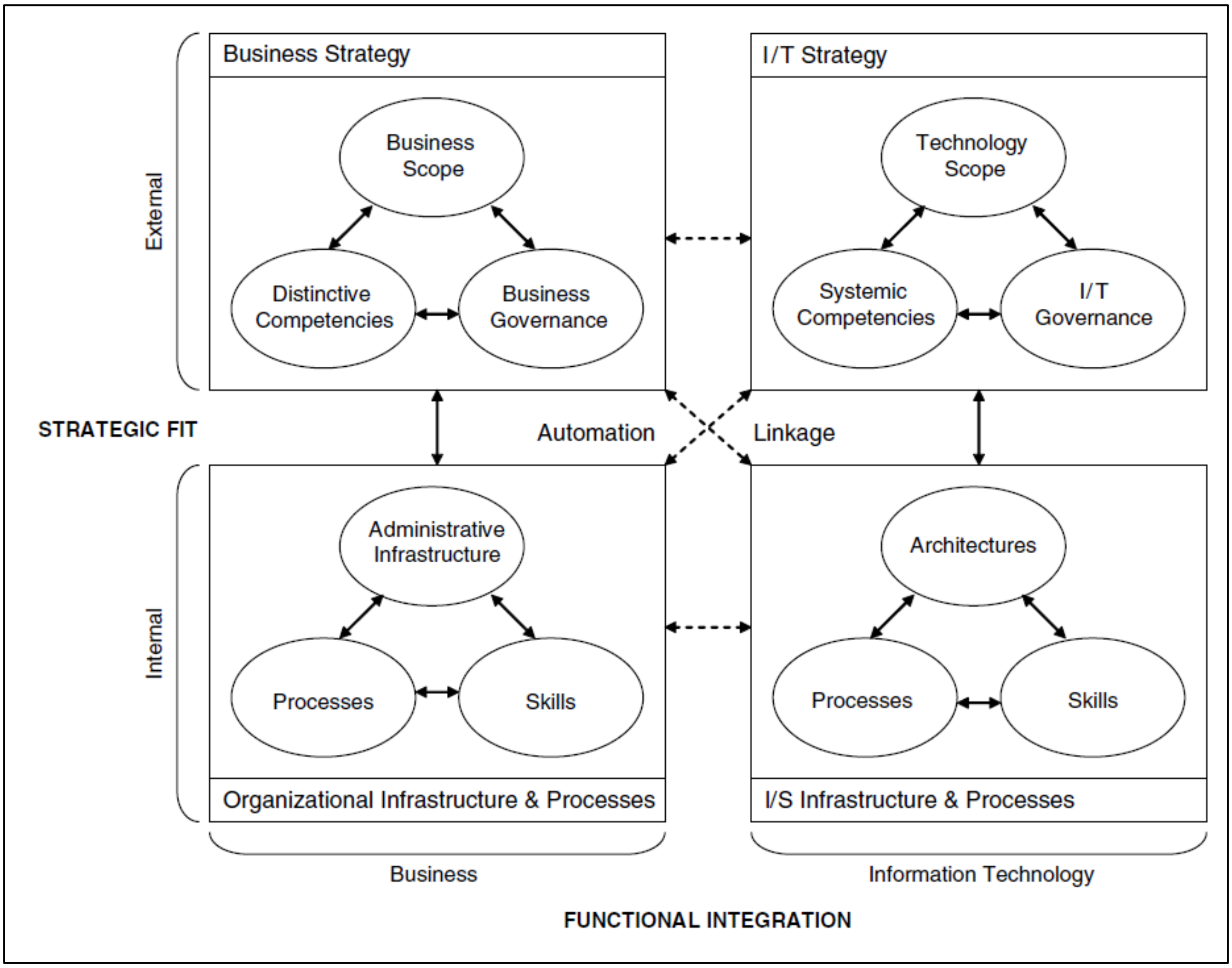

Figure 2.5: Strategic Alignment Model

Source: Henderson and Venkatraman (1993, p. 476).

The Henderson and Venkatraman (1993) business-IT alignment model, known as the Strategic Alignment Model (SAM) is illustrated in Figure 2.5.

There are two dimensions of BITA according to Henderson and Venkatraman (1993):

- The strategic fit dimension (horizontal axis in Figure 2.5) which refers to the fit of the internal organisation structures with external business environment for both the business and IT. The internal capabilities of both business and IT must be capable to deliver value to the customers and compete successfully in the market.
- The functional integration dimension (vertical axis in Figure 2.5) refers to the fit of business plans, infrastructure and processes with the IT plans, infrastructure and process in terms of both the internal environment and external environment.

Henderson and Venkatraman (1999, pp. 9-12) identified four main components within the intersection of the strategic fit and functional integration dimensions. These are (i) the business strategy component; (ii) the organisation infrastructure component; (iii) the IT strategy component; and (iv) the IT infrastructure component.

In the SAM, the human dimension is captured within the skills and processes in the organisation infrastructure and IT infrastructure. In the SAM, the concept of strategic alignment shows cross-domain alignment between the external and internal environments, and the business and IT domains, different from the bivariate fit in the Baets model. This has remained mostly unaltered for all BITA models presented since.

A new dimension to this model is the influence of IT on the governance within organisations (see Figure 2.5). Henderson and Venkatatram were very clear about the ability of IT to both support and shape business policy (Chan & Reich, 2007, p. 303).

Given the previous arguments about cultural alignment, it is interesting to note that this is not explicitly dealt with in the model structure, although by the very nature of the cultural dimension it deals with concepts like trust, tacit knowledge sharing, joint planning and similar concepts that are not easily depicted on the model. However, these aspects are part of the dynamic complexity that is the modern digitally-transformed or IT-enabled organisation and yet the most commonly-used model fails to account clearly for this challenge.

Following on Henderson and Venkatraman was Maes (1999, pp. 1-25), who added to the SAM in an important area by indicating that BITA cannot be demarcated as a management concern only; and establishing alignment as a design concern as well. According to Maes (1999), the information sharing and architectural issues that are central in both the generic framework for information management, and in the Integrated Architecture Framework, play a pivotal role in this alignment.

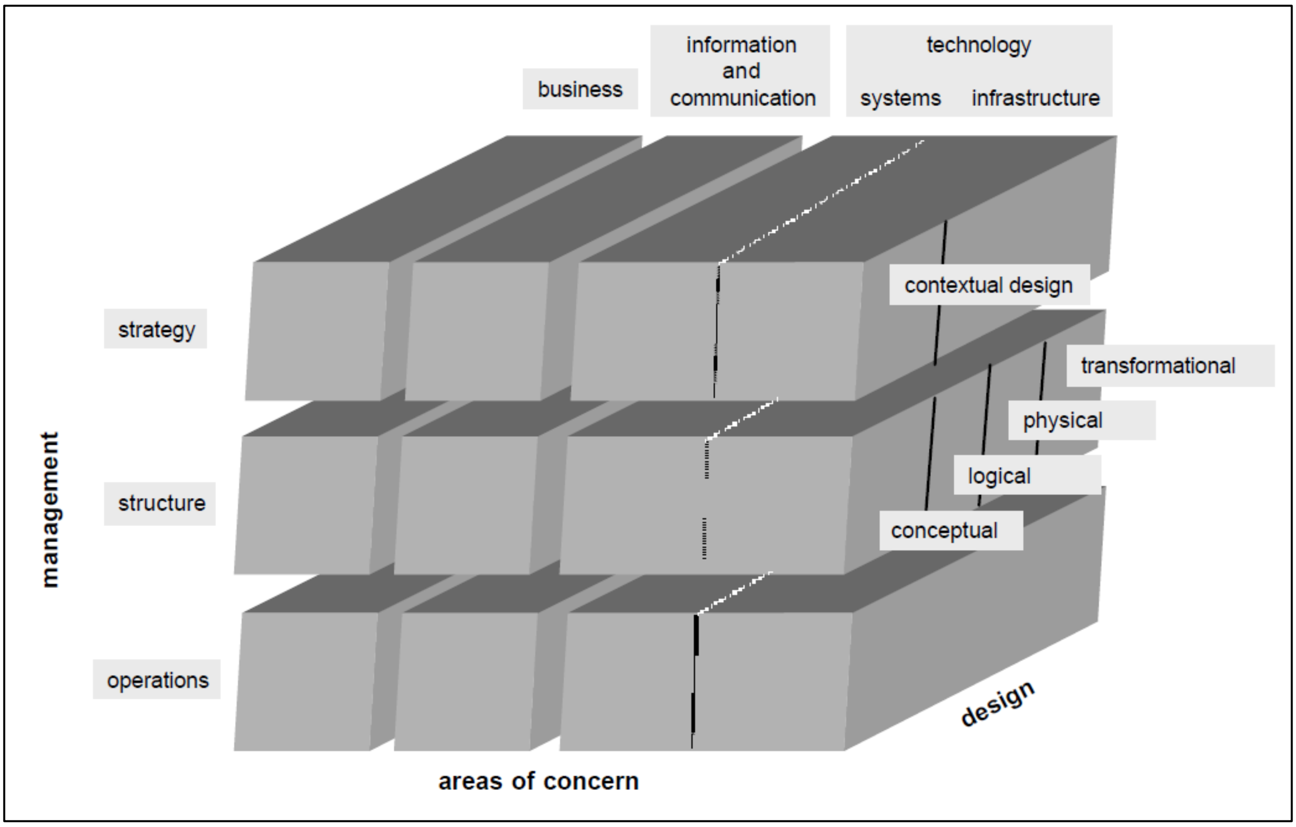

Figure 2.6: The outline of a unified framework for alignment

Source: Maes (1999).

Subsequent work by Maes et al. (2000, p. 19) redefined BITA as the continuous process, involving management and design sub-processes, of consciously and coherently interrelating all components of the BITA relationship to contribute to the organisation's performance over time, alluding to dynamic complexity. This work by Maes et al. (2000) is important as it acknowledged a more process-orientated view of alignment and focussed very strongly on the interrelationships, a very systems-orientated view on the alignment challenge.

Maes et al. (2000) extended the SAM model to produce a framework that incorporates additional functional and strategic layers and a third dimension that takes cognisance of the design sub-processes. A new principle introduced was the separation of information providers from the systems that provide information. The concept of infrastructure that enables systems to provide information is still the basis of most IT strategic planning models. A new information domain represents the knowledge, communication and coordination of information. They also added a third dimension that contains specific sub-architecture areas.

The generic framework (Figure 2.7) was presented by Maes et al. (2000) as an improvement on the SAM. It reflects the need for information and communication, by including extra functional and strategic levels in the model although it deals more explicitly with information management and not with BITA. According to Maes et al. (2000), the framework is a generic model for exploring the interrelationships between the different components of information management. The Maes et al. (2000) generic framework deals with the interrelationships of business, information, communication and technology at the strategic, structural and operations levels.

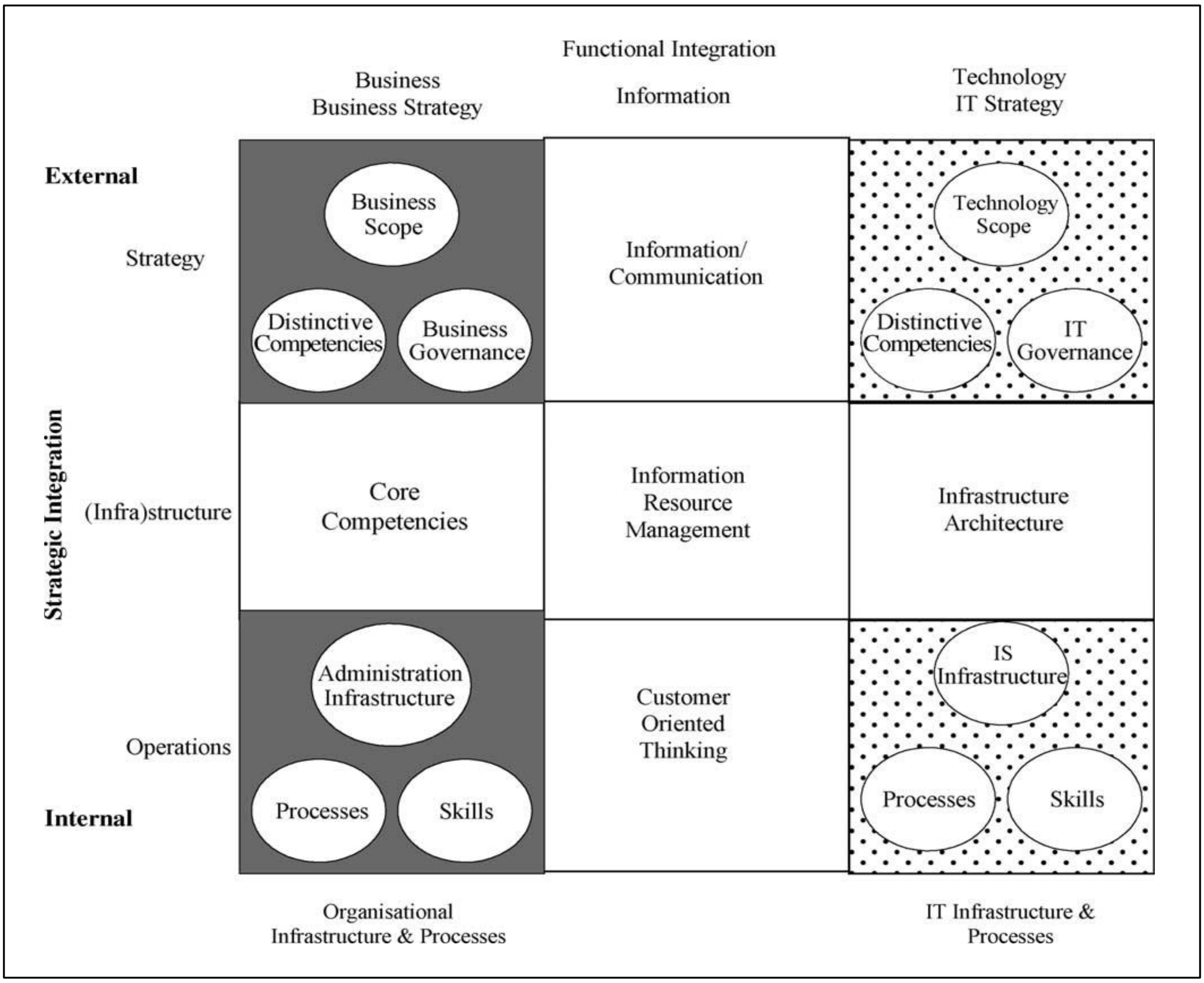

Figure 2.7: A generic framework for information management

Source: Maes (1999) and Maes et al. (2000).

Maes et al. (2000) divided the internal domain into structural and operational levels and the more long-term design elements into the architectural components, competencies and infrastructures of the organisation. By adding the middle row (horizontal) and middle column (vertical) new competencies (like customer-orientated thinking) and new core processes (like information resource management) were added to the traditional SAM.

Maes et al. (2000, p. 25) posited that a key value of the model is where infrastructure meets information and communication, the concept of information resource management is introduced, as well as the benefits of a learning enterprise through knowledge sharing, a key enabler in BITA in all models to date. Maes et al. (2000) called information sharing and communication anchors for all the other dimensions in the model. Although the model of Maes et al. (2000) does not mention dynamic complexity explicitly, the emphasis on design and new capabilities like customer-orientated thinking and information resource management are significantly more suited to deal with dynamic complexity in a changing environment.

None of the early BITA authors refer specifically to a firm’s dynamic capabilities (see Section 2.4.1.3.). The concept of dynamic capabilities, as well as principles such as dynamic complexity, were in the early developmental stages in both the systems thinking and the strategic management literature. Senge (1997) was essentially the first author to elaborate on dynamic complexity in the systems domain. At the same time, Teece et al. (1997, p. 516) were the first authors in the strategic management literature to present a firm’s dynamic capabilities in the strategic management literature. However, some of the concepts that led to the development of the Maes model (1999) acknowledged the dynamic nature of the firm.

Subsequent work by Maes (2007, pp. 11-26) took an information management perspective on the BITA challenge. He presented information management as an “integrative discipline that connects all the information-related issues of an organisation. Its integrative nature is investigated through a generic framework linking strategy and operations and also business and technology” (Maes, 2007, p. 11). The importance of an IT-enabled information management capability was supported by Mithas, Ramasubbu and Sambamurthy (2011, pp. 251-253) who stated that the aim was to achieve business excellence, and not only to create, but also sustain a competitive advantage.

Following on the work of Henderson and Venkatraman (1993) as well as the model by Maes et al. (2000), Luftman (2000, pp. 1-50) developed the Strategic Alignment Maturity Model (SAMM), which is an extension of the SAM. The SAMM measures the BITA maturity of an organisation according to six different criteria as indicated by Figure 2.8.

Luftman (2000, p. 2) argued that achieving and sustaining BITA demands maximising the enablers as well as minimising the inhibitors of alignment. The development and use of the SAMM provided organisations with an instrument to evaluate these activities (Figure 2.8). For many authors that empirically tested for critical success factors that lead to improved alignment, the alignment as measured by the SAMM became the elusive measure of alignment success that they had been searching for. For researchers investing the CSFs (see Section 2.3.2 and Chapter 4) that present the actions to be taken, the SAMM became the key success criteria (KSC) that indicate the degree of alignment (see Section 2.3.3).

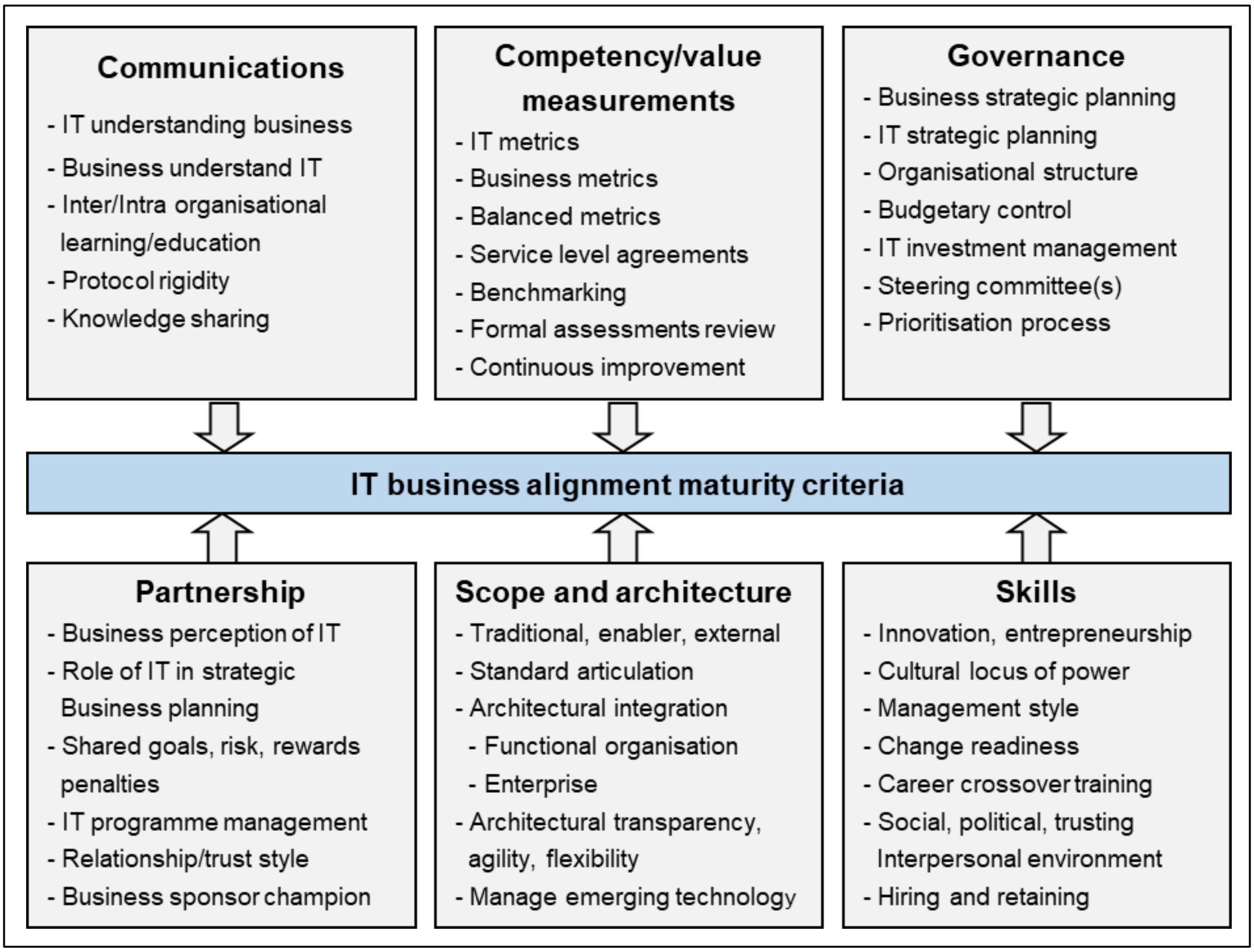

Figure 2.8: Strategy maturity criteria of the Strategic Alignment Maturity Model

Source: Luftman and Kempaiah (2007, p. 167).

Knowing the maturity of its strategic choices and alignment practices makes it possible for an organisation to determine the current status and how it can be improved. Each of the scores of the components of an organisation is then placed on a maturity model. The six components and their alignment criteria are (Luftman & Kempaiah, 2007, pp. 166-167):

i) **Communication** measures the effectiveness of knowledge sharing between IT and business allowing both business and IT insight into strategy, tactics, risk and priorities.

ii) **Value** uses multiple measures to indicate the contribution of IT to the organisation by means of terminology that both the business and IT understand and accept.

iii) **Governance** defines IT decision making ownership and the business processes at strategic, tactical and operational levels to set priorities and allocate resources.

iv) **Partnership** gauges the relationship between a business and IT including ITO's contribution in strategy formulation and the mutual perception of each other's value contributions.

v) **Scope and architecture** measures IT's contribution towards a flexible infrastructure, the use of new technologies and the delivery of customised systems to meet business requirements.

vi) **Skills** measures the full scope of human resource practices and the organisational capability for learning, the readiness for change and ability to leverage new ideas.

Achieving alignment is evolutionary and dynamic according to Luftman (2000, p. 2). He argued that alignment requires "strong support from senior management, good working relationships, strong leadership, appropriate prioritization, trust, and effective communication, as well as a thorough understanding of the business and technical environments" (Luftman 2000, p. 2). By defining levels of maturity, the work in these different areas can be measured to determine the currents status, define a desired future, and measure progress towards the defined idealistic values over a period of time.

The Luftman and Kempaiah (2007) capability conceptualisation was explored and used as a departure point by a number of research studies (Bharadwaj, El Sawy, Pavlou & Venkatraman, 2013a; Guillemette & Paré, 2012; Mithas et al., 2011; Rai, Pavlou, Im & Du, 2012). Chumo (2016, p. 81), for example, used the SAMM to establish alignment maturity levels of public universities in Kenya. He established that the alignment maturity was higher at the IT project level than the organisational level. However, there was consistency in the critical success factors that drive alignment with communication and partnership scoring high at both project and organisation level, compared with the human resource skills that ranked the lowest at all levels. The SAMM is thus not just useful to define the level of alignment, but also to identify the factors to be addressed to improve alignment within a particular context.

According to Ahuja (2012, p. 567), SAMM is a useful tool for measuring the maturity of BITA in an organisation at the macro level. However, at the micro level, organisations use several well-established practitioners' frameworks like the Balanced Score Card, Information Technology Infrastructure Library (ITIL) or Control Objectives for Information and related Technologies (COBIT) to align business and IT processes. The complexity of alignment increases with the existence of more than one tier of cascading and use of different tools or frameworks. Ahuja (2012) argued that measuring BITA at the micro level is difficult, and in order to accurately measure outcomes, mapping between metrics at all levels is required.

Other authors like Esmaili, Gardesh and Sikari (2010, p. 556) used the SAMM as baseline to determine if existing practitioner maturity measures, in this case ITIL, can be used to track the degree of alignment. Esmaili et al. (2010, p. 556) validated ITIL maturity to BITA by using the SAMM. The acceptance of SAMM was further vindicated when the authors used the SAMM to identify opportunities to improve ITIL, a very well-established IT practitioner model, from a BITA perspective.

Authors doing interdisciplinary work often use the SAMM as the measure of BITA in comparative studies to determine external factors that could influence BITA within a particular context. Silvius, De Haes and Van Grembergen (2010, p. 25), for example, used the SAMM in their study to determine the influence of national culture on BITA. Hosseinbeig, Moghadam, Vahdat and

Moghadam (2011, p. 2) used SAMM to determine the contribution of the COBIT framework to achieving BITA in Iranian financial organisations. To date the SAM and SAMM is seen to be the most authoritative model (SAM) and measurement (SAMM) in the BITA academic literature, in spite of some limitations (El-Masri, Orozco, Tarhini & Tarhini, 2015, p. 7 Khaiata & Zualkernan, 2009, p. 140).

Multiple authors agree with the value of the SAM and SAMM and have stated that raising of the BITA maturity levels is important and will help to identify and understand the problems as well as opportunities to improve BITA. However, according to Leonard (2008, p. 560), the SAM merely describes *what* needs to be aligned. Leonard points out that there has been far less consensus regarding *how* alignment is to be achieved. Gerow et al. (2014, p. 3) started to address the *what* needs to be aligned by deconstructing BITA into six elements to investigate the apparent conundrum of value, or not, in the BITA literature.

After considering multiple studies they decided to use the model proposed by Henderson and Venkatraman (1999, p. 476). Henderson and Venkatraman (1999) made a distinction between Intellectual alignment (Business Strategy to IT Strategy), Operational alignment (Organisation infrastructure and process and Information systems infrastructure and processes) and the cross-domain alignment between these dimensions (see to Figure 2.5). By adopting the work of multiple authors to structure their work for cross-domain functions Gerow et al. (2014, p. 6) developed six different constructs to describe BITA (see to Table 2.1):

Table 2.1: Alignment definitions

Construct	New definition
Business alignment	Refers to the level of alignment in the BUSINESS and is the degree to which the higher-level, externally-focussed business strategies are aligned with the lower-level, internally-focussed business infrastructure and processes
Cross-domain alignment (business strategy to IT infrastructure and processes)	Refers to all aspects of BRIDGING higher-level, externally-focussed strategies with lower-level, internally-focussed infrastructure and processes. This includes how the business strategy aligns with the IT infrastructure and processes
Cross-domain alignment (IT strategy to business infrastructure and processes)	Refers to all aspects of BRIDGING higher-level, externally-focussed strategies with lower-level, internally-focussed infrastructure and processes. This includes how the IT strategy aligns with the business infrastructure and processes
Intellectual alignment	Refers to the higher-level, externally-focussed STRATEGIC level of alignment and deals with how business strategy supports and is supported by the IT strategy
IT alignment	Refers to the level of alignment in INFORMATION TECHNOLOGY (IT) and is the degree to which the higher-level, externally-focussed IT strategies are aligned with the lower-level, internally-focussed IT infrastructure and processes
Operational alignment	Refers to the lower-level, internally-focussed OPERATIONAL level of alignment and deals with how the business infrastructure and processes align with the IT infrastructure and processes

Source: Gerow et al. (2015, p. 470).

The models presented for BITA all intended to contribute towards achieving alignment for practitioners but have found limited application in practice. The models are widely used in research, but unfortunately not in practice. Renaud, Walsh and Kalika (2016, p. 75) suggested that "20 years on, there remains a significant disparity between the intended contribution of the literature built around SAM and the apparent practical consequences of its application in organizations". The practitioner literature hardly mentions any BITA model despite a very active debate on the value of IT as well as the struggle for organisations to gain value from their growing IT investments.

A noteworthy development in the time period between the SAM/SAMM and the final model from Gerow et al. (2015, p. 470) presented in Table 2.1, is research dealing with the micro-level, or process-level, alignment factors. Schwartz et al. (2010, p. 57) argued that research should determine how the investment is enacted and reflected within the firm at the business process level. They proposed a theoretical model that IT investments influence technology resources and related business processes based on the literature within dynamics capabilities theory (Section 2.4.1) and IT-business alignment to understand the impact of IT-enabled business processes and IT-business alignment on the strategic and operational success of a firm" (Schwartz et al., 2010, p. 57). Their work was followed by other researchers (Chen et al., 2014, p. 333; Coltman et al., 2015, p. 93; Karpovsky & Galliers, 2015, p. 136) who started to define the contribution of IT to the process level and deal with the dynamic complexity that is organisational processes.

Amarilli et al. (2016, p. 6) supported the continued research into BITA at the micro scale due to the influence of IT sub-systems or organisation sub-systems (see Figure 2.9). Their argument is that information technology presents in multi-scale socio-technical systems where the interaction of components at the lower level of analysis ultimately determines the levels of alignment at the higher one; in this instance process alignment impacting organisational alignment.

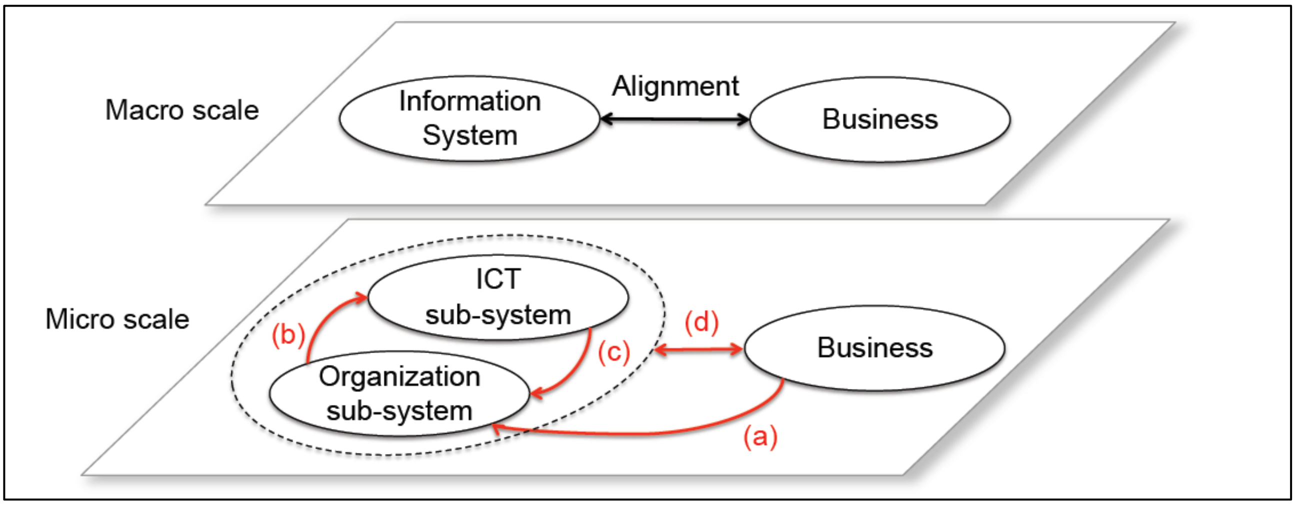

Figure 2.9: The Amarilli model to interpret business and IT alignment

Source: Amarilli, Van Vliet & Van den Hooff (2016, p. 6).

According to Amarilli et al. (2016, p. 7), most IT literature is converging on a classification of alignment as either a *state* and or a *process. Alignment as a state* refers to alignment as a condition that can be achieved, assessed, measured and targeted. From a state perspective variance models have been developed to explain how alignment can be achieved by manipulating several success factors. *Alignment as a process* encompasses a vision of the company in a constantly-evolving condition, while searching to align its various components. Alignment is thus seen as a continuous sequence of adjustment steps that requires both meticulous planning but also adaptability when required within a particular context.

However, Karpovsky and Galliers (2015, p. 136) concurred that the existing research trajectory is limited given the predominantly static focus. They argued that, even though the process perspective is a promising approach to studying BITA's dynamic nature, the literature is very limited about the actions and impact of the organisational actors to align IS and related concerns with business imperatives. Karpovsky and Galliers (2015, p. 136) continued to suggest that to "address this lack of understanding regarding the practices of aligning, we argue for research that goes beyond abstract macro analysis of alignment processes to that which considers the actual micro practices of aligning". They argued that the categorisation of aligning activities that are being undertaken in practice could make substantive and insightful contributions to the insights about BITA as it is enacted, by practitioners. This is exactly the contribution that this research intends to make with the focus on practices, executed by the different actors, which support elements of alignment.

2.2.5 Synthesis of alignment and models

Although multiple authors have commented on both the lack of micro-level process (macro level is well covered) as well as the dynamic nature of alignment, even widely-used models are still limited in their application. This research is to an extent, what Karpovsky and Galliers (2015) suggested, as it examined the practices of alignment through the use of system dynamics diagrams used to depict the complexity across the different domains within the BITA complexity that does not only address the macro-level elements. Importantly, it also provides guidance on the desired actions for key organisational actors.

It is evident from the preceding sections that BITA has attracted significant interest in academic research during the last 30 years. Two key observations are made about the literature presented in this section.

The first observation is that the concept of IT value is complex from multiple perspectives. Value can be at customer value level initially ignored by authors who focussed on the operational view based on the IT resource perspective, i.e. driving operational efficiency. The debate later acknowledged the contribution towards customer value, although it may be more difficult to measure or even captured by other actors in the value chain. The second complexity with IT value is how it is measured, since not all value manifests in the traditional financial measures. Authors arguing approaches like the balanced scorecard acknowledged the challenge and introduced potential value measures. Important to note, and not always explicit in the literature, is that IT value is realised at organisational level. Although the term *IT value* is common in the academic discourse, the more correct if more unwieldy terminology could have been 'organisational value captured due to the deployment of IT'.

The second observation is based around the development of the multiple alignment models. Although they built upon previous work as is evident in the various perspectives presented, some new ideas from different viewpoints made significant contributions; for example, the work of Maes (1999) that was developed out of information management and not necessarily IT. This indicates that perspectives from different academic domains could effectively contribute to the current debate and supports the somewhat novel application of system dynamics to deliver more insight about this complex challenge used in this research.

The SAM model (Figure 2.8) seems to be the most widely-used BITA model and is often utilised by authors to measure the dependent variable of BITA performance, when searching to empirically validate the impact of some independent variables on alignment. However, using the distinction made between CSF and KSC (see Figure 1.2), it is observed that the six dimensions within the model are essentially CSFs, or even groupings of CSFs, though they are incorrectly used by some authors as KSC to measure alignment.

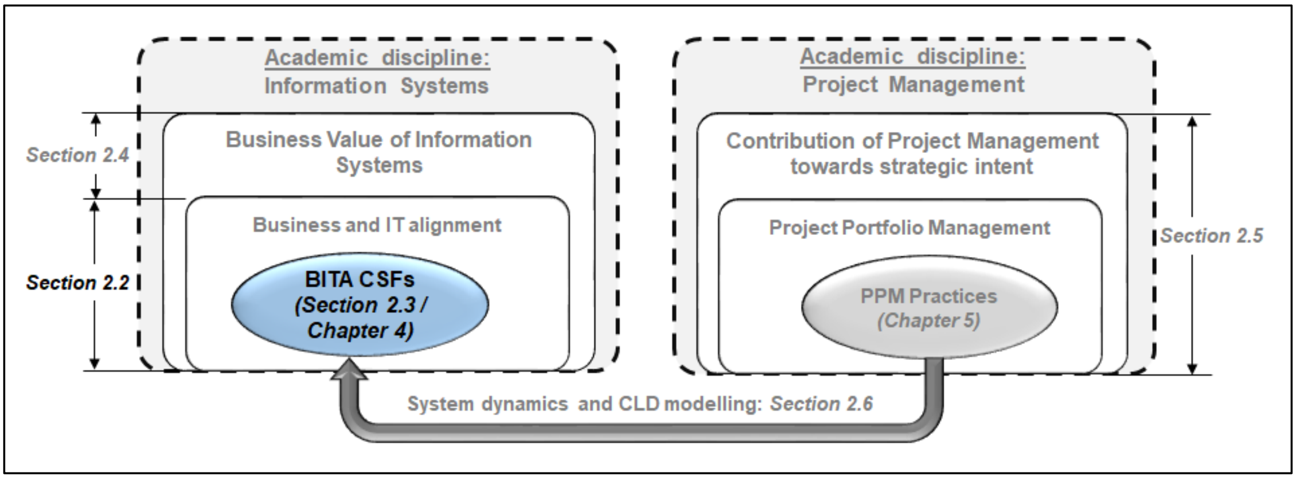

Figure 2.10: Structure of the literature review: BITA CSFs

Figure 2.10 presents an outline of this literature review chapter. As indicated, the next section deals with the CSFs from multiple authors. Section 2.3.1 presents a summary of the multiple sets of CSFs identified in Tables 2.3 to 2.10. Table 2.2 contains a list of all the authors who have presented a discrete set of CSFs presented in this section. This is followed by Section 2.3.2 that lists the key measures used to gauge the level of alignment, the KSC.

2.3 ACHIEVING AND MEASURING BITA EFFECTIVENESS

2.3.1 Factors and drivers

Wagner et al. (2014, p. 241) argued that, while alignment research has matured, there is still no sound theoretical foundation for alignment. McAdam et al. (2017, p. 7169) commented on the lack of a uniformly-accepted and used theoretical BITA base and concluded that systematic reviews of alignment between business strategy and IT "note a paucity of empirical studies based on underpinning theory and a lack of definition of alignment levels". Jonathan (2018, p. 375) argued that, since BITA is "associated with improved overall organisational performance, it is an important issue that needs to be addressed". In order to address BITA, it is important to know what to do (success factors), as well as to know that it has indeed been achieved (success criteria).

Rockart (1979, p. 81) defined a critical success factor (CSF) as the designation for a factor that is necessary for an organisation, or project, to achieve its mission. It is an activity required to ensure the success of a company or an organisation. CSFs represent the collective actions to be executed properly before a goal or project can be achieved (Gomez & Romão, 2016, p. 491). In the context of alignment, they are the factors, within the control of the organisation, that are critical for alignment to be achieved.

Numerous terms have been used in the literature to describe CSFs, all referring to the essential elements that must be actioned to ensure the successful alignment between business and IT. Chan et al. (2006) referred to them as 'antecedents', a term that was also used interchangeably with 'behaviours' by Chan and Reich (2007). Luftman et al. (1999) referred to these factors as 'enablers' of alignment. Teo and Ang (1999) used the now common 'critical success factors', while Scott (2005) defined these factors as 'dimensions' that must be addressed for the achievement of alignment. Vermerris et al. (2014, p. 629) referred to the antecedents of alignment, or 'alignment practices'.

The differences in the terminology, granularity and different factors presented by the authors necessitated a process to determine the CSFs used for this research. Chapter 4 contains the systematic literature review that lists the factors used for the interview and building of CLDs (see Chapter 6). However, prior to performing a systematic literature review in Chapter 4 the next section (Section 2.3.2) lists some common factors from the literature.

All the terms used to describe these factors, irrespective of the authors' use of terminology, were gathered from the literature as being the factors that are crucial for the successful realisation of alignment. With reference to Figure 2.2, these include practices where control and execution reside within the business domain as well as practices where control and execution reside within the IT domain.

Boddy and Paton (2004, pp. 225-233) explained that different project stakeholders will have different views on project success and that it was important to define criteria that can be used to measure success. This is certainly true for IT projects and in general for alignment of IT with strategy as well.

Luftman et al. (2017, p. 26) agreed and believe that despite extensive research, the concept of alignment and its detection remain elusive. The difference between practices to execute, and measures to detection alignment, is often treated with vagueness in the literature. Many authors present BITA models or factors that intermingle both actions to be taken (CSFs) and measure to gauge (KSC) the degree of alignment.

The drivers of success, called critical success factors (CSFs) in this research, are significantly more common in the literature than measuring the level of alignment, the key success criteria (KSC). One reason cited is that alignment is dynamic, making it difficult to measure. However, being dynamic does not warrant not measuring the level of alignment at a particular point in time. Measuring the alignment, or the extent to which CSFs are properly executed, is done through defined measures of success, also called project success criteria by Gomez and Romão (2016, p. 491).

Key success criteria (KSC) are the "outcomes of a project or achievements of an organisation that are needed to consider the project a success or to esteem the organisation successful. Success criteria are defined with the objectives and may be quantified by Key Performance Indicators (KPIs)" (Westerveld, 2003, pp. 411-412). KSC thus measure the objectives that must be met in order for alignment attributes to be considered successful. Section 2.3.3 deals with these measures of success.

2.3.2 Critical success factors

Several antecedents were found to be pertinent to the success of alignment in IT academic literature. They were seen to be overlapping and interdependent (Reich & Benbasat, 2000), and are simultaneously necessary for alignment achievement. Many studies have been done on the critical success factors (CSFs) of alignment, most empirically, and some theoretically. The granularity and terminology used have not always been identical, but many similarities are evident.

This section provides a synopsis of the critical success factors and attempts to collate common ideas to form a list of CSFs that increase the chances of achieving alignment. These different factors were theoretically and empirically tested to be the actions, behaviours and elements necessary for alignment to be reached between business and IT.

Table 2.2: Literature on critical success factors

No	Study	Type of study	Focus
1	Teo and Ang (1999)	Empirical	12 CSFs for strategic alignment
2	Luftman, Papp and Brier (1999)	Empirical	Enablers and inhibitors of BITA
3	Reich and Benbasat (2000)	Empirical	Four factors that influence the social dimension
4	Chan (2002)	Empirical	Four factors impacting strategic alignment
5	Scott (2005)	Empirical	Eight dimensions of linkage of business and IT
6	Chan et al. (2006)	Theoretical and empirical	Five antecedents of alignment across industries and different business strategies
7	Kearns and Sabherwal (2007)	Empirical	Knowledge-based view on contextual factors
8	Preston and Karahanna (2009)	Conceptual and empirical	Causal structure between social and intellectual dimensions

According to Chan et al. (2006, p. 27), there has been a dearth of theory-based empirical research on the factors influencing alignment. They assert the many different factors affecting alignment are often dependent on the particular situation being studied. However, they discovered common themes between studies, even if the description of the factors that influenced alignment use different terminology. Table 2.2 contains a list of articles that focussed on BITA critical success factors reviewed in this section.

The first study presented is from Teo and Ang (1999, p. 178) that defined a list of 18 CSFs and empirically tested their influence on strategic alignment. Their research found that 12 of the factors (see Table 2.3) had an influence on BITA (Teo & Ang, 1999, p. 183). They determined that the two most important factors were the commitment of business executives and shared knowledge. Shared knowledge is effectively the combination of factors 3 and 4 which deal with business management's knowledge of IT and IT management's knowledge of business (Teo & Ang, 1999, p. 178).

Table 2.3: CSFs in Teo and Ang

No	Antecedents/Critical success factors/Enablers
1	Top management commitment to the strategic use of IT
2	Top management's confidence in the IT department
3	Top management's knowledge of IT
4	IT management's knowledge of business
5	Business goals and objectives that are known to IT management
6	The corporate business plan being available to IT management
7	The IT department being able to identify creative ways to use IT strategically
8	IT staff who are able to keep up with advances in IT
9	Frequent communication between users and IT departments
10	Business and IT management partnering to prioritise applications development
11	The IT department's efficiency and reliability
12	An IT department that is responsive to user needs

Source: Teo and Ang (1999, p. 183).

Teo and Ang (1999, p. 183) posited that, if business and IT executives focussed on these 12 factors, it should lead to the successful realisation of strategic alignment. According to them, each CSF must be appraised in each individual organisation and acted upon accordingly to serve the needs of the organisation to formulate practices that enable alignment. It is evident that what Teo and Ang (1999) calls success factors is actually a combination of CSFs and KSC since some of the items in Table 2.3 present actions while others represent measures of success.

Luftman et al. (1999, p.16) investigated the enablers of IT alignment and empirically validated the six factors shown in Table 2.4. They identified not only the factors but also the actors that could influence each of these factors. The actors that can effect alignment are the business executives, called the top management team in their research, or the IT executives, effectively the distinction made in Figure 2.2.

Table 2.4: CSFs in Luftman et al.

No	Antecedents / Critical success factors / Enablers
1	Senior executive support for IT
2	IT involved in strategy development
3	IT understands the business
4	Business-IT partnership
5	Well-prioritised IT projects
6	IT demonstrates leadership

Source: Luftman et al. (1999, p. 16).

Their study suggested that IT executives can impact upon shared knowledge (already identified by Teo and Ang (1999)), project prioritisation through participation in strategic planning, and taking on a leadership role by fostering relationships with business executives. They argued the importance of having IT executives as part of the highest level of management in the organisation (Luftman et al., 1999, p. 17), although it is not explicitly stated as a CSF.

Business executives in turn, can influence alignment by focussing on IT participation in strategy formulation and supporting IT in strategic initiatives. Although they did not use the terminology of top management commitment introduced by Teo and Ang (1999), both participation and support are indicators of support. There is an observed similarity between the factors, although different terms were used.

Reich and Benbasat (2000) examined four factors on the social dimension of strategic alignment (see Table 2.5). Shared knowledge, implementation success and communication were found to have an effect on short-term alignment, while long-term alignment was dependent on shared domain knowledge (Reich & Benbasat, 2000, pp. 84-86).

Table 2.5: CSFs in Reich and Benbasat

No	Antecedents / Critical success factors / Enablers
1	Shared domain knowledge
2	IT implementation success
3	Communication between business and IT executives
4	Connection between business and IT planning

Source: Reich and Benbasat (2000, pp. 98-99).

The presence of shared knowledge already identified by Teo and Ang (1999) as well as Luftman et al. (1999) are clearly critical in achieving BITA alignment. However, Reich and Benbasat (2000, p. 104) argued that, to measure alignment, the level of knowledge would have to be taken into account as well. The argument is that knowledge sharing is a CSF, but measuring certain knowledge, or even knowledge sharing attributes could be a KSC as well.

According to Reich and Benbasat (2000, p. 98), shared knowledge could lessen the effect of implementation failure on its own, without the aid of the other two factors. Although trust and credibility where not explicitly mentioned by them, they suggested that managers who are familiar with the other executives' domain, are more likely to be trusting that the executives are giving their best efforts for mutual good. In their research, trust and credibility are thus more parts of an overarching theme, than a CSF.

Chan (2002) used a different approach in her study and focussed on why alignment was so difficult to attain; the misalignment approach. These reasons were then listed as the factors for misalignment with their converse being the solution to realising strategic alignment. The findings suggested that strategic alignment theory and practice were synchronous, i.e. their empirical evidence support the most common BITA theories used to date (Chan, 2002, p. 104).

Table 2.6: CSFs in Chan

No	Antecedents/Critical success factors/Enablers
1	Communication and understanding between line and IS executives
2	Linked business and IS missions, priorities, and strategies
3	Interconnected business and IS planning processes, and resulting plans
4	Line executive commitment to IS issues and initiatives

Source: Chan (2002, p. 104).

Table 2.6 contains the four factors empirically tested by Chan (2002). She identified a shared understanding between business and IT as the most important factor, which is aided by communication (Chan, 2002, p. 100). The shared understanding is thus not only highly prevalent in the CSF literature, but also empirically validated as leading to BITA.

Scott (2005) examined eight dimensions of alignment (see Table 2.7). Scott (2005, pp. 916-919) listed and empirically validated these factors as the dimensions necessary to realise alignment. The factors used by Scott are in many instances sub-elements of previous factors, although the *Joint architecture/portfolio selection* is new in the research presented. In the context of this research, that deals in particular with the contribution of project portfolio management practices towards BITA, this is an important CSF.

Joint architecture and portfolio selection do have an interdependency, but it could also be completely different. Where joint architecture could refer to the business executives working with IT on the architecture of the enterprise applications to ensure agility and being future fit, portfolio selection is the first indication of CSFs acknowledging the portfolio approach in managing IT assets. Selecting initiatives for the portfolio could indeed have architectural issues, but it could also have virtually no impact on the architecture at all, if it merely uses existing IT assets and does not new assets that impact architecture.

Table 2.7: CSFs in Scott

No	Antecedents/Critical success factors/Enablers
1	Understanding of IT and corporate planning
2	Chief information officer (CIO) is a member of senior management
3	Shared culture and good communication
4	Deep commitment to IT planning by senior management
5	Shared plan goals
6	Deep end-user involvement
7	Joint architecture/portfolio selection
8	Identity of plan factors

Source: Scott (2005).

A shared understanding of business-IT domains was once again the most important factor in Scott's (2005) research. Although mentioned by other authors, Scott (2005, p. 920) strongly argued the importance of not looking at the dimensions individually. He argued that all factors are important for alignment as they work simultaneously to aid in the attainment of strategic alignment and also have an impact on each other. Factors working together and influencing each other is also known as dynamic complexity and central to the technique used in this research.

Chan et al. (2006) developed and empirically tested a BITA model. They used factors previously identified but not empirically tested in previous studies (Chan et al., 2006, p. 28). The factors included those that were directly under the control of IT executives, such as shared knowledge, planning sophistication and the confidence in the IT department due to prior success. They also looked at factors outside the purview of the IT executives, such as organisational size and environmental uncertainty. These antecedents are shown in Table 2.8.

Table 2.8: CSFs from Chan et al.

No	Critical success factors
1	Shared domain knowledge
2	Planning sophistication
3	Prior IS success
4	Organisational size
5	Environmental uncertainty

Source: Chan et al. (2006, p. 28).

According to Chan et al. (2006, p. 38), shared knowledge was the most critical to the achievement of alignment, followed by prior IT success due to its influence on the credibility of the IT department and hence the confidence of business executives in their IT department. Although shared knowledge is consistently mentioned in the previous research, Chan et al. (2006, p. 38) made the link between shared knowledge and IT credibility explicit for the first time.

Kearns and Sabherwal (2007) took contextual factors affecting alignment from existing literature and investigated the role of what they termed 'knowledge considerations' in the connection between these factors and alignment. They investigated at organisational emphasis on knowledge management and centralisation of IT decisions as the knowledge considerations (Kearns & Sabherwal, 2007, p. 130). The factors that these considerations were to influence are listed in Table 2.9 (Kearns & Sabherwal, 2007, pp. 133-136).

Table 2.9: CSFs in Kearns and Sabherwal

No	Antecedents/Critical success factors/Enablers
1	Business managers' participation in strategic IT planning
2	IT managers' participation in business planning
3	Top managers' knowledge of IT
4	IT managers' knowledge of business
5	Organisational emphasis on knowledge management
6	Centralisation of IT decisions

Source: Kearns and Sabherwal (2007, pp. 133-136).

Although the emphasis is on knowledge factors in particular and not a comprehensive view like the other studies, the concept of knowledge sharing was common in the preceding BITA literature. Their research emphasised that shared knowledge is actually a composite indicator consisting of multiple sub-practices around knowledge, information and decision-making. This is a good synthesis of the BITA studies that all emphasize these concepts and their role in achieving alignment.

The final study presented in this section is that of Preston and Karahanna (2009), who studied the casual link between social and intellectual dimensions of alignment. They developed and used a nomological network to show shared understanding (intellectual dimension) as a contiguous antecedent to the social dimension of alignment.

They used other factors that had been identified in previous literature and related them to their own study as shown in Table 2.10 (Preston & Karahanna, 2009, p. 162). They argued that shared understanding is a crucial precursory element of the intellectual dimension of alignment and strengthens shared language and the knowledge of business executives and IT executives of each other's domain.

Table 2.10: CSFs in Preston and Karahanna

No	Antecedents/Critical success factors/Enablers
1	Social systems of knowing
2	Structural systems of knowing
3	Shared domain knowledge
4	Shared understanding
5	Relational similarity control variables of age, gender, tenure, experience

Source: Preston and Karahanna (2009, p. 162).

They demonstrated how shared understanding leads to alignment by developing a causal structure between social and intellectual dimensions (Preston & Karahanna, 2009, p. 174). They also argued the importance of mutual insight embedded in the critical success factors and focussed on how cognitive elements of business and IT executives interact to achieve BITA. Preston and Karahanna (2009, p. 175) finally suggested that concentrating on the cognitive component to determine strategic choices may give critical levers that executives can use to realise alignment.

Although multiple factors were identified in the literature, both knowledge sharing and top management commitment dominated.

2.3.3 Key success criteria

2.3.3.1 Measuring BITA success

Luftman (2000, p. 8) argued that, since alignment is an important topic among business practitioners and IT has an ever increasing importance in the success of a business, it is important that there are clear measures that can be undertaken to get a clear picture of the degree of BITA. Among the limitations of existing studies that hamper alignment implementation, is the proliferation of definitions and conceptualisations of alignment (Amarilli et al., 2016, p. 1). Measuring BITA is no different and multiple models to measure alignment are presented in this section.

Plazaola, Molina, Vargas, Flores and Ekstedt (2006, p. 3) suggested that assessment approaches in general define how a given phenomenon can be described by a set of underlying components, measurable in terms of certain properties. In the context of this research report, the 'phenomenon' being examined is business-IT alignment success. According to Plazaola et al. (2006, p. 4), assessment approaches consist of a set of principles and rules that combine the lower-level elements of the phenomenon. These approaches can be thought of as a hierarchical breakdown of the phenomenon to be measured that constitutes an 'operationalised theory'.

Approaches to assess alignment are common, but unfortunately a universally-accepted model has not been identified. Multiple practitioner articles have commented on the levels of alignment within organisations (Sia, Soh & Weill, 2010; Weill & Aral, 2006; Westerman, Fonstad & Gibson, 2010). Unfortunately, with the exception of the Weill and Ross (2009) Model (Section 2.3.3.3) few models have seen widespread application by practitioners.

In the case of BITA, the lack of a commonly-accepted factors (set of principles in Plazaola et al.'s (2006) terminology) to determine the degree of alignment makes the measurement complex. It is thus necessary to divide alignment into its most basic elements and then aggregate the individual elements to provide a view on the overall level of alignment. These individual elements are the key success criteria (see to Figure 2.2).

IT literature is converging on a classification of alignment as either a *state* or a *process* (Amarilli et al., 2016, p. 7). *Alignment as a state* refers to alignment as a condition that can be measured and targeted. From the state perspective, variance models have been developed to explain how alignment can be achieved by manipulating several factors. *Alignment as a process* encompasses a vision of the company in a constantly-evolving organism, searching to align its various components. Alignment thus becomes a continuous sequence of adjustment steps that need to be meticulously planned, yet adapted on a continuous basis in a flexible business environment.

Once an organisation is aware of the level of alignment, they are able to evaluate their strategic choices and alignment practices. The knowledge of alignment status (measured by any method) allows a firm to construct a roadmap that points out the weaknesses and strengths, thereby enabling it to improve alignment for the benefit of the organisation (Luftman, 2000, p. 8).

Two broad types of success criteria were found in the literature. The first are the criteria that mostly stem from the six strategic alignment criteria in Luftman's (2000) SAMM, and the second are the criteria that originate from the nine strategic dimensions of business strategy posited by Venkatraman (1989b). The initial work by Venkatraman did not deal with IT in particular, but with the concept of strategic fit and is thus not included as a BITA set of KSC in this section. However, the work of authors who adapted his strategic fit model for the IT domain, like Chan, Huff and Copeland (1998), are included.

Luftman's (2000) SAMM was the most common method cited by several authors (Chen, 2010; Khaiata & Zualkernan, 2009; Sledgianowski, Luftman & Reilly, 2006) as the method to determine the level of maturity of a firm's strategic alignment with IT. Other methods such as that of Avison, Jones, Powell and Wilson (2004, p. 223-246) are yet to be validated, as they were used on only one company in one industry.

2.3.3.2 Strategic Orientation of Information Systems Model

One of the first BITA measurement instruments was developed by Chan et al. (1998). The basic premise of their Strategic Orientation of Information Systems (STROIS) model was to determine if the intended use and deployment of IT, manifests as the actual end use and if the intended strategy was ever achieved. This could then be used to validate that IT was playing an integral part in the realisation of the organisation's goals (Chan et al., 1998, pp. 273-274).

Chan et al. (1998, p. 274) contended that their approach to alignment enables managers and researchers to examine a portfolio of information systems in terms of the types of support provided for business activities, as well as the adequacy of these forms of support for each activity. Their model consists of eight different dimensions as presented in Table 2.11.

Table 2.11: STROIS dimension definitions and sample indicators

Dimension	Definition
IS to support company aggressiveness	IS deployments used by the business unit when pursuing aggressive marketplace action.
IS to support company analysis	IS deployments used by the business unit when conducting analyses of business situations.
IS to support company internal defensiveness	IS deployments used by the business unit to improve the efficiency of company operations.
IS to support company external defensiveness	IS deployments used by the business unit to strengthen marketplace links.
IS to support company futurity	IS deployments used by the business unit for planning and projection purposes.
IS to support company pro-activeness	IS deployments used by the business unit to expedite the introduction of products/services.
IS to support company risk aversion	IS deployments used by the business unit to make business risk assessments.
IS to support company innovativeness	IS deployments used by the business unit to facilitate creativity and exploration.

Source: Chan, Huff and Copeland (1998, p. 279).

The framework is based on Venkatraman's (1989a) measures of the Strategic Orientation of Business Enterprises that proposed that the business can be viewed in terms of nine different dimensions (Chan et al., 1998, pp. 276-277). The purpose of the (STROIS) model was to provide a synopsis of an organisation's capabilities and IT infrastructure at a particular moment in time. This would allow the practitioner user of the model to determine how IT was being used to attain the organisation's goals in a quantifiable manner. It is effectively the first set of KSC in the academic literature to measure BITA that is also aimed at the practitioner.

After empirically testing the model's principal components, the analysis indicated that the eight STROIS dimensions led to dimensions which were interdependent. For example, a market intelligence system to support Pro-activeness might also provide some support for *aggressiveness* and a detailed project-related *analysis* might facilitate risk avoidance, thus providing support for *analysis* and *risk aversion* (Chan et al., 1998:285). Due to the interdependence it was decided to describe the important factors more parsimoniously. Chan et al.'s (1998, pp. 285-287) analysis revealed four relatively independent, higher-order grouping systems to support (i) Action; (ii) Analysis; (iii) Anticipation; and (iv) Armour as indicated in Figure 2.11 (Chan et al., 1998, pp. 286-287).

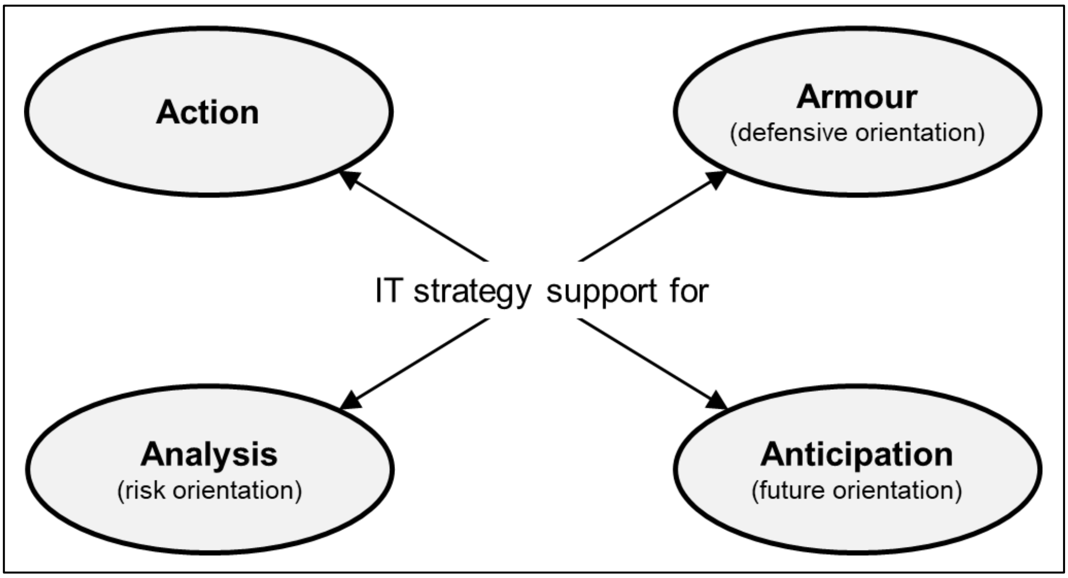

Figure 2.11: Information system types

Source: Adapted from Chan et al. (1998, p. 285).

Their findings indicate eight distinct types of information systems support that can be used as the key measures for BITA, the KSC or at least categorisation of the KSCs. However, it is also possible to use a smaller number of information system types, some of which individually support several aspects of business strategic orientation. By referring to IT support for Action, Analysis (or risk orientation), Armour (or defensiveness) and Anticipation (or future orientation) the model is clearly more desirable for practitioners that could relate to the dimensions described in 'business language'.

In closing, Chan et al. (1998, p. 288) argued that a system in an organisation may support multiple aspects of business strategic orientation, for example *pro-activeness* and *innovativeness*. However, a system typically falls more clearly into one of the four A-categories (Figure 2.11). Although a less complex four-dimensional view reduces the precision of the measurement of IS deployment, it provides a useful narrowed-down IT strategy taxonomy useful for practitioners. It also provides a measurement approach with reduced collinearity and redundancy because the categories are relatively independent. Despite this potential value, there does not seem to be any widespread adoption from practitioners and not a single practitioner journal used the STROIS or simplified four-A categories as far as it could be established.

2.3.3.3 Weil and Ross alignment measurements

Research conducted by Weill and Ross (2009) found that organisations that spend above average on IT and are above average IT literate (called 'IT-savvy' in their research), perform 20 percent better than the industry average, whereas organisations that spend less on IT and are less knowledgeable, perform 32 percent worse than the industry average. Also, an IT knowledgeable organisation is in a position to take advantage of business opportunities that may arise (Weill & Ross, 2009). They developed an alignment measurement model that uses criteria in five different categories to measure the degree of business and IT alignment (see Appendix I). The Weill and Ross (2009) model uses five sets of practices and competencies that characterise the degree of alignment within an organisation as follows:

- **Senior management commit to use IT strategically:** In order to get value from IT, the commitment and attention of the senior management is needed. It is not sufficient to verbally support IT initiatives; action must be taken. Senior managers need to demonstrate their commitment by constantly using IT strategically; otherwise, there will not be enough commitment (Campbell et al., 2005, p. 659; Siurdyban, 2014, p. 918).
- **Business and IT integration:** The objective is "to have a single source of truth from key data; digitized process components for your core business processes; and a limited set of standard technologies" (Weill & Ross, 2009, p. 136). The role of technology must be included in every business plan and for every business strategy. The implication that it will have for IT must be considered and IT must make sure that it is feasible.
- **The management of IT politics:** According to Weill and Ross (2009, p. 137), IT is inherently an integrating technology. IT integrates processes within the organisation and integrates it with its customers and suppliers. Any aspects that inhibit that integration, reduce the effectiveness of the organisation's IT investments (Weill & Ross, 2009, p. 137). If there is no sense of community, a shared destiny, the politics of the day will undermine the organisation's IT initiatives.
- **Empowerment of people with great systems and information:** According to Weill and Ross (2009), this indicates that users of the systems can do their work effectively and efficiently. Also, the users' satisfaction with the quality of their IT services is measured regularly. If the satisfaction measures are transparent, they will improve over time.

- **Learning from experience:** Well-aligned organisations learn from their mistakes in order not to make the same mistake twice. Lessons are learned from the past as well as from other organisations and incorporated in the governance processes (Weill & Ross, 2009, pp. 136-139).

Although the BITA measures cannot be used to manage BITA (Renaud et al., 2016, p. 75), multiple authors used the instrument from Weill and Ross (2009) to measure the level of IT alignment in empirical studies (Ali, Green & Robb, 2011; Poon, Eugster, Davis & Choi, 2007; Quaadgras, Weill & Ross, 2014). The Weill and Ross (2009) instrument can thus be seen as one of the few sets of KSC that found significant practitioner acceptance, partially due to their instrument being easily accessible in a book, as opposed to academic literature, as well as the authors' own consulting work in industry.

2.3.3.4 Strategic Alignment Maturity Model

Luftman (2000) was one of the first authors to present an approach to measure the alignment in a firm as well as the steps needed (hence CSFs) to improve this alignment with a clear idea of the status and shortcomings of said status. Luftman (2000, p. 6) contended that, while there has been significant research and analysis into the connection between business and IT, most of this work was focussed on either one industry or firm, or for organisations of a similar size. This produced inconsistent results regarding industry functional position and time; thus, there was a need to design an instrument that would negate these variables and allow the business-IT alignment to be evaluated to reveal a true picture of a firm's position.

Luftman (2000) developed the Strategic Alignment Maturity Model (SAMM) presented earlier (see Figure 2.8). The SAMM has been used extensively by authors (Chen, 2010, pp. 9-16; Khaiata & Zualkernan, 2009, pp. 138-152; Sledgianowski et al., 2006, pp. 18-33) who validated and cross-validated the method empirically. These authors either used the model in its original state, or used it as a point of departure to validate elements within the model, or adapted the model for their particular context.

The SAMM has six different dimensions and five different levels of maturity (see Appendix J). The **communications maturity** (Luftman, 2000, pp. 14-15) dimension indicates that understanding and clear communication foster alignment as described previously in this chapter. According to Luftman (2000, p. 14) a disconnect often exists between business and IT in terms of their knowledge and understanding of what the other intends to do. Thus, there is a low level of awareness of the intent of the other actions. This is a sentiment shared by Reich and Benbasat (1996, p. 73), who in their study into the social dimension of alignment and its measurement found that mutual understanding and congruence of vision were important to the attainment of high levels of alignment.

The **value measurements maturity** (Luftman, 2000, pp. 15-16) dimension states that the value of IT to the business has to be fully appreciated to allow the full potential to be harnessed. It was established that IT is often not able to clearly indicate and provide evidence of how they enable the business to meet its goals to the rest of the organisation, leading to IT being undervalued. This happens due to the metrics of importance and performance being different for IT and business. A common method is required to enable each department to be keenly aware of what IT is bringing to the business (Luftman, 2000, p. 15).

The **governance** (Luftman, 2000, p. 17) dimension was derived from his prior work (Luftman et al., 1999) on the enablers of alignment. Making sure that business and IT executives communicate and prioritise the use of IT resources in the organisation was one of the most important enablers, according to the Luftman et al. (1999) study. This process of inclusion in identifying IT resource use of both business and IT has to be clearly defined in terms of authority, ownership and process flow (Luftman, 2000, p. 17).

The **partnership** (Luftman, 2000, pp. 17-19) dimension states that communication and inclusion is at the core of alignment, according to the findings in a previous study by Luftman et al. (1999). The relationship between IT and business has to be in the form of a partnership (Luftman, 2000, p. 18). IT has to be included in the formulation of business strategy, and the level of this inclusion and the trust and understanding that follows are all contributors to BITA and the achievement of greater alignment maturity.

The **scope and architecture** (Luftman, 2000, p. 19) dimension is mostly about the level to which the IT department’s infrastructure is up to date with technology advancements in their field. This dimension indicates the IT department’s relevancy in the competitive world and ability to keep pace with external developments and the utilisation of these developments for the benefit of the organisation to improve processes and serve customers.

The **definition of the skills** dimension (Luftman, 2000, pp. 19-20) refers to the human element in the business – how accountable and able the human resources in the organisation are to rise to the challenge of the competitive environment and bring to fruition the business strategy of the organisation with the aid of IT. Assessing the level of ability, motivation and willingness of the organisations human resources allows gaps to be quickly identified and the alignment to be advanced to a higher maturity level.

Each of the dimensions and maturity levels has a set of attributes that accompany them (Luftman, 2000, p. 21). These attributes allow each dimension to be properly evaluated. According to Luftman (2000, p. 21), these attributes commonly range in relevancy from organisation to organisation. The list of specific attributes for each maturity dimension can be found in Appendix J.

Luftman and Kempaiah (2007, p. 167) used the SAM and the core concepts of the Software Engineering Institute’s Capability Maturity Metric to define scores that an organisation achieves for these six components of maturity. These scores can then be compared to a five-level maturity model to denote the organisation’s IT-business alignment maturity (see Appendix J).

These five maturity levels have the following level descriptors:

i) For a Level 1 organisation the initial or **ad hoc processes** represent the lowest level of strategic alignment. Understanding of IT by the business is low due to a lack of, or poor communication. Also, the investment in IT is underleveraged.

ii) With a Level 2 organisation, there is a **committed process** towards strategic alignment maturity; IT is viewed as an asset to the organisation. Alignment at this level is difficult to achieve. Furthermore, potential opportunities are recognised.

iii) At Level 3 there are **established, focussed processes**. Organisations concentrate on governance, processes, and communications toward specific business objectives. There is a focus on business processes that generate a long-lasting competitive advantage.

iv) Level 4 organisations **improve processes**. IT is leveraged on an organisation-wide basis. There is a focus on driving business process enhancements to gain competitive advantage. Also, IT is viewed as an innovative and imaginative strategic contributor. Further, there is capitalisation on information and knowledge.

v) Finally, Level 5 organisations **optimise the processes** and there is strategic alignment between business and IT. Proper governance processes integrate strategic business planning and IT planning.

The SAMM was validated by Sledgianowski et al. (2006) and also cross-validated by Chen (2010). The Sledgianowski et al. (2006, p. 20) study was the first to test the maturity of alignment empirically and in addition to the 38 attributes in the SAMM it contained an additional item to obtain the participant's own self-rated maturity level, to compare with the assessment's final results. They used confirmatory factor analysis (CFA) to validate the model and where able to identify 22 indices that measure strategic alignment maturity. They then used regression analysis to correlate their results to the self-reported maturity level of the executives in the organisations (Sledgianowski et al., 2006, p. 25) and determined that the SAMM works well to assess the maturity level of an organisation. In addition, different factors affect different companies, according to their research.

The SAMM was cross-validated by Chen (2010) on companies in China. He found that the SAMM had statistically sound results and was a good method to measure the alignment maturity of an organisation (Chen, 2010, pp. 14-15). The SAMM was found to be the most pervasive measurement of alignment in the academic literature, either in the initial format, or adapted for a specific context.

2.3.3.5 Avison's extension of the SAM

Avison et al. (2004, p. 230) extended the SAM to examine the constituent elements of strategy and configuration in a company, and hence determine the factors required to assess the level of alignment. Their updated model is defined in terms of four domains of strategic choice: (i) business strategy; (ii) IT strategy; (iii) organisation infrastructure and processes; and (iv) IT infrastructure and processes.

According to Avison et al. (2004, p. 232), their work is the first real attempt to refine the SAM to reflect the reality of IT becoming more entwined with business strategy due to advances in technology. They added a third domain, which represented the importance of communication as a buffer between business and IT (Avison et al., 2004, pp. 232-233). This new information domain represents the knowledge, communication and co-ordination of information (Avison et al., 2004, p. 233). This is effectively the same argument made by Maes et al. (2000) when he added information management dimensions to the early BITA models (Section 2.2.4).

The information about the company could then be put into each domain based on the area it applied to (Avison et al., 2004, p. 234). They believe that there is sufficient literature to assist an assessor with the information to determine which activities and systems should be placed in the different domains (Avison et al., 2004, p. 234). This information is then analysed and the results of the domain analysis can be reported to facilitate graphical representation of the organisation's level of alignment in terms of operational, structural and strategic points of view (Avison et al., 2004, pp. 242-243).

To test their methodology, they observed how business and IT executives met and discussed all proposed projects and then prioritised them (Avison et al., 2004, p. 242). From this information, they developed a process that enables the alignment level of an organisation to be determined. This is a product of having both a measure of where an organisation 'wants to be', as well as clear insight of where they are at the moment (Avison et al., 2004, pp. 242-243). It thus allows planning for the adjustment of alignment based on where the organisational want to go at the strategic level and enables the mapping of the proposed IT projects to determine if they contribute towards strategic intent.

2.3.3.6 Tallon's measurement processes

Tallon (2007, p. 228) extended the research on measuring alignment and operationalised a methodology that conceptualised alignment at the process level. He argued that using a value discipline outlook on the strategic foci of companies, would allow alignment to be viewed at the level of the different processes required to execute strategic intent. This is important in the context of this research, since business processes lead to dynamic complexity as they either impact on each other by design, or due to sharing common resources and having structural touch points. Measuring BITA at the process level could thus contribute towards understanding and dealing with dynamic complexity of interdependent business processes.

Tallon (2007, p. 227) advocated for correct measuring the type of alignment and not merely the extent of the alignment. This, in Tallon's (2007) view, will allow organisations to gain a deeper appreciation of what really impacts upon the performance, since identifying the key processes will enable focussed efforts. Organisations could then move from an IT department that tried to support the business strategy, to focussed IT initiatives on the particular strategic focus areas at a process level (Tallon, 2007, p. 231).

Tallon also used the work of Venkatraman (1989b) on the different types of alignment measures and chose to use profile deviation and moderation (Tallon, 2007, p. 238). Profile deviation involves a deviation or difference from an ideal situation. Tallon (2007, p. 231) believes there is “variability in process-level alignment among firms with different strategic foci; variability not just in the extent of alignment as measured on a process-by-process basis, but in the implications of failing to achieve tight alignment in core processes”. In terms of moderation, he conceptualised that since IT use affects the success of the business through performance, it was dependent upon the business strategy (Tallon, 2007, p. 239).

Tallon (2007) identified five generic processes and then three value disciplines for likely strategic focus areas. The business processes modelled on a generic value chain were: (i) supplier relations; (ii) productions and operations; (iii) product and service enhancement; (iv) marketing and sales; and (v) customer relations (Tallon, 2007, p. 229). The value disciplines for business strategy were: (i) operational excellence; (ii) customer intimacy; and (iii) product leadership (Tallon, 2007, p. 244). Having these, the moderation method for alignment was developed using a five-item construct, one item for each process.

The results from Tallon’s (2007, pp. 255-256) work showed that there was a high degree of correlation for both perspectives of alignment at the process level, implying that focussing on the processes that are strategically key to the company can unlock more value from IT use for the organisation (Tallon, 2007, p. 256). Therefore, the locus of alignment is fundamental to the actual utilisation of IT for strategic success.

Tallon’s (2007, p. 256) study is important because it recognised the difference of firms in terms of size, industry and strategy. This tool allows a company to pick out where it is going strategically and determine whether it is using IT the correct way to unlock the full potential from alignment.

Tallon’s (2007) research made a strong argument that organisations need to know which business processes are key. Furthermore, they need to know that IT should not only support business strategy on a high level, but should be finely attuned to the processes that define how the firm chooses to execute the strategy (Tallon, 2007, p. 256). However, Tallon (2007, p. 257) acknowledged that tight alignment in certain areas of a business are necessary for competitive parity and not competitive advantage. These areas should not be overlooked and indeed can be incorporated in the measure of alignment as well to ensure that an organisation is not oblivious of where it stands.

2.3.3.7 Khaiata and Zualkernan’s extension of the SAMM

Khaiata and Zualkernan (2009) extended the SAMM and proposed a modified instrument based on the model. Their idea was to simplify the methodology, while making it both flexible and relatively easy to use and interpret.

They used a one-dimensional framework to encode all the attributes (Khaiata & Zualkernan, 2009, p. 138) of the SAMM and then used non-parametric statistical methods to analyse the data. Their technique yielded similar results to the SAMM in terms of delivering the level of alignment of the organisation under study. The attributes were the same, with the methodology having a modification of a single question for each of the 38 attributes (Khaiata & Zualkernan, 2009, p. 140). The difference to the SAMM was that each attribute was then tied back to the parent criterion, something the initial methodology did not do.

The validation and use of the instrument developed yielded satisfying results. Importantly they noted a ‘second order’ misalignment between how the different management roles in the organisation surveyed viewed maturity of various attributes of alignment areas. This was evidenced in the high degree of variance around what people believed was the maturity level of fundamental attributes like IT strategic planning, IT investment management, formal assessments and reviews, continuous improvement, sharing of risks and goals, depending on the area of the business that they represented (Khaiata & Zualkernan, 2009, p. 151).

This second-order misalignment existed not only between management and staff but also between management and IT management. In the initial validation of the strategic model, Luftman (2000) argued the importance of involving all the management roles when determining levels of maturity due to the disparity in the views. Interestingly none of the authors actually proposed using this disparity in views as an indicator of misalignment in spite of the emphasis on communication and shared knowledge prevalent throughout the research.

It seems that given the many tacit elements embedded in measuring BITA and hence the necessity to measure this via feedback from employees and managers, it is not just defining the measurement that is a challenge for the practitioner. Ensuring accurate and representative responses from employees is equally crucial to ensure the instrument used is valid and reliable.

2.3.4 Synthesis of success factors and measurement criteria

Although the measurement of alignment is substantially different from the driving factors, this is not always clearly distinguished in the literature. Alignment models often contain both CSFs and KSC without stating or acknowledging the difference between influence and measure. KSC measure a level of alignment at a particular point in time. Even for a dynamic concept, such as the level of alignment, measurement and comparison over time is possible. However, CSFs for BITA are complex and by definition, not really ‘measurable’. The CSFs are practices, ‘things to be done correctly’, and are more dynamic and complex in nature.

Taking a dynamic process perspective on alignment does not negate the requirement to measure the state at any particular point in time; in fact, it probably becomes even more important to measure the results of these processes and their contribution to BITA on a regular basis. In principle the argument is that, when it is difficult to measure the speed at which an objective is traveling, the measure of distance can be used to infer the speed.

There is a fair degree of commonality between the different CSFs presented in Tables 2.3 to 2.10, but no individual study contains all the factors identified by the different authors. In addition, the different levels of granularity as well as differences in terminology make it difficult for both practitioners and researchers who would like to use a comprehensive list of all the CSFs.

There is less communality between the different sets of KSC used to measure the degree of alignment. The Weill and Ross model (Section 2.3.3.3) seems to have found some application in practice and the SAMM model (Section 2.3.3.4) is often used by researchers. This use (of the SAM) is either to measure levels of alignment as presented in this section, or to develop extensions to the model, often for a particular context. Based on the literature review in this section, measuring BITA seems to be rather elusive and most organisations concern themselves with the improvement over a period of time and not absolute values of alignment that may not be meaningful.

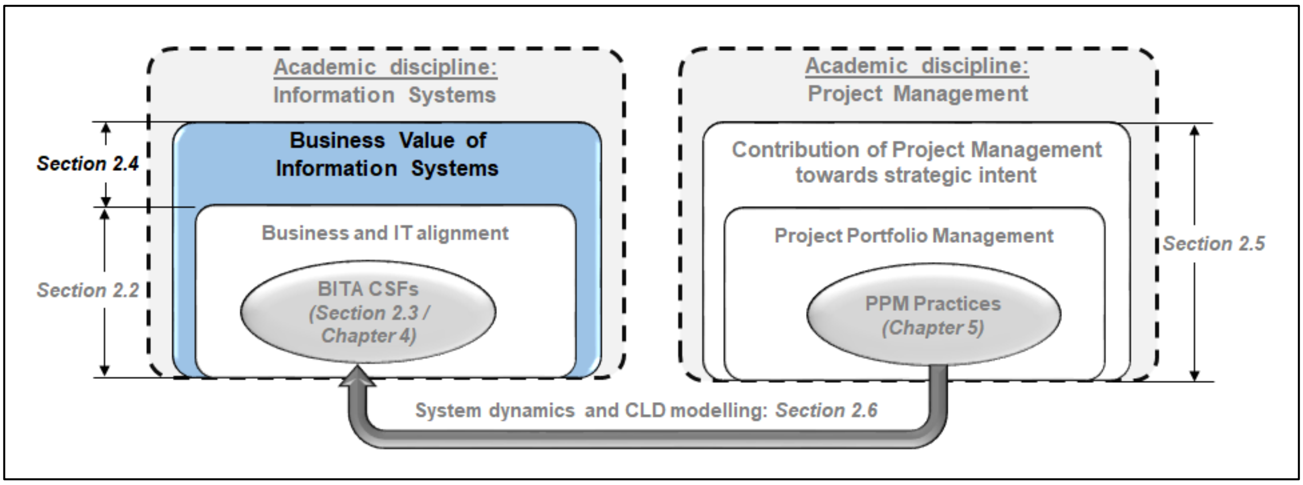

Figure 2.12: Structure of the literature review: Business value of IT

Figure 2.12 contains an overview of the chapter structure and highlights Section 2.4 that follows. This next section deals with the concept of business strategy and then in particular with the alignment of the ITO as well as IT resources and work effort with the organisation, i.e. the *business* of business and IT alignment. The historic perspective on strategic management is required to justify how the productivity paradox and IT value debate also needed to not only develop theory and concepts within the IT literature, but also take cognisance of the moving target of strategy as it evolved during the same period.

It is evident that part of the BITA complexity, although at times not stated by authors, is the requirement for IT research to align towards a moving target strategic management theoretical model. The evolution of strategic management is summarised in Table 2.13 that also contains the major contributions of IT towards each of the different perspectives.

Section 2.4 thus deals with the IT value perspective from the business and strategic management lens and argues the ‘value’ part of IT value from an organisational and not technical perspective.

2.4 BUSINESS AND IT STRATEGY

2.4.1 Role of IT in achieving strategic intent

The pursuit of competitive advantage is arguably the central theme of the academic field of strategic management (Furrer, Thomas & Goussevskaia, 2008, p. 2). Competitive advantage is obtained when an organisation develops, or acquires, a set of attributes that allow it to outperform its market competitors. The development of theories that explain the concept of competitive advantage has occupied the attention of the management community for nearly six decades. Porter (1980; 1985) is widely seen as the author with the biggest impact in the development of the discipline, although the structure-conduct-performance paradigm associated with industrial organisation, popularised by Porter, has now been superseded by more modern concepts (covered in this section) according to Ramos-Rodríguez and Ruíz-Navarro (2004, p. 1001).

Strategic management is concerned with defining organisational performance, variables of strategic choice and competitive advantage. In the early period, there were two dominant theories of competitive advantage: the *market-based view* (MBV) and the *resource-based view* (RBV). The notion of core competencies is closely related to the RBV of strategy.

Two more recent points of view in strategic management is the *knowledge-based view* and the *capability-based view*. According to Wang (2014, p. 33), both of these views can be seen as extensions of RBV, to an extent. Another recent development is the *relational view* of strategy, whilst the most recent view on strategic management, according to Wang (2014, p. 33), proposes “a notion of *transient advantage* that effectively overturns much of the existing wisdom”. These different views of strategic management are discussed in more detail followed by a summary of the impact of IT on each perspective.

2.4.1.1 The market-based view and resource-based view of strategy

The MBV of strategy propositions that industry factors and external market orientation are the primary determinants of firm performance (Bain 1968; Caves & Porter 1977; Porter 1980). According to the MBV, the sources of value for an enterprise are embedded in the competitive positioning characterising its end-product’s relative strategic position (Wang, 2014, p. 35). The strategic position of an organisation is the set of activities that are different from their rivals, or, how the organisation performs similar activities to other organisations, but in very different ways. In this perspective, an organisation’s profitability or performance are determined solely by the structure and competitive dynamics of the industry within which it operates (Schendel, 1994).

Porter (1979, p. 141) was one of the first authors to argue the importance of positioning an organisation appropriately in the competitive marked. He argued that positioning was crucial to establishing a profitable position in the industry in which an organisation operates. However, sustaining profitability requires scalable and integrated infrastructure to support integration across a diverse ecosystem of complementary offerings (Woodard, Ramasubbu, Tschang & Sambamurthy, 2013, p. 537). Therefore, managers are required to choose a profitable position in their industry and then need to align execution and value chains in order to deliver the required value proposition (Porter, 2001, p. 71).

According to Furrer et al. (2008), the focus of the academic discourse changed in the 1980s from the structure and positioning within an industry, to the organisation's internal structure, i.e. the resources and capabilities of the organisation. This has led to the RBV as a popular theory of competitive advantage (Furrer et al., 2008). Although the origins of the RBV go back to Penrose (1959), Wernerfelt (1984) is mostly acknowledged as the pioneer of the RBV of the firm.

Where MBV researchers argued that a firm's performance was significantly dependent on the industry environment, the RBV draws attention to the firm's internal environment as a driver for competitive advantage. The RBV emphasises the resources that firms have developed to compete in the environment, including the investment in IT and the process changes brought about by these investments. Barney (1991) advanced the RBV by developing a model for identifying the features of strategic resources, which are the resources that constitute a source of competitive advantage. Even though the RBV dates back to Wernerfelt's seminal work in 1984, it was not until the mid-1990s that it actually secured wide recognition among researchers in the strategic management field.

It has been argued that the RBV ignores the nature of market demand and only focusses on internal resources. However, some of the earliest authors in strategic management, like Chandler (1962) and Andrews (1971), argued that external and internal elements are interdependent and cannot be separated. Maier and Remus (2002) defined the concept of 'fit' as a balancing act between the external-oriented MBV and the internal-oriented RBV, typical of the widely held view in the 1990s and 2000s that RBV and MBV integration or balance is the most appropriate point of view.

IT investments, and hence the alignment challenges covered in IT literature, are very clear about both the MBV and the RBV. Investments in technology enable organisations to position themselves differently in the market with new products, services and distribution channels (Chen et al., 2014, p. 327; Turel et al., 2017, p. 117; Wu et al., 2015, p. 499). Conversely, IT investments also create strategic capabilities and impact organisational processes creating new resources that enable organisations to perform at a different level (Turel et al., 2017, pp. 117-118). Just as the RBV and MBV are not mutually exclusive, IT investments can either create new process capabilities to exploit market conditions, or allow a different positioning in the market, or both.

According to Dyer and Singh (1998) in relation to the RBV and MBV "clear contradictions between these views suggests that existing theories of advantage are not adequate to explain inter-organizational competitive advantage". Wang (2014) suggested that an inter-organisational level view is useful to analyse business relationships, since neither the RBV nor the MBV address this specific aspect. Following the RBV and MBV discourse are four more recent views on strategy, which are important to understand the business side of BITA: (i) knowledge-based view; (ii) capability-based view; (iii) relational view; and (iv) transient advantage.

2.4.1.2 The knowledge-based view of strategy

Most researchers subscribing to the RBV, regard knowledge as a generic resource. However, some researchers (Murray 2000; Teece et al., 1997; Tiwana 2002) proposed that knowledge has special characteristics that make it the most valuable resource, giving credence to the *knowledge-based view* (KBV). These authors argue that continuous acquisition and transfer of knowledge within organisations counter the fast-changing competitive context that firms are dealing with.

Multiple authors support the principles embedded in this view from different perspectives. Hamel and Prahalad (1994) argued that knowledge, know-how, intellectual assets and competencies are the main drivers of superior performance in the information age. Evans (2003) made an important argument that material resources decrease when used in the firm, while knowledge assets increase with each use. Tiwana (2002) argued that technology, capital, market share or product sources are easier to copy by other firms while knowledge is the only resource that is difficult to imitate, making it important for a sustained competitive advantage.

The common theme, based on some of the principles of the learning organisation popularised by Senge (1997, p. 9) is that knowledge, in all its dimensions and processes, is an important source of strategic advantage for organisations. It is interesting to note that knowledge, and in particular the sharing of knowledge, manifests strongly in the BITA CSFs presented in Tables 2.3 to 2.10 as well as the systematic review in Chapter 4 and in the CLDs in Chapter 6.

2.4.1.3 The capabilities-based view of strategy

Whilst some authors started to focus on the KBV or knowledge dimension, Grant (1991) argued that capabilities are the source of competitive advantage and that resources are the source of capabilities. This extension of the RBV view became known as the *capabilities-based view*. Amit and Shoemaker (1993) adopted a similar position and suggested that resources do not contribute to sustained competitive advantages for a firm, but its capabilities do. Haas and Hansen (2005), as well as Long and Vickers-Koch (1995), supported the importance of capabilities and suggested that a firm can gain competitive advantage from its ability to apply its capabilities to perform important activities within the firm. The concept of core competence was used to define the set of capabilities that set a firm apart of the norms within an industry (Teece et al., 1997, p. 516).

Wang (2014, p. 37) defined the capabilities, "in contrast to resources, as 'a firm's capacity to deploy resources, usually in combination using organisational processes, and effect a desired end." They are information-based, tangible or intangible processes that are firm-specific and developed over time through complex interactions among the firm's resources'. Important in this view is the notion of dynamic capabilities, the firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments" (Wang, 2014, p. 37). Dynamic capabilities, in contrast to core competence, enable an organisation for the changing environment in which modern organisations need to operate (Teece et al., 1997, p. 510). This view is explored in detail in Section 2.5.10 before dealing with dynamic complexity.

2.4.1.4 The relational view of strategy

While both the capabilities and knowledge views can be seen as extensions of the RBV, Dyer and Singh (1998) offered a new *relational view* of competitive advantage that focuses on network routines and processes as an important unit of analysis for understanding competitive advantage. The relational view does not share the RBV's assumption that resources are owned by a single firm. Dyer and Singh (1998) argued that a firm's critical resources may extend beyond firm boundaries. They suggested that inter-firm linkages may be a source of relational rents and competitive advantage. They defined a 'relational rent' as "a supernormal profit jointly generated in an exchange relationship that cannot be generated by either firm in isolation and can only be created through the joint idiosyncratic contributions of the specific alliance partners" (Dyer & Singh 1998, p. 662).

The relational view of strategy has become increasingly popular with support from other authors (Ahuja, 2000; Dyer & Singh, 1998; Seidmann & Sundararajan, 1997). Wang (2014, pp. 33-43) presented a framework for analysing a business context in terms of business relationship. The three forms of analysis are market-level, firm-level and interaction-level. Both market-level and firm-level analysis are fundamentally inter-organisational in that they analyse a firm from the perspective of its peers and the external market environment. According to Wang (2014, p. 38), market-level analysis views an organisation in the context of its market environment, while firm-level analysis looks at resources, strengths and capabilities of the organisation, but only relative to those of its peers.

Wang (2014, p. 34) proposed the notion of a business arrangement as the fundamental unit of analysis for business relationships. "While the MBV of strategy suggests that the primary source of high returns is the bargaining power of a firm in the market, and the RBV suggests that this (source of high returns) is the set of unique resources, capabilities and knowledge of a firm, the relational view suggests that these are the shared knowledge and complementary resources of the network" (Wang, 2014, p. 38). A key challenge is that business relationships are more fluent that internal structures and market positioning, leading to a more dynamic formulation of business strategy, and hence the resources required to support this strategy.

IT investments not only assist organisations with positioning and resources; they increasingly enable organisations to form part of complex value networks. Practitioner literature (Catlin, Lorenz, Nandan, Sharma & Waschto, 2018; Geraci, 2016; Van Zeebroeck, 2017) has given significant attention to platform and eco-systems business models made possible through IT investments. These networks of value share attributes with the relational view of strategy, and more importantly, also with the latest strategic view of transient advantage.

2.4.1.5 The transient advantage view of strategy

The most recent view on strategy is by McGrath (2013, pp. 62-70), who proposed overturning traditional assumptions about the temporal scope of the strategy formulation and execution processes, using what she calls '*transient advantage'*. According to McGrath, strategies are traditionally formulated to guide an organisation's behaviour for extended periods of time. Hence strategies would be revised and re-formulated on an infrequent basis. However, McGrath (2013) argued, given the way the current business environment has evolved, in no small measure due to the impact of IT, opportunities for leveraging competitive advantage are transient. In her opinion, this requires a new perspective on formulating strategic intent.

Wang (2014, p. 39) holds a similar view and believes that this observation has significant implications for the way in which strategies are formulated, executed, monitored and revised. Wang (2014) supports McGrath (2013) that the strategy life cycle needs to be much shorter, and, necessitates fast reaction to changing market conditions. This is, arguably, more important for the MBV, wherein market positioning responses would have to be significantly faster in the modern operating environment. While internal firm capabilities and resources have not been dynamic enough to date to warrant the use of the word 'transient', this may actually change in the new business environment (Wang, 2014, p. 39).

The dynamic complexity in the business environment where significant IT assets are deployed also need to align with strategy, more often than not, also in transition. This mandates alignment processes to not move towards a fixed target and hence an obligation within the IT department and systems a dynamic capability to adapt quickly to provide the resources and support new dynamic processes in an agile manner (see the agility arguments in Section 2.4.3).

The concept of transient advantage also impacts the relational view of strategy since business networks are also increasingly becoming temporary, with virtual enterprises forming and ending continuously. IT plays a very important role in enabling this formulation and also, in enabling the shared processes required for successful virtual enterprises. Once again, IT is thus shaping the strategic environment but also enabling the resources and capabilities of the firm to operate within this digital environment.

2.4.2 Digital business strategy

With technology reshaping value chains, the term '*digital business strategy'* has become omnipresent in the practitioner and academic literature. 'Digital business strategy' is defined as a series of deliberate competitive initiatives undertaken by an organisation that offers digitally-enabled products or services (Mithas, Tafti & Mitchell, 2013, p. 531; Woodard et al., 2013, p. 537). That is, the strategic posture of an organisation is required to adapt to meet the requirement of competing in a dynamic marketplace, through the use of technology to digitalise value creation and supporting processes (Mithas et al., 2013, p. 531).

It follows that IT should not only be considered as a functional-level strategy that supports business strategy, but rather as essential to the framing of overall business strategy itself, as a fusion with business strategy (Mithas et al., 2013, p. 531). This implies the dynamic synchronisation between business and IT to gain a competitive advantage. However, a dynamic synchronisation leads to dynamic complexity and limitations in any model that does not address the dynamic nature of BITA.

Strategic posture is defined as the variance from the industry norm and with technology ubiquitous in many market places, a digital business model may only provide strategic parity (Mithas et al., 2013, p. 531). The real challenge in using IT is achieving strategic advantage and this requires a high degree of alignment between the IT investments and strategic intent.

Although there is a clear need to alter the strategic posture of firms in order to capitalise on the possibility of new opportunities, there are also challenges. Woodard et al. (2013, p. 558) believe that there are two fundamental challenges. The first is the challenge to support flexible adaptation of products and services to changing market needs. Tallon, Queiroz, Coltman and Sharma (2019) corroborated this as their research indicated an increasing challenge for IT practitioners when they realise that past IT decisions could hinder current and future agility. The second challenge is to provide a stable value direction mechanism to gain economic appreciation and thus the ability to launch new innovative initiatives. Research by Day (2011, p. 183) determined that the flood of data with which the marketing departments in organisations were being challenged was well beyond their capacity to comprehend and utilise, making it difficult to provide this direction.

Silvius, De Waal and Smit (2009) confirmed the key benefit of a strong alignment between IT and business. They argued that successful IT implementations enable the execution of the business strategies to provide companies with a significant competitive advantage. To illustrate this point, Silvius et al. (2009) categorised digitally-enhanced business strategies into the following three types:

i) Operation excellence strategy: Organisations use this strategy to generate high volumes of product or service at a very low cost.
ii) Product leadership strategy: Organisations use this strategy to distinguish themselves by creating a very high-quality product or service at a higher price.
iii) Customer intimacy strategy: Organisations use this strategy to delight and retain customers by customising their products to customer needs and desires.

Importantly these categorisations are not new due to the impact of IT, rather, they are existing strategic choices that organisations make; yet IT can assist with the execution of these choices. Silvius et al. (2009) also described how IT can be used to enable organisations to execute their strategy irrespective of the path taken as indicated in Table 2.12. The complementary IT strategies presented in Table 2.12 are in fact nothing more than an indication of IT aligned with the strategy of the business.

Table 2.12: Complementary IT and business strategy

Business strategy	IT strategy
Operation excellence: Low cost provider.	The strategy focuses on investing in IT that improves the internal business process efficiency with the key objective of reducing cost and improving decision-making. An example of this is an enterprise resource planning (ERP) system that improves the utilisation of resources.
Product leadership: High quality product and/or service.	The strategy focuses on investing in IT systems that produce a higher quality products and services. IT systems should allow for quick responses and comprehensive decision-making.
Customer intimacy: Customer-centric approach	The strategy focuses on enabling organisations to benefit from IT investments that facilitate flexibly processes to tailor products and/or services based on customer need. The IT investment should focus on market flexibility, time to market and quick decision making.

Source: Adapted from Silvius et al. (2009).

Digitising a business strategy emphasises that the IT strategy is no longer a functional-level strategy, but should rather be elevated to an overarching integration with business-level strategy. The challenge is not aligning an IT strategy with a business strategy, but rather infusing the strategic intent of the organisation with the impact of information technologies. IT resources can be leveraged and can create differential value through formulating and realising business strategy (Bharadwaj et al., 2013a).

2.4.3 Benefits derived from BITA

Over the last decade, digital technologies have fundamentally altered the way in which businesses deliver value. Various elements have changed to incorporate new technologies and the use thereof. These elements include the transformation of business strategies and processes, the evolution of products, capabilities and services, as well as relationships between firms (Bharadwaj et al., 2013a, pp. 471-472). These digital technologies are reshaping business strategy into cross-functional, commutable, distributed and global processes enabling execution across functional boundaries (Kohli & Grover, 2008, p. 36; Rai et al., 2012, p. 258).

Zhang (2009, p. 1080) noted that the use of information technology provided the opportunity for business to expand, for example, by using the online retaining channel capabilities that would not have been possible without using newly established IT capabilities. However, new technologies have not only created new capabilities (changing the RBV), but have also accelerated change in the marketplace essentially impacting an organisation’s MBV (Day, 2011, p. 183). Firms are, therefore, more vulnerable if they do not capitalise and use these capabilities. Importantly, the environment in which an organisation operates moderates the salience of the IT-enabled value creation processes (Xue, Ray & Sambamurthy, 2012, p. 509). It is therefore important that IT investments should include exploration initiatives and that alignment of IT and business strategy also includes alignment of the strategy to the industry environment (Xue et al., 2012, p. 524).

Harmonising business systems and IT was seen as a key challenge by Chen (2010, p. 240) as well as being the top priority in leveraging IT to attain a competitive advantage (Liu, Ke, Wei & Hua, 2013, p. 1452). The advantage of achieving alignment is also found to increase firm value (Fang, Palmatier & Grewal, 2011, p. 587; Kohli et al., 2012, p. 1149). According to McLaren, Head, Yuan and Chan (2011, p. 909) aligning the IT strategy to the business strategy was crucial to achieving success, that is, organisations must adapt and align their competitive strategies and information systems.

Roberts and Grover (2012, p. 244) also emphasised the criticality of alignment and mentioned the importance of customer sensing and responding, because the inability to respond to either a threat or opportunity could have a big impact on the organisation. McLaren et al. (2011, p. 909) investigated the misfit between an organisation's competitive strategies and IS capabilities, and presented an argument for a more fine-grained approach to determine the specific areas of misfit between an organisation's competitive strategies and its IT capabilities. Evidence from a multiple case study analysis indicated that a more granular assessment of strategic fit can strengthen the validity, usefulness and ease of corroboration of the BITA measurements (McLaren et al., 2011, p. 926)

The need for a transparency strategy in the digital environment is more apparent than ever, as value continue to change in a world of digital business strategy (Bharadwaj, El Sawy, Pavlou & Venkatraman, 2013b, p. 633). Therefore, digital business strategy means that structures that accommodate ever-continuing shifts in value should be implemented (Keen & Williams, 2013, p. 646).

While the thought of hitting an ever-moving target may sound discouraging, digital business is marked by innovation through interface (Keen & William, 2013, p. 646). This interface could be to customers, suppliers and multiple business partners, therefore creating the platform to interface is an important role of IT, and strongly supports the relational view of strategy (see Section 2.4.1.4). Value is a function of choice and digital business is centred on using the forces of disturbance to gain advantage, which in turn, opens up the 'choice space'. Because of this, the structures or interfaces that are put in place must be able to accommodate ever-continuing shifts in value (Keen & William, 2013, p. 646).

According to Chen, Preston and Xia (2010, p. 232), organisations are challenged to create value, which now depends on the ways in which IT investments are managed and employed. Pagani (2013, p. 627) noted that internet technology brought new forms of value through the enablement of a combination of products and services into activity-based offerings. The research analysed the structure and dynamics of value creation in a technology-enabled industry. It was found that incremental innovation changed value networks from vertically-integrated networks to more loosely coupled networks. Outside disturbances could in turn create multi-sided markets. An example of this shift in respect of value would be the strategic advantage gained by large influencers or orchestrators when adopting a community platform to extract value (Markus & Loebbecke, 2013, p. 649).

Digitisation created hyper-competition and transparency in many industries. However, managing the 'obvious', made evident in a highly-visible system, instead of managing value may have a short-term advantage, but which might come at the cost of a long-term value (Grover & Kohli, 2013, p. 655). Short-term digitisation might deliver favourable results, but not necessarily in the longer term as it reveals strategy and company intent due to its transparent nature, which erodes competitiveness as the organisation's strategy is revealed (Grover & Kohli, 2013, p. 655).

Alignment in the context of digital strategy is challenging for several reasons (Yeow, Soh & Hansen, 2018, p. 43). Firstly, organisations find it difficult to fully articulate their digital strategies upfront in a dynamic environment. According to Yeow et al. (2018, p. 43), alignment is "therefore a continual process of aligning to the moving target of emerging strategy". Secondly, a digital strategy is intrinsically multi-functional, and alignment requires the simultaneous development and reconfiguration of IT and business resources across numerous organisation processes. While prior research has typically treated alignment as an event or end-state, more recent research has called for a focus on the aligning process rather than on alignment (Karpovsky & Galliers, 2015, pp. 136-138) and to understand the role of actions taken over time to align strategy and resources (Yeow et al., 2018, pp. 43-44).

Table 2.13: Contribution of IT to the multiple strategic perspectives

Strategic view	Value contribution of Information Technology
Market based	IT enables firms through digital business models, distribution channels and virtual networks to position themselves appropriately in the market.
Resource based	IT creates and supports new resources at firm level to create digitised processes with high efficiency levels delivering new service and product value offerings
Knowledge based	IT assets improve the capabilities of the firm to collect information, share knowledge and apply the knowledge in both operational practices and meeting customer demand
Capabilities based	The firm's capabilities at the process level is dynamic and changes with its strategic intent and IT supports the required capabilities through digitised processes and appropriate value delivery channels
Relational	The capabilities and resources to add value do not necessarily reside within the firm and IT enables the creation of virtual value-adding networks that allow the firm operational efficiencies and market reach built on its relationships within the network
Transient advantage	Both resources (including capabilities) and positioning are transient in nature and the IT needs to enable a firm to adapt quickly and with low real and opportunity cost to reposition itself in the market or virtual network to add value and serve customers

Source: Author's summary of Sections 2.4.1, 2.4.2 and 2.4.3.

Table 2.13 contains a brief synopsis of the key value arguments presented in this section based on the different strategic points of view from the previous section. As argued previously, the views are not mutually exclusive and hence neither are the value contributions listed; the one type of value does not supersede the previous, it merely adds additional potential value.

Transient advantage remains elusive for organisations. Yet Dutta et al. (2014, pp. 771-772) maintained that sustainable competitive advantage has become the exception, not the rule, and that transient advantage is now the new normal. They believe that, when looking at the concept of the competitive dynamics of digital systems, managers should accept this 'new normal' of transient advantage and its associated agility. Organisational agility is central to transient advantage and needs some more attention, especially since it is prominent in the most recent BITA literature and is discussed in the next section.

2.4.4 Organisation agility

Eggers (2012, p. 47) posited that it is crucial for an organisation to be agile and able to adapt quickly when it does business in an environment where technology is changing. 'Agility' is defined by the ability to sense what is required and then being able to respond and make the changes required. Tallon and Pinsonneault (2011, pp. 463-486) investigated the competing perspectives in prior research about the link between strategic IT alignment and organisational agility. They presented clear arguments that organisational value is derived from strong BITA. However, more challenging was the impact of alignment on agility, and especially structural alignment on agility.

Roberts and Grover (2012, p. 232) studied the manner in which the IT function could facilitate an organisation's customer agility and focussed on developing agility in the marketing function. They found evidence that this increased agility was facilitated by IT and argued that IT provided the capability to increase competitiveness. The importance of IT in supporting business processes or activities should not be overlooked, as IT enhances a firm's dynamic marketing capability according to Wang, Hu and Hu (2013, p. 341).

The resource-based view was the point of departure for evaluating the alignment between business and IT by many authors (Bhatt, Emdad, Roberts & Grover, 2010, p. 342; Fang et al., 2011, p. 587; Gu & Jung, 2013, p. 88; Liu et al., 2013, p. 1453;). However, Wang et al. (2013, p. 337) argued that the resource-based view was less applicable in highly-volatile environments and, therefore, researchers should shift their focus to an organisation's dynamic capability. As researchers embrace alignment with the dynamic capabilities, there is also a requirement to embrace methods and techniques appropriate to present the alignment with the dynamic capabilities, hence the use of system dynamics diagrams used in this research.

Davis, Eisenhardt and Bingham (2009, p. 413) provided insight on the challenges that emerge when trying to align the IT departments with business strategy in a dynamic and changing environment. They posited that, in a predictable business environment, a highly-structured environment could be high performing since it takes advantage of consistent patterns that are mirrored in the structure. In contrast, if the environment became unpredictable, the structure should be reduced.

In addition, Davis et al. (2009, p. 413) argued that the challenge remains to achieve an altered mind-set to be able to deal with functioning at the edge of chaos. This is necessary to improvise and capture new opportunities and quickly rebound from mistakes to create equilibrium to achieve goals. This optimal balance is noted as the perfect fit between flexibility and efficiency. In striving to align an organisational structure to achieve this balance or to achieve the perfect fit, organisations simply had to adapt (Davis et al., 2009, p. 413). The challenge is that, as it becomes more crucial to adapt, it also becomes more challenging to do so, as the industries keep evolving and agility is often juxtaposed with efficiency, when using traditional mind-sets.

Sensing and responding are two of the critical building blocks of agility. The digital world increases transparency, for example, organisations that know faster when things go wrong when information gathering is digital, are able to react quicker. If digital processes are designed to be responsive, they would also be able to respond quickly to this newly-found information (Bennis, 2013, p. 635). The sensing part is significantly easier to achieve than the response. Sensing has always been part of IT's value proposition; responding to change, not so much. For decades, IT investments were seen as delivering operational efficiencies, or at best, as giving access to new clients via new products or distribution lines. Being agile, or enabling agility did not feature prominently in academic IT literature for at least three decades.

An organisation's ability to sense market opportunities depends on its ability to create and leverage knowledge (Roberts & Grover, 2012, p. 241). Roberts and Grover (2012, p. 242) found that an organisation's ability to respond to opportunities in the market depended on the level of coordination within the organisation, but also with the firm's external partners. Their research indicated that in a dynamic environment, organisations will require customers to help create this insight in order to improve the sensing capability. It is noted that customers should be able to contribute to the company as resource, co-creator, as well as user. IT thus has an important role to play in enabling customers as part of the value chain to generate the higher level of insight required to succeed in the modern dynamic environment (Bhatt et al., 2010, p. 347).

Effective leadership in a digital age requires adaptive capacity. Resilience is required as part of the adaptive capacity as well as being open to the new (Bennis, 2013, p. 635). A third leadership aspect mentioned is an optimistic sense of 'can do' and 'can try'. Bennis (2013, p. 636) mentioned that organisations had to learn to enhance their adaptive capacity in the digital world, otherwise they would be left behind. Bennis (2013, p. 635) found that information-driven transparency would forever change how top leaders derive power. Understanding how to use the new management instrumentation is also crucial to utilising the power that the new digital world brings, although it is not yet fully understood.

IT has changed how business is done. Because this is a continuous process, business-IT alignment must first be understood, but also constantly renewed and adjusted (Guillemette & Paré, 2012, p. 529). The new alignment paradigm is agility. Alignment enables agility and applies to all organisations regardless of market volatility. IT infrastructure flexibility has a significant impact on agility, which together indicate that IT infrastructure flexibility and alignment facilitate agility (Tallon & Pinsonneault, 2011, p. 479).

Alignment can be seen as a sensing capability due to alignment benefiting from knowledge sharing and a shared understanding. Because IT flexibility creates the ability to sense and respond to market opportunities and threats with speed, ease and dexterity, IT infrastructure flexibility can be seen as a response capability. Therefore, agility fully mediates the link between alignment and firm performance (Tallon & Pinsonneault, 2011, p. 479).

Tallon and Pinsonneault (2011, p. 479) warned about organisations investing all efforts in one technology, because another technology could end up being superior. The optimal process would be to start knowledge building in multiple technologies in order to mediate the effects if one were to surpass the other; one of them, therefore, becoming redundant. Roberts and Grover (2012, p. 244) agreed and argued that ‘agility alignment’ is as important as the ability to rank opportunities. They warned about continuing to execute IT initiatives with lower possible impact that could lead to missed market opportunities and less effort into the more important but newly-emergent initiatives.

Marnewick and Langerman (2018, pp. 233-250) made a strong case for the introduction of agile principles in the management of IT projects. Their arguments include the dynamic nature of organisations and their strategic intent, contrasted with the typical static processes prevalent in the traditional IT development processes. In the ever-evolving world of IT, the ability to effectively respond to market changes is a difficult but critical task (Roberts & Grover, 2012, p. 244).

As organisational capabilities change, so must IT processes, and sometimes it can be necessary to reconfigure or completely replace IT systems in response to new realities. Roberts and Grover (2012, p. 244) defined IT agility as a measurement of how efficiently the IT infrastructure and digitised processes of an organisation can respond to external stimuli. In essence, it is a measure of how effectively it embraces the pressure to change, and responds to new opportunities. IT agility should be viewed as more of an overall mind-set, eventually becoming part of the company culture (Roberts & Grover, 2012, p. 244)

No BITA discussion is complete without dealing with the impact of alignment on agility. Liang et al. (2018, p. 2), for example, raised concerns about the impact of IT on organisation agility since ‘tight alignment’ of an organisation’s IT systems can impede agility in fast-moving markets. Dutta et al. (2014, p. 762) argued the converse by providing examples of organisations that achieved increased agility thorough investments in IT. Whether alignment impedes or improves alignment is not clear with the contradictory arguments. What is important is the test of Roberts and Grover (2012, p. 244) to determine how quickly the combined IT capabilities and supported processes can react to external stimuli.

It is important to balance the IT value view with a view on the potential risks, like reduced agility, introduced by investments in technology.

2.4.5 IT-induced strategic risk

Although there are multiple operational risks associated with the increased dependency on IT, this is normally dealt with in IT risk management processes, or increasingly, as technology risk in enterprise risk management processes. However, there is a tactical and strategic-level risk associated with the IT investment as well. The full risk discussion falls outside the scope of this research, but it is important to look at the risk closely associated with business and IT alignment.

Otim, Dow, Grover and Wong (2012, p. 160) found that IT investments had an impact on the downside risks of firms and specifically decreased risk if implemented to automate business functions. Larger technological failures, on the other hand, could result in complete company failure in the worst-case scenario (Eggers, 2012, p. 73) and organisations typically have to institute risk management processes to deal with the increased dependency on IT.

A key uncertainty emphasised in the academic discourse is that this ever-changing environment is yet to be fully understood. This lack of understanding represents a significant amount of risk. Aligning the business strategy with that of IT is critical, because if it is implemented ineffectively the implementation could effectively harm the business through increasing competition and lowering profits (Roberts & Grover, 2012, p. 244; Zhang, 2009, p. 1080). However, alignment of IT resources with strategic intent could also pose new risk like a loss of the organisation's agility, or dynamic capabilities, or high cost structures due to significant capital investments.

A key BITA risk is using static models and measurements to define success in a highly-dynamic environment. Keen and Williams (2013, p. 647) noted that searching for a model to use and manage the changing environment was an incorrect approach when wanting to take charge of change. They suggested an IT value architecture that is built on identifying and capitalising on new technology intrinsic opportunities. Yeow et al. (2018, p. 43) fully agreed and contended that prior IS research has not fully addressed the aligning process in the highly-dynamic context of digital strategy.

The risks inherent in IT investments are multi-dimensional. The entire IT value debate and productivity paradox was triggered by questions about IT value, still present to date. Based on the ongoing academic discourse, this remains a significant challenge: investing in IT that does not deliver the intended value. However, the inverse is also strongly argued in both academic and practitioner literature: miss the required investment to build the capabilities and take the required strategic posture, and it could be the end of the firm outmanoeuvred by its competitors. Less severe, but on the same continuum is poorly-aligned IT and business that leads to low levels of efficiency, or, inflexible alignment and the risk of rigidity that makes agility difficult.

Companies competing in a dynamic environment are required to exhibit flexibility and agility, which are in contrast with the rigidity associated with an excessive alignment (Amarilli et al., 2016, p. 2) Given the multiple models dealing with IT value, business and IT alignment, and the modern challenge of transient value and required agility, this research focussed strongly on the agile and dynamic requirements. This approach finds support in academic literature with Fang et al. (2018, p. 1304) arguing the value of "system dynamics as a modelling methodology for extending existing variance theory in the IS field from a systems perspective", the focus of this research.

2.4.6 Synthesis of IT value and risk

Strategic management as an academic discipline and the different processes to define and formulate strategy have seen profound changes during the last three decades, as summarised in Table 2.13. The table also indicates how the contribution of IT has evolved over this period from a narrow role of IT as resource to improve operational efficiency, towards the critical enabling role of IT when organisations form part of a business network or need to develop dynamic capabilities.

The potential business value from IT, although elusive to obtain under all conditions as argued in this research, is evident and multi-faceted. An important argument introduced in this section is the role of IT in achieving organisational agility, or impeding agility if not appropriately deployed. Some authors have argued the negative impact of a lack of alignment and what they call 'tight alignment' that could impede agility.

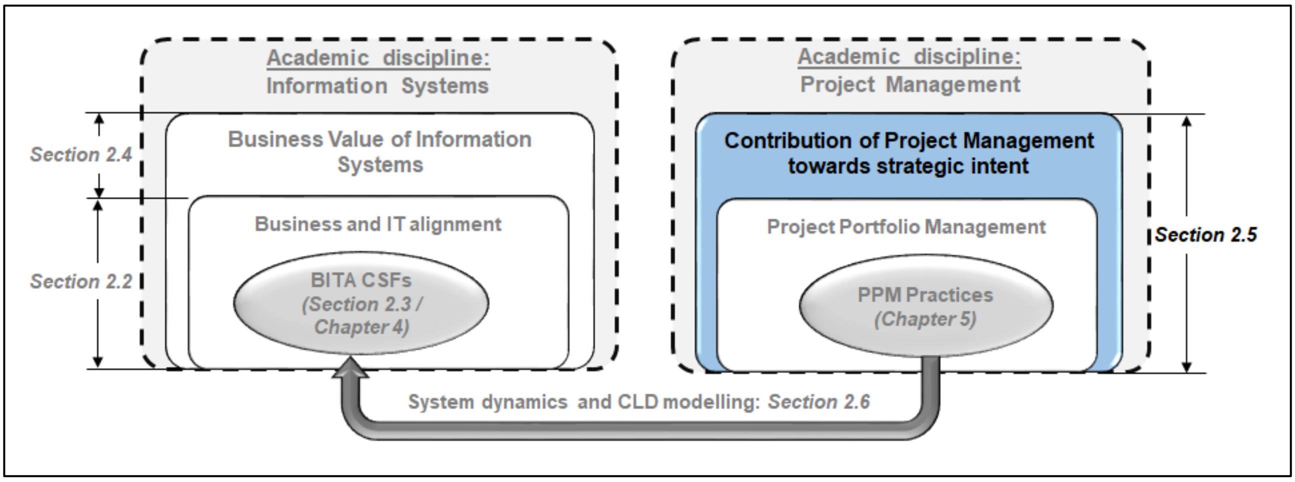

Figure 2.13: Structure of the literature review: BITA CSFs

This chapter has dealt with the IT value debate, BITA and the factors that lead to alignment as well as the value and risks. As indicated in Figure 2.13, the emphasis in Section 2.5 now moves towards the set of practices in the project management domain that could assist in achieving alignment since it also deals with the dynamic nature of adding and removing projects that consume organisational resources to execute the strategic intent.

The first section (Section 2.5) on portfolio management shares some of the dynamic nature and complexities with the deployment of IT assets in an organisation. In this section a brief introduction to project management (Section 2.5.1) is followed by a more in-depth view of project portfolio management (Sections 2.5.2 – 2.5.8). The contribution of project management to strategic intent (Section 2.5.9) and in particular the importance of the dynamic capabilities view where project management and strategic management intersects stongly (Section 2.5.10) concludes this section.

2.5 PROJECT PORTFOLIO MANAGEMENT

2.5.1 Project and programme management

The most likely origin of the current understanding of the concept of project management (PM) is the work of Gaddis (1959, pp. 89-97), who defined the nature of a project in the *Harvard Business Review* as early as 1959. According to Gaddis (1959, p. 89), a project is an organisation unit dedicated to the attainment of a goal, which generally amounts to the successful completion of a developmental product on time, within budget, and in conformance with predetermined performance specifications. Such a conceptualisation led to the introduction of the classic triangular relationship (time, cost and performance), still viewed as being central to any current project. The first academic publishing on projects using a systems approach and formal management techniques was done in 1968 (Cleland & Gareis, 2006).

PM entails the management and completion of a specific task which is not part of the normal organisation's operations, within a specified time frame, using either organisational or external resources. The relative complexity of the task does not feature in any of the existing definitions, but only the understanding that the project, as such, must have a definite end date or date by which it must be completed (Crawford, 2005, p. 7; Kerzner & Kerzner, 2017, pp. 4-5).

Delisle and Olson (2004, pp. 327-337) bemoaned the lack of a common PM reference language in the academic literature. Information systems projects, called IT projects in this research to remain true to the term IT used consistently, are by nature more fluid and less tangible than traditional construction and defence and aerospace projects and are particularly strongly influenced by the lack of consistency in terminology. Although there is credible evidence that IT projects have benefitted from the adoption of project management principles, the inconsistencies have also had a negative impact in this domain (Hidding & Nicholas, 2017). With BITA already plagued by the absence of a uniformly-accepted and -used theoretical base (McAdam et al., 2017, p. 7169), alignment between business strategy and technology was not helped by the inconsistencies in the project management domain.

'Programme management' refers to the coordinated management of a group of related projects (Grundy & Brown, 2002, p. 248). Other authors (Cleland, 1999, p. 69; Dai & Wells, 2004, p. 524) refer to a programme as a complex project that consists of various sub-projects. Lycett, Rassau and Danson (2004, p. 289) supported the above-mentioned definitions, but add that programme management entails the "integration and management of a group of related projects with the intent of achieving benefits that would not be realised if they were managed independently". These authors asserted that programme management requires basically the same skills, abilities and techniques as does the management of a project, albeit a very complex project. As a result, various texts use the terms 'programme management' and 'project management' interchangeably (PMI, 2013a, p. 10).

Marchewka (2014), Schwalbe (2015) and Taylor (2003) provided significant guidance in the application of project and programme management principles in the Information Technology domain. A common concern is the low success rate of IT projects as evidenced by the widely used, and abused, CHAOS report research project on IT project success rates and project management best practices (Eveleens & Verhoef, 2009, pp. 7-8; Marnewick, 2012). In response, the industry has embraced different methods and have reaped results from many of the more agile approaches evidenced in the IT project management literature today (Serrador, & Pinto, 2015).

According to Stevenson and Starkweather (2017, p. 1), investigations into the reasons behind the poor IT project success rates is common in the IT project management literature for decades. They presented a list of 142 success factors from 25 years of academic literature on IT projects classified into five groups. According to their research, the most important factor is the *Ability to communicate at multiple levels from the project manager/team group*. This communication requirement manifests strongly in both IT and PM literature and is also one of the PPM practices extracted from the PPM literature (see Section 5.3.9), as well as being a CSF from the IT alignment literature (see Section 4.3.2.).

Although this research study used practices from within the broader project management domain, the practices are very specific to project portfolio management, dealing with the dynamic portfolio of active projects within an organisation. Generalist coverage of the project management literature was thus not required for the research. However, in-depth coverage of project portfolio management is rather important to define a theoretical base within the project management academic discourse.

2.5.2 Portfolio management

Portfolio theory is concerned with risk and return. Assigning weight to risk at least equal to the return, was a novel and important concept in the 1950s. Until then, both in academia and for the practitioner and public, the stock market was no more than a ‘playground’ for speculators (Dolci & Maçada, 2011, p. 199). In 1952, Nobel laureate, Harry Markowitz, proved that diversification is the best option for an investor, or for that matter, in the context of this research, the manager of a modern organisation faced with multiple investment opportunities (Dolci & Maçada, 2011).

These investments also include the growing investments in IT prevalent in modern organisations (Anderson et al., 2006, p. 2373), and thus potentially, not hedging the future of the organisation on a single large IT project, but rather on a combination of multiple IT projects with different risk and return profiles.

The essential elements of portfolio theory developed by Markowitz in the early 1950s still remain relatively unchanged (Sharpe, 1970, p. 3). No matter what its designation, the theory continues to be used to understand possible decisions involving outcomes that cannot be predicted with complete certainty. Although it is commonly applied to financial instruments, such as bonds and equities, the theory is not exclusively used in this space. In fact, the use of portfolio theory recalls the definition of

PM, in terms of which a project is regarded as a once-off activity, in which decisions must be taken despite uncertainty about the future. IT projects, given the lack of tangibles associated with many traditional construction and mechanical projects, suffer from a higher degree of uncertainty about the future and could thus benefit from the application of portfolio theory (Kaiser, El Arbi & Ahlemann, 2015, p. 128; Meskendahl, 2010, p. 809; Teller & Kock, 2013, p. 818).

The collection of decisions determining an entity's future prospects is referred to as a portfolio (Sharpe, 1970, p. 19). The measurement of the performance of such a portfolio is the actual rate of return relative to the expenditure entailed. Dealing with a portfolio involves great uncertainty, with the analysis of all factors that could potentially influence the outcomes being so complex that they are often not fully comprehensible (Meskendahl, 2010, p. 809; Sharpe, 1970, pp. 1-3; Young & Conboy, 2013, p. 1090).

The fundamentals of portfolio theory require the focus to be placed on only the most significant factors. Such selectivity bears a strong resemblance to PM, where the project manager is continuously faced with having to prioritise a wide range of factors, so that trade-offs can be made in order to maximise effect. However, it is at the organisational level that the true challenge for projects manifests as different projects compete for limited resources within the organisation. Selecting projects at the organisational level is a very important challenge for organisations to ensure that they always have the optimum portfolio of active projects to ensure the best possible return on their investment.

Portfolio selection is not merely based on the single risk and return attached to the entity (bond / equity / project / IT asset) being added to, or removed from, the portfolio. The manager entrusted to make such a selection should consider all current projects, no matter their status, as well as all future prospects, before making an appropriately-informed selection (Wyrozębski, 2016, p. 93).

The strategic alignment argument for selection presented by Wyrozębski (2016) is important and at times complex. Selecting IT projects and initiatives are even more complex due to the transient nature of the project value and complexity to embed the project outcomes in organisations. Multiple authors have proposed several approaches to deal with this complexity, including using goal programming (Lee & Kim, 2000, pp. 367-382), analytic hierarchy processes (Wei, Chien & Wang, 2005, pp. 47-62), multi-objective particle swarm optimisation (Rabbani, Bajestani & Khoshkhou, 2010, pp. 315-321) and multi-criteria utility theory (Stewart & Mohamed, 2002, pp. 254-270). Suffice to state that the techniques suggested in academic literature to assist with project selection, are probably as complex as the realities faced by the practitioner who has to make these selections.

Brigham and Ehrhardt (2002, p. 212) and Teller and Kock (2013, pp. 817-829) described the application of portfolio theory in project management from both risk and return perspectives. When the theory is applied to securities, both the risk and return associated with any portfolio element must always be seen in the context of the entire portfolio. According to Brigham and Ehrhardt (2002, p. 213) the contribution and risk attached to a single entity could be viewed quite differently when seen as part of the portfolio as a whole. This clearly holds true for the contribution of a project as well.

Given the significant investment in IT projects, and the importance of alignment of these projects with strategic intent, their return should also be seen within the context of the portfolio. However, in the wake of the continued high failure rate of individual IT projects (Hughes, Rana & Simintiras, 2017, p. 143), it remains important to find the balance between ensuring a focus on the success of the individual project (to ensure it does not fail), whilst also ensuring that the entire portfolio of projects is managed for alignment with the organisation's strategic intent.

The concept of 'efficient portfolios' (Brigham & Ehrhardt 2002, p. 213; Pajares & López, 2014, p. 646) refers to a combination of securities that collectively yield the highest rate of return for a specific risk, or the lowest level of risk for a specific return. It is the integrated management of all projects competing for the collective of the organisation resources, which is an attractive proposition from the portfolio management theory.

From the 1970s onward, portfolio theory began to be used in the area of information systems, intensifying its usage and application during the 1990s. The first studies were more focussed on operational issues of investment decisions and the computational power of technology was used to analyse financial information and show the benefits of diversification (Rickard & Torre, 1999, p. 48). Jeffery and Leliveld (2004, pp. 41-43) began to promote the concept of IT Portfolio Management (ITPM), the analysis of the value of IT investments and the ways of maximising the investments. Moreover, a growing management concern about selecting and prioritising IT projects to maximise the results of IT investments resulted in greater interest in the processes of project portfolio management (Dolci & Macada, 2011, p. 206; Grant & Collins, 2016, pp. 113-114).

According to Dolci and Maçada (2011, p. 199) portfolio theory has influenced two major streams in the IT domain called Information Technology Portfolio Management (ITPM): (i) analysis and classification of IT investments in different dimensions; and (ii) analysis and classification of IT projects. Both lines of research use Markowitz's studies as reference to evaluate the trade-off between risk and return on investments in IT projects at the organisational level of analysis. Thus, IT investments can be managed as a portfolio, combining risk and return to maximise the benefits of IT investment, and help managers to choose the best option and make the best decision (Dolci & Maçada, 2011, p. 199).

Initially, the early use of technology in portfolio theory was more focussed on determining the most operationally risky issues and ROI. However, with an "increase in competition and the need to always reduce costs and increase productivity, multiple studies began to focus on managing scarce resources" (Dolci & Macada, 2011, p. 206), including the IT resource that seemed to grow in strategic importance. Dolci and Macada (2011, p. 209) posited that, as "IT is constantly changing, with different technologies being released and used for companies, more and more tools to assist managers in these decisions are necessary". They suggested studies using portfolio theory in "order to evaluate the risks and expected returns on investments on these new technologies"; a principle strongly supported by Grant and Collins (2016, pp. 113-114).

2.5.3 Defining project portfolio management

According to Killen, Jugdev, Drouin and Petit (2012, p. 526), project portfolio management (PPM) is a relatively-young discipline with research approaches and standards in the developmental stage. For a long period of time no internationally-accepted standard for PPM existed within the project management body of knowledge (Marnewick & Labuschagne, 2004, p. 288).

The academic view on project portfolio management is also not well-formulated according to Killen et al. (2012, p. 527) due to it being a relatively young discipline. Young and Conboy (2013, p. 1090) agreed and added that most commercial standards of PPM are not rooted in theory, which makes building competency standards difficult and somewhat limiting. Martinsuo (2013, p. 798) believes that research on PPM increasingly assumes project portfolio management as significantly more than a set of techniques used for rational decision-making. She is of the opinion that theoretical models need to be established to take both the practice and context of PPM into account.

Levine (2005, p. 60) argued definitively that PPM is not just an extension of project management, and neither is it the ability to manage multiple projects. He sees it as the management of a project portfolio to maximise the contributions of the collective set of projects for the wellbeing and success of the organisation.

According to Levine (2005, p. 70), PPM is a "set of processes, supported by people and tools, to guide the enterprise in selecting the right projects and the right number of projects, and in maintaining a portfolio of projects that will maximise the enterprise's strategic goals, efficient use of resources, stakeholder satisfaction, and the bottom line". PPM is thus presented as a management technique focussed on the interaction between different projects.

A popular early academic definition of PPM is from Archer and Ghasemzadeh (1999, p. 208), who defined PPM as a set of projects executed in parallel that compete for scarce resources under the sponsorship of a particular organisation. The concept of scarcity of resources is significant since no organisation has unlimited resources and maximising the available resources, as well as the optimal allocation of resources, ultimately becomes important. Laslo (2010, p. 609) as well as Pajares and López (2014, p. 648) considered resource allocation among concurrent projects to be one of the primary themes in PPM literature and value contributions from PPM. Refer to Section 5.3.4 that deals in detail with the resource allocation challenge.

Blichfeldt and Eskerod (2008, p. 358) defined PPM as a set of managerial activities that assist organisations in choosing the right projects; helps prioritise projects in an ongoing basis; and assist in the continuous prioritisation of project resource allocations. They argued that choosing the correct projects in an organisation reduces waste and leads to a focus on projects that contribute to an entity's continuous relevance. The keywords 'ongoing' and 'continuous' in the definition from

Blichfeldt and Eskerod (2008) are an indication that choosing the appropriate projects need to be supported by the constant re-evaluation of the portfolio, is an important contributor to the effectiveness of portfolio management.

A recent and often-cited definition from the work of Young and Conboy (2013, p. 1092) states that PPM "involves identifying, prioritising, authorising, managing and controlling the component projects and programs and the associated risks, resources". This view is an appropriate summary of the more fragmented views of the previous authors and presents a succinct view of PPM.

The earliest references to the word 'portfolio' in project management literature refer to the project selection process, entailing the selection of the correct portfolio of projects (Archer & Ghasemzadeh, 1999, pp. 207-216). Although neither of the authors referred to 'project portfolio management' or 'project portfolio selection' in their discussion of this topic, Badiru and Pulat (1995, pp. 397-424) and Shtub, Bard and Globerson (1994, pp. 45-162) emphasised the importance of project selection and described various project selection techniques.

The term 'portfolio management' was used by Pennypacker and Cabanis-Brewin (2003, pp. 1-3), who regarded such management as a strategic level intervention focussed on project selection and resourcing, in essence, determining the best value opportunity for the organisation's collective efforts. Strategic management theory indeed provides an interesting lens to look at PPM and its potential to assist organisations in gaining competitive advantage. The RBV posits that, in order for an organisation's resources to solidify its competitive advantage, it need to be valuable, rare, inimitable, non-substitutable and involve organisational focus and support (Killen et al., 2012, p. 526). This is ultimately true for the collective of projects (the portfolio), since it is intended to contribute towards strategic intent, or 'the best value opportunity' in the words of Pennypacker and Cabanis-Brewin (2003, p. 2).

The PPM definition of Koh and Crawford (2012, p. 33) provides additional aspects to consider. They defined PPM as "the coordinated management of portfolio components to achieve specific organisational objectives. It is a technique for optimising the organisational returns from project investments by improving the alignment of projects with strategy and ensuring resource sufficiency. It aims to optimise the outcomes from project investment across a portfolio, and it is also regarded as the governance method for selection and prioritisation of projects or programs". This definition by Koh and Crawford (2012) is very important as it mentions the crucial link between project portfolios and the strategic intent of an organisation.

PPM is evidently not only about the efficient execution of the portfolio of projects, as argued by the earlier definitions, as PPM also encapsulates the value gained from the entire portfolio. In the context of IT projects, there is indeed an emphasis on the allocation of resources within the project (efficiency), but also an emphasis on alignment with strategic intent (effectiveness). The strategic challenge to analyse the external environment and increase the advantages over competitors include prioritising the necessary IT projects.

Research has indicated that concentrating on the internal environment only, is inimical to a successful PPM strategy; rather like focussing on the RBV at the expensive of the MBV in strategic management. Balancing the intra-project value (efficiency) with the project to strategy view (effectiveness) is crucial to understanding the entire PPM value contribution. Biedenbach and Muller (2012, pp. 621-635) argued that PPM is instrumental to understanding and seizing external information to mould decisions and actions, thereby adjusting the portfolio of projects managed to the current external context.

In a fast-paced business environment, organisations need to be more prudent in their investment decisions. One of the challenges of the fast-moving environment is that product life cycles shorten and services becoming obsolete, very fast. Rajegopal (2013, p. 69) explained that project portfolio management enables executives to answer strategic alignment questions in this dynamic environment that individual projects cannot answer.

Beringer, Jonas and Kock (2013, p. 832) structured the scope of project portfolio management into three recursive phases: (i) portfolio structuring; (ii) resource management; and (iii) portfolio steering. Jonas (2010, p. 820) called these phases the 'managerial tasks' of PPM and added a fourth, (iv) organisational learning. In brief these phases are tasks are defined as follows:

i) **Portfolio structuring**: The activities that determine how a company translates the needs identified in its business strategy to a targeted portfolio of projects that align with strategic intent.
ii) **Resource management**: As projects compete for scarce resources, effective and efficient resource management aligned with the dynamically changing strategic plan is required.
iii) **Portfolio steering**: This provides governance by constantly assessing the health of the portfolio of projects as well as the alignment of the entire portfolio to the organisational strategy.
iv) **Organisational learning**: Formalising lessons learned from past projects to avoid mistakes in future projects, and importantly, defining processes to ensure the knowledge is used and establishing a culture of experienced learning and improvement.

The widely-used PMI (20013b) PMBOK concurs with the more comprehensive view on PPM although it is still called portfolio management. According to PMI, portfolio management helps organisations to meet their strategic goals despite the challenges of resource limitations. Alignment with organisational strategy, viability of the proposed projects, value to other organisational endeavours, risk management, and availability of competent resources form part of the validations necessary before considering new portfolio components (PMI, 2013b, pp. 21-22).

A final aspect that emerges in the recent PPM discourse is the challenge for legitimacy due to a combination of different decision-making approaches that is required to achieve flexibility. Gutiérrez and Magnusson (2014, p. 30) argued that making decisions using only by rational and formal approaches, might lead to a deficient balance between different types of ideas and projects, and this may lead to opportunities being missed. They established that rational and formal decision-making processes are experienced as more legitimate than informal and non-rational ones. Decision makers deal with legitimacy by certain mechanisms that allow them to bypass highly-accepted approaches and legitimising decisions made by low-accepted ones. This presents a problem of fit-for-purpose versus legitimacy in applying PPM practices. Daniel, Ward and Franken (2014, p. 96) agreed and warned against managers who may emphasise decisions that are defendable as rational and formal, at the expense of the complete set of actions required to execute PPM properly.

Martinsuo (2013, p. 799), for example, elaborated on the importance of “intuition, negotiation and even bargaining”. She believes that these less formal and defendable attributes of decision-making are not present in in the frameworks built upon rational project portfolio decision-making. Martinsuo (2013, p. 799) argued that it is evident that some topics are “not yet being investigated sufficiently in association with project portfolio management. When extracting PPM practices from the literature care should be taken to not miss important practices that may seem less formal.” In the extraction of practices in Chapter 5 this warning of Martinsuo (2013) was heeded and some practices described in the chapter emerged as code families during the coding process that had not been elevated to practice level in the literature.

2.5.4 PPM from selection to continuous processes

Portfolio theory, the most likely root of the term ‘project portfolio management’, consists of three core elements, namely: (i) preferences (i.e. priorities), (ii) portfolio analysis, and (iii) portfolio selection. If PPM is to remain true to its most plausible root, portfolio management, it entails much more than mere project selection (Patanakul, 2015, p. 1085).

PPM is also about the setting of project priorities and a continuous analysis of the portfolio of projects to determine priorities that assist organisations when assigning limited resources to projects. PPM may be defined as the selection and monitoring of, and active intervention in project and programme objectives, for both related and unrelated projects, aimed at establishing project priorities and ensuring alignment of project objectives with the organisation’s strategic intent.

Early portfolio project management research mainly focussed on choosing the optimal number of projects with mathematical models (Blichfeldt & Eskerod, 2008, p. 358). Most of the early research studies were based on the concept of financial portfolios, but did not focus on balancing risks for greater returns regarding investment decisions (Young & Conboy, 2013, p. 1096). There was a low appetite for dealing with the measured success of portfolio selection to ensure the returns were consistent with the risk level; a principle inherent with portfolio theory.

PPM research studies then moved on to the development of tools and techniques different from individual project management to enable the scientific selection of projects. These tools typically provided mechanisms to rank projects and improve resource allocations considering project priorities and various constraints in the organisation (Petit, 2012, p. 540).

More recent research started to focus on the dynamic nature of project portfolios (Pajares & López, 2014, p. 650). Researchers argued that organisations need to constantly monitor and control the entire project portfolio (Pajares & López, 2014, p. 648). The work of Petit (2012, p. 552) has been instrumental in understanding how uncertainties affect a portfolio in dynamic environments, making it important for an organisation to consistently monitor their portfolio.

With PPM maturing over the last two decades as a management discipline, the emphasis clearly moved from managing individual projects towards managing the project portfolio. This ability to still individually manage a project to success, whilst working together in a portfolio, to achieve the objectives of the portfolio, dubbed portfolio management efficiency by Martinsuo and Lehtonen (2007, pp. 56-57), remains important.

The academic discourse about portfolio balance (Voss & Kock, 2013, pp. 847-861) and portfolio efficiency (Pajares & Lopez, 2014, p. 646) in PPM has many similarities with the IT value debate. Organisations also strive for a balance in IT investments that will yield sufficient future value, yet do not expose them to unnecessary risk. Ultimately, this value desire requires of the organisation to be efficient in using the IT assets to gain sufficient value from their investments. IT and project management may be different domains using different terminology, but they are certainly experiencing similar challenges.

Organisations that have matured in their single project management activities are poised to exploit the strategic importance of portfolio management (Teller, Unger, Kock & Gemünden, 2012, p. 599). When organisations use standardised tools and processes in running single projects, they have a higher success rate, which also contributes to the overall project portfolio management success (Teller et al., 2012, p. 599). The literature is clear (Heising, 2012, p. 583; Killen & Hunt, 2013, p. 136) that the strategic alignment, introduced by project portfolio management, is more successful and ultimately valuable when an organisation has a high degree of project management maturity.

Maturity in project management capabilities is thus an important pre-requisite for successful portfolio management. If an organisation is still struggling to execute individual projects in an effective and efficient manner; the benefit intrinsic to PPM might not be realisable. It thus becomes important for organisations to strive for higher levels of project management maturity in order to achieve the maximum return on the introduction of PPM.

Project portfolio success is determined by a combination of the “average project success”, i.e. an aggregated view in the individualised success of all projects, and the interdependence between projects (Beringer, Jonas & Gemünden, 2012, p. 17). Individual project success does no longer guarantee achievement of strategic intent; it is the combined outcomes of all relevant projects that ensure the effectiveness of the portfolio.

2.5.5 Benefits of project portfolio management

Appropriate implementation of PPM leads to strategic value and ROI for organisations that select the projects in their portfolio in a systemic process devoid of emotional decision-making (Gutiérrez & Magnusson, 2014, p. 31). Importantly, organisations also gain benefit by terminating poorly-performing projects sooner than organisations not measuring the value contribution of projects to their strategic intents (Rajegopal, 2013, p. 71).

A common benefit from PPM cited in the literature is the ability to avoid "a large number of small, low-impact projects, low project prioritisation, a high level of project failures, too many projects for the available resources and the inability to reject them" (Sanchez, Robert & Pellerin, 2008, pp. 98-99). This is not uncommon of the modern enterprise where multiple small and fragmented IT investments could tie up organisational resources. Weeger and Ulrich (2016) proposed using activity theory to deal with the complexity of multiple IT initiatives in a dynamic environment.

PPM also provides visibility to all project stakeholders and hence enables organisations to make well-informed decisions taking cognisance of all the important measures when reviewing projects. When all stakeholders have the same level of visibility on the entire project portfolio, informed decisions can be made about projects that contribute to the company's competitive advantage, or not, irrespective of project size. According to Rajegopal (2013, p. 71), PPM provides a centralised and standardised view for all projects in a portfolio, including the individual project performances and the benefit realisation process. PPM also reduces the risk associated with the execution of individual projects, but especially the entire portfolio of interdependent projects, since there is a systemic "analysis of dependencies, better resource allocation based on priorities and a pre-selection investigation of financial and strategic returns for the organisation" (Rajegopal, 2013, p. 71).

PPM helps organisations to improve cost optimisations during the project life cycle through cost tracking and visualisation, as well as trend identification across projects in the portfolio. The PMI (2013a, p. 36) defined the project life cycle as a sequence of stages that a project passes through from its initiation to its closure. The insights gained from historic project metrics, for the entire life cycle, assist to predict performance in new projects showing early indications of following the same trends. In line with the basic premise of portfolio theory, entities "can balance their portfolio with regards to cost and benefits across the most strategic but high-risk projects" (Moore, 2010, p. 55). Moore (2010, p. 56) is also of the opinion that the agility gained by having complete portfolio insights allows organisations an ability to swiftly re-prioritise resources based on new information and strategic priorities.

Unger, Kock, Gemünden and Jonas (2012, p. 675) stressed the importance of terminating projects that no longer conform to corporate strategy in order to ensure strategic fit. According to their research, rigorous culling of bad and troubled projects affects portfolio effectiveness. They introduced the concept of project termination quality and through a quantitative longitudinal study of a sample of project portfolios, proved that termination quality positively affects strategic fit. The decision to initiate or terminate projects is thus based on hard facts and not emotions or political influence (Unger, Kock et al., 2012, p. 675).

Portfolio value maximisation is clearly a complex endeavour that includes both financial and non-financial metrics as well as adding and terminating projects on a continuous basis. Martinsuo and Lehtonen (2007, p. 57) posited that organisations are no longer solely seeking financial returns but are also seeking strategic returns from projects in a portfolio. According to Biedenbach and Muller (2012, p. 623), PPM performance is measured “through six metrics, which concern balance of resources, value, time-orientation, and reaching time goals, business strategy alignment, and spending linked to business strategy. Based on their results, top portfolio performance is achieved by organisations that apply more formal approaches to portfolio management with well-defined procedures, utilisation for all projects, and management trust”.

Traditionally resource planning and scheduling have been handled separately, for each project, and within a project. However, there is a clear need to integrate the activities and also across different projects as highly-skilled resources must not only be allocated to projects, but final scheduling need to interact to ensure a practical allocation of the resources for execution (Laslo, 2010, p. 610). When organisations have an organisation-wide view of the available pool of resources, it becomes easier to centrally manage the resource allocations including the prioritisation of the particular project. Formal resource allocation processes increase the speed of resource allocation, reduce the conflicts typical from subjective process and improve the reliability of the commitments (Teller et al., 2012, p. 603). All stakeholders would have more faith in the allocation of scarce resources and their scheduling when there is visibility and uniformity in the process.

Early PPM researchers failed to consider the roles of customers as main actors in the project execution processes. The work of Voss (2012, p. 568) combined the field of marketing and PPM for the first time when he developed a framework for integrating customers in the PPM process. This is important for value co-creation and has a positive effect on PPM success. Beringer et al. (2012, p. 19) extended the customer value to a broader set of project portfolio stakeholders influenced by and having an influence on the project portfolio. However, “project portfolios and their management are dynamic. During an organisation's life cycle, the importance of stakeholders varies at different stages because of their varying potential of contribution and behaviour” (Beringer et al., 2013, p. 835) and thus managing stakeholders for the benefit of the portfolio also becomes a dynamic process.

PPM helps organisations to remain competitive by providing the appropriate techniques to ensure that organisations select the correct projects when introducing new products and services (Biedenbach & Muller, 2012). Gutiérrez and Magnusson (2014, pp. 30-39) shared the same view regarding PPM’s ability to ensure a continuous and relevant portfolio of active projects, effectively arguing that an organisation could only remain relevant if the development projects of today, result in products tomorrow. Killen et al. (2012, p. 525) believe organisations with high levels of PPM capabilities are not easy to imitate since they possess unique organisational capabilities that engender competitive advantage.

Measuring benefit beyond financial gains from project portfolio management is important, but challenging. Martinsuo and Killen (2014) agreed that PPM value should be measured beyond financial measures, however, they argued that financial measures are the easiest to measure and thus often the measures reported. Voss (2012, p. 577) defined some of these non-financial measures, such as competence, market leadership and social rewards, as part of a broader view of business benefits. A key challenge is that these benefits cannot always be uniquely attributed to a particular project, or set of projects, since there are multiple aspects that could lead to these less-tangible benefits.

Perry and Hatcher (2008, p. 1) described research conducted in organisations where PPM was deemed to be successfully implemented. The combined value-add reported from these cases can be seen in Table 2.14. They claim a payback period for the PPM implementation at the companies of merely 7.4 months and a total annual benefit of US$83 500 per 100 users, thus presenting clear evidence of the value to be gained from PPM (Perry & Hatcher, 2008).

Table 2.14 is an example of the highly-credible arguments about the return on PPM efforts since it is measurable. However, the research from Perry and Hatcher (2008) provides no indication of ‘other value’ that may have been gained highlighting the arguments from preceding authors about the challenge to define the entire value created.

Table 2.14 Case study reported PPM value-add

Number	PPM value-add	Impact
1	Number of projects managed	Increased by 35%
2	Cost per project	Reduced by 37%
3	Redundant projects	Reduced by 78%
4	IT staff productivity	Increased by 14%
5	Project failure rate	Reduced by 59%

Sources: Perry and Hatcher (2008, p. 1).

A final important benefit to be gained from formalised PPM is managing the risk across the portfolio of projects. The basis for portfolio theory remains dealing with the entire portfolio’s risk profile based on the impact of individual components. Petit (2012) identified the risk inherent in the execution of the collective of projects as one of the components that must be aligned to strategic intent to ensure optimal benefits from the project portfolio. Sanchez et al. (2008) agreed that collective risk management contributes to strategic alignment and portfolio balancing. According to Sanchez et al. (2008), project risk management involves identifying and managing the risks and opportunities that influence, positively or negatively, the realisation of a portfolio’s strategic objective (Sanchez et al., 2008).

2.5.6 Project portfolio management tools and techniques

Early PPM literature focussed mainly on the development of tools and techniques and not necessarily on the implementation in practice. The focus on tools and techniques can lead to a lack of appreciation of the extent to which organisations are using PPM as a management practice and the real learnings from it. More recent research undertakings have targeted understanding of the practical aspects of PPM in companies (Blichfeldt & Eskerod, 2008, p. 358) and addressed the "lack of awareness of practice, i.e. what managers actually do, and context, i.e. what are the unique conditions in which the project portfolio is being managed" (Martinsuo, 2013, p. 794). Chapter 5 contains this collective of what managers actually do; the PPM practices.

Initially PPM was very much seen as a specific technique for new product development. The early project selection method used was highly quantitative, often with the aid of constrained optimisation to devise optional resource allocation models (Cooper, Edgett & Kleinschmidt, 1997a, p. 18). The use of mathematical models, although having the benefits of being more scientifically rigorous when compared with some of the less rational selection criteria that was prevalent, posed the challenge of a very narrow and rigid way of selection, since some important project justification variables cannot have mathematical representations. The early academic work in PPM mostly focussed on presenting it as a rational decision-making framework (Gutiérrez & Magnusson, 2014, p. 31).

The work of Gutiérrez and Magnusson (2014, pp. 30-39) as well as Killen and Hunt (2013, p. 140) challenged that view as overly simplified. They argue that project portfolio decision-making should consider the project type amongst multiple other variables, and not make use of a fixed set of criteria that are universal for all projects. They also posited that alternative non-rational decision-making should be combined with some of the rational decision-making processes embedded in the early days of PPM. One complication is that information that leads to astute decision-making is not necessarily available from project conceptualisation and more facts, and context for decision-making, will emerge during the project life cycle. Whilst multiple techniques are mostly from rational decision-making, like a ROI, a combination with non-rational more qualitative decision-making criteria can help with effective project selections (Killen & Hunt, 2013, p. 140).

Practitioner literature also stresses the importance of project selection, and in particular, the practical challenge of project termination. Campbell and Park (2004, p. 28) noted that "managers select one or two promising candidates and commit to them heavily". This escalation of commitment, leading to unwavering support for failing projects was also argued by Koller, Lovallo and Williams (2019, p. 3) that they "linger because of emotional or legacy attachments that executives have toward specific projects or parts of the business. Rather than pull back when there are signs of significant financial or operational weakness, individuals and teams are inclined to escalate their commitment to losing courses of action". It seems that organisations could be committing to underperforming projects and a continual pruning process, like PPM, can help avoid significant losses.

It is clear from empirical work that decision-making is not only rational as rooted in PPM theory but there are other less-rational factors that should also be considered (Gutiérrez & Magnusson, 2014, p. 31). Combining a rational framework with non-rational factors in a formalised format presents a very interesting research angle according to Gutiérrez and Magnusson (2014), but one that has not yet been fully explored. However, Gutiérrez and Magnusson (2014:38) warned that organisations must be careful not to abuse non-rational decision-making, but rather try to be innovative and balanced with a flexible set of techniques that account for the full spectrum of criteria.

Many of the techniques associated with PPM have been embedded in software intended to assist organisations with the management of their project portfolios (Kostalova, Tetrevova & Svedik, 2015, p. 96). Recently these software applications have moved to Software as a Service (SaaS) with quick deployment and update cycles leading to a proliferation on PPM software utilisation, often using the SaaS model (Rajegopal, 2013). The use of PPM software has seen a market increase in the requirements of organisations that now want to see the "'integration of cost management and tracking to strategic drivers, value metrics, key performance indicators (KPI), and performance indicators (PI) either process or financial based are enabling organisations to tie projects and programs to the benefits reaped", in their deployed PPM applications (Rajegopal, 2013, p. 110).

As much as individual project risk management is important, it is increasingly relevant to perform risk management on the portfolio level because some risks are impactful only at a portfolio level (Martinsuo, 2013). Considering the overall risk in a portfolio and not the sum of the individual project risks will lower the failure of the project portfolio. There are also risks that are only evident when the interactions between projects are considered and these are important value drivers in PPM when dealing with risk at the portfolio and organisational and not project level. Sanchez et al. (2008) presented a project portfolio-risk opportunity identification framework, which is a breakthrough model in portfolio risk management.

2.5.7 Project portfolio management governance

Governance of PPM was not an initial focus for researchers as many believed single project governance was suitable for the entire portfolio. A number of researchers merely extended project governance to portfolio governance using the same tools and techniques (Mosavi, 2013, p. 389).

Mosavi (2013, p. 390) believes the tendency to extend project/programme governance to project portfolio governance notwithstanding the considerable differences in project, programme and portfolio management, is ill advised. According to Koh and Crawford (2012), the application of portfolio management techniques within established organisational governance contexts, provided a higher degree of certainty that projects are aligned with strategic intent. This alignment between organisational and project portfolio governance is highly dependent on executive buy-in since only top management are typically able to express a well-informed opinion on alignment with strategic intent.

Mosavi (2013, p. 389) believes that academic research in project portfolio governance is extremely limited and that most of the guidelines are provided by the international project management organisations like PMI and APM. Recent undertakings by academic researchers to evolve practices for project portfolio management are important and more will be needed as the academic community seeks to reach common understanding about PPM.

Young and Conboy (2013, p. 1096) contended that the practices involved in PPM are not as properly elucidated in the available academic literature as in the commercial standards. To complicate matters even further, Young and Conboy (2013, p. 1097) believe that, since project portfolios are highly diverse, a single PPM governance framework cannot be used in every instance. They suggested that each project portfolio should adapt existing frameworks to suit the specific needs.

Too and Weaver (2014, p. 1382) maintained that PPM governance is not PPM management and the importance of separating these functions. This is well understood as a fundamental principle of governance; however, no governance system can operate without effective support of the management system. The role of management is to make decisions within the guidelines set by governance.

According to Unger, Kock et al. (2012, p. 608), organisations mostly discharge their PPM governance duties through project portfolio management offices (PPMO) and their research showed “a significant positive effect of PPMOs' coordinating and controlling roles on performance in terms of project portfolio management quality, which is a predictor of portfolio success”.

2.5.8 Project portfolio management challenges and limitations

Whilst PPM is becoming a very important management area that is crucial for organised and proactive management in a multi-project environment (Beringer et al., 2012), there are still many challenges facing organisations in the implementation of PPM as a tool to forge competitive advantage. Some of the early challenges include a disconnect from organisational strategies during the process of project selection as well as an ineffectual stage gate process that allows authorisation of projects without diligent scrutiny according to defined selection criteria (Cooper, Edgett & Kleinschmidt, 1997b, p. 45).

Another challenge is organisations excluding smaller projects from the project portfolio selection criteria, although they may be important in the portfolio context. Blichfeldt and Eskerod (2008) mentioned that these smaller projects could be a source of portfolio management failures as the projects utilise the time and resources that should contribute to the important portfolio of projects, or influence important outcomes that may be necessary for the success of other projects (Killen & Hunt, 2013, p. 140).

A perceived shortcoming of PPM as a management discipline is that it has not explored established management theories (Killen et al., 2012, pp. 525-526). Current PPM practices utilise practitioner tools and techniques, developed by industry bodies like PMI and APM, and this could be a disadvantage as some relevant management theories could lend more credence and insights to the discipline. An example of this is the work of Beringer et al. (2013, pp. 830-846) that explored the lack of influence of stakeholder theory on PPM. Beringer et al. (2013, p. 831) further defined a project portfolio stakeholder as “any group or individual in a relationship with a project portfolio such that the group or individual can affect or be affected by the achievement of a portfolio’s objective”. Organisations that practice some of the foundational principles of stakeholder theory have better chances at portfolio success, in their opinion.

Killen et al. (2012) also linked various strategic management theories, like RBV, with PPM and believe that PPM could benefit from moving its base beyond the realm of project management in order to develop the academic rigour of the research, and ultimately, its application.

A significant challenge with project portfolio selection is the ‘competition’ among projects that are at different stages in their life cycles. Whilst some projects are in the conceptualisation or justification stages, others within the portfolio are in execution of even closing stages. It is rather difficult to have a framework that assesses projects in different stages, taking them into consideration in a consistent and transparent manner when they have different value propositions and are at stages that should not really be compared with each other (Cooper et al., 1997b).

The complexity in the implementation of PPM is evidenced in its dependence on future and uncertain information that must be updated as the situation becomes clearer (Cooper et al., 1997a, p. 17). Although this is true for normal projects in isolation as well, in this instance, the uncertainly is amplified due to the interdependency between the different elements in the portfolio. This complexity nullifies the simplistic view of PPM as a decision-making and resource allocation exercise (Cooper et al., 1997a, p. 17). Given the complexity of BITA introduced earlier, these arguments support the research proposition of PPM practices supporting BITA given that it is also significantly more than selecting the correct IT initiatives and providing resources for execution.

Cooper et al. (1997a, p. 18) also commented on the challenge for organisations to have a balance in managing the scarce resources available for all projects within the portfolio. A smooth transfer of resources amongst projects as priorities changes may not always be as simple as envisaged, since there may be organisational complexities beyond the control of the project portfolio manager.

2.5.9 Project management and strategy

Just more than two decades ago Cooper et al. (1997a) contended that many organisations have not linked their strategic plans to their project selection and prioritisation. This lack of synergy between business strategy and project selection results in wastage as companies realise later that they have funded new products that will not be relevant in future. He also found that poorly-performing or poorly-aligned projects are not terminated effectively in most organisations as the projects that start, would normally finish even when it is obvious that they are not contributing positively to organisational strategy (Cooper et al., 1997a, p. 18). The key challenge is to have gating processes that are factual and unemotional and would be strictly about meeting the strategic needs of the organisation. When the gating process is effective, organisations will only start projects that will contribute to their competitive advantage and easily terminate projects that are not relevant to the portfolio (Cooper et al., 1997a, p. 18).

Although this could have been the case 20 years ago, the field of PPM has matured tremendously, and literature contains multiple example of the opposite of Cooper's outdated arguments. Today the terms 'strategic fit' feature strongly in the literature and it references the alignment of project outcomes and allocation of organisational resources according to the strategic importance thereof (Beringer et al., 2012, p. 18). In fact, PPM has become an important component of implementing strategic intent and has an important influence on the future competitive position of organisations in the opinion of Gutiérrez and Magnusson (2014, p. 30). Gutiérrez and Magnusson (2014, p. 31) described PPM as decision-making processes to ensure that a selected group of projects contribute to the execution of the organisation's business strategy.

Labrosse (2010) highlighted the importance of finding the appropriate mix of projects that will help the organisation achieve its overall strategic goals whilst finding, as far as possible, the optimum allocation of the organisation's finite resources. Datz (2003, pp. 56-68) also provided examples where PPM saved companies substantial operating costs due to better controls and alignment among projects.

Importantly, literature now also recognises that PPM is not a static process but dynamic (Killen & Hunt, 2010, p. 157; Pajares & López, 2014, p. 648). The recent literature is clear that PPM is a continuous process and requires regular attention to ensure the project portfolio remains in balance, within itself, and also remains aligned with the organisation's strategic objectives (Young & Conboy, 2013, p. 1092). Voss (2012, p. 571) argued that PPM provides future preparedness for organisations and that appropriate PPM implementations assist to realise future value. Refer to Section 5.3.1 for an in-depth coverage of contemporary alignment literature inclusive of the notion of future orientation.

The future orientation is an important element of PPM in the context of this research given the desire of agility, yet potential 'over alignment' or 'rigid alignment' argued in Section 2.4.3. The principles of being future-fit apply equally to the BITA challenge and the project portfolio.

Nikolova (2016, pp. 36-37) argued that PPM combines "(i) organizational efforts to ensure compliance of selected components in the portfolio of strategic development of the organization; and (ii) efforts in the management of project-oriented activities to effectively achieve the results of the components in the portfolio – projects, programs and other investment activities in accordance with accepted earlier plans and budgets." The management of project portfolios is thus very closely related to the strategic management of the organisation.

Project portfolio management provides a continuous review of the balance and composition of the project portfolio, within the context of the changes in the strategy of the organisation. Figure 2.14 shows the common relationships between strategic, tactical and project portfolio management processes within an organisation, according to Nikolova (2016).

Figure 2.14 indicates that the management of project portfolios is closely related to the strategic management of the organisation and should assist in driving the execution of strategy via projects, operating in conjunction with the normal activities of the organisation (Nikolova, 2016, pp. 37-38).

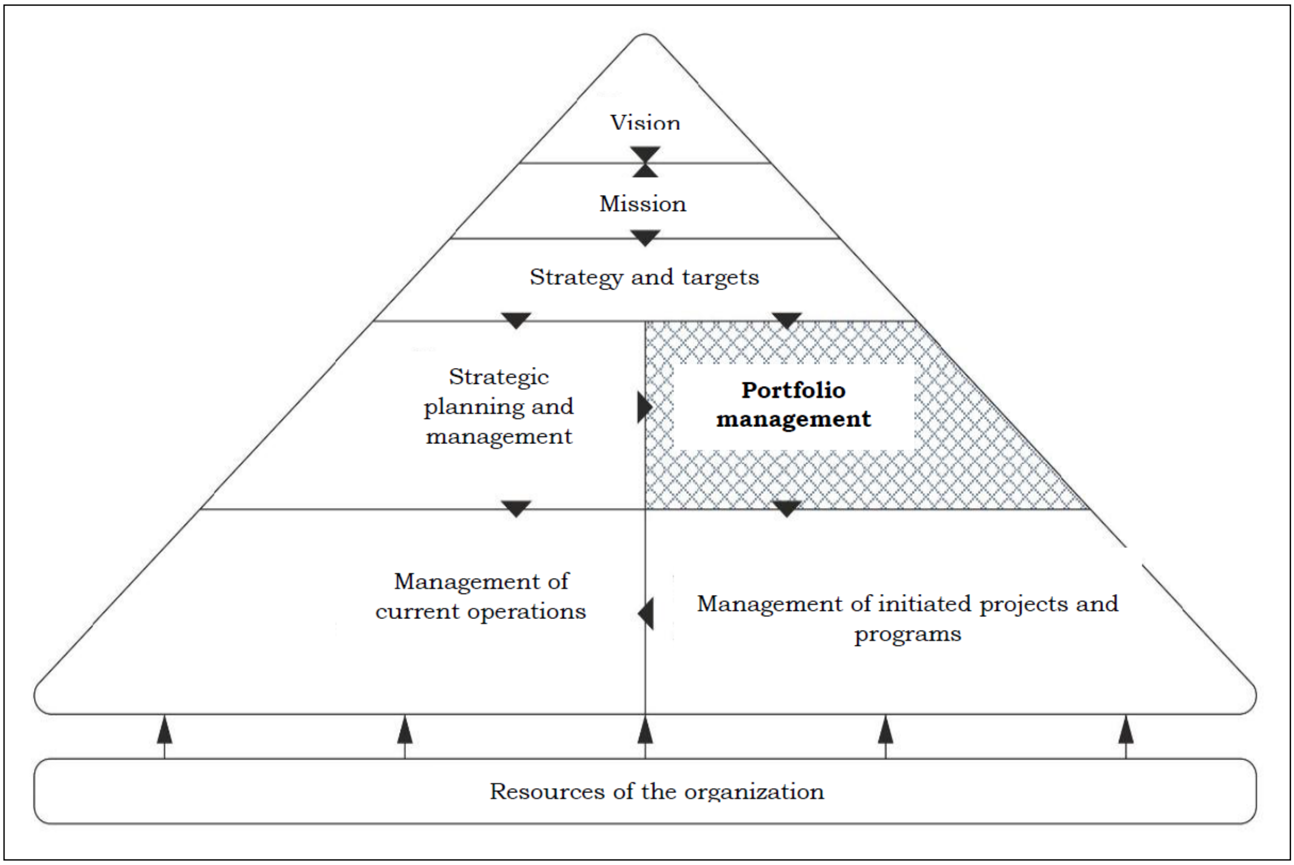

Figure 2.14: Project portfolio management links with strategic management

Source: Nikolova (2016, p. 37).

The link between PPM and organisation strategy is evident as is the challenges brought about by dealing with a dynamic portfolio striving for alignment with changing strategic imperatives. This challenge is not different from achieving BITA, a continuous process of adding and retiring IT assets to align with a set of dynamic requirements from the organisation. The next section deals briefly with the strategic view that embraces the concept of continuous change; the dynamic capabilities view.

2.5.10 Dynamic capabilities view

The dynamic capabilities view (DCV) is a theoretical lens focussing on the internal resources, processes, and competences that enable an organisation to keep pace in dynamic industries and is rooted in the resource-based view (RBV) of the firm (Daniel et al., 2014, p. 97). The RBV suggests that sustained competitive advantage can be realised by exploiting resources that are rare, valuable, inimitable and non-substitutable (Singh, Mathiassen, Stachura & Astapova, 2011, p. 164).

The RBV has been criticised in part for the assumption that such resources simply exist, with little thought to how they are acquired or developed. In response to this criticism, the DCV was formally articulated by Teece et al. (1997, pp. 509-533) to help explain how firms build competitive advantage during periods of rapid change. "Dynamic capabilities are the firm's ability to integrate, build, and reconfigure internal and external competences to adapt to rapidly-changing environments" (Teece et al., 1997, p. 516).

The term 'dynamic' refers to the firm's ability to renew their competences to adapt to changing environments. 'Dynamic capabilities' refer to the firm's ability to adapt, integrate and reconfigure internal and external organisational skills, resources, and competences to adapt to changing environments. A seminal DCV paper from Eisenhardt and Martin (2000, p. 1105-1121) defined dynamic capabilities as processes embedded within firms that are specific and strategic. These processes, that often exhibit commonalities across organisations, are mostly known as 'best practices' (Eisenhardt & Martin, 2000, p. 1106). Eisenhardt and Martin (2000, p. 1107) defined dynamic capabilities as "the firm's processes that use resources, specifically the processes to integrate, reconfigure, gain and release resources, to match and even create market change". Dynamic capabilities are therefore the operational, tactical and strategic processes through which firms achieve new resource configurations as markets change as well as the products for these markets to develop the organisational ability to operate in this new configuration.

Depending upon the industry, dynamic capabilities can create value without necessarily creating competitive advantage. Capabilities may allow an organisation to integrate organisational structures, human resources, and planning processes to define and achieve strategic objectives (Reeves & Ford, 2004, p. 298), or to improve organisational performance without necessarily achieving profit. Resources and capabilities are distinct but related concepts; that is, the execution of capabilities usually requires certain resources, and in turn, the effective use of specific resources depends on certain capabilities (Daniel et al., 2014, p. 97). Hence to be effective, a dynamic capability is likely to be required to change both resources and related capabilities.

IT resources alone are unlikely to be sufficient to produce sustained competitive advantage (Carr, 2003, p. 24). IT resources may have a direct effect on firm performance, but are more likely to have a complementary and contingent effect, such as from the complementary use of IT and capabilities such as human resources competences (Trkman, 2010, p. 126). Consistent with the IT investment and IT use literature, process management and change management emerge from the dynamic capability literature as important complementary capabilities to IT investment and use. The value of new information systems should thus be measured at the activity and process level, where the prime effects are expected to be realised (Trkman, 2010, p. 126).

Therefore, investment in IT and deployment of IT systems need to be seen in the context of the RBV and DCV. The contribution of IT to the strategic intent is highly context dependent and also often requires complementary resources (such as human capacity development) and processes (such as change management) to provide the intended value. The additional processes and resources, unfortunately, lead to more complexity in the IT deployment in organisations and in achieving BITA. Although BITA authors acknowledge the complexity, they at times, fail to recognise the dynamic nature of this complexity, which is the contribution made by this research.

2.6 SYSTEM DYNAMICS AND CAUSAL LOOP DIAGRAMS

This section deals with the methods used to create the diagrams presenting the data gathered for the research. Although the emphasis is moving towards research methods, discussed in detail in Chapter 3, it is necessary to conclude the literature review by acknowledging the importance of dynamic complexity as presented in the previous sections and the ability of system dynamics to deal with this complexity. As indicated in Figure 2.15, this section deals with system dynamics and CLD modelling.

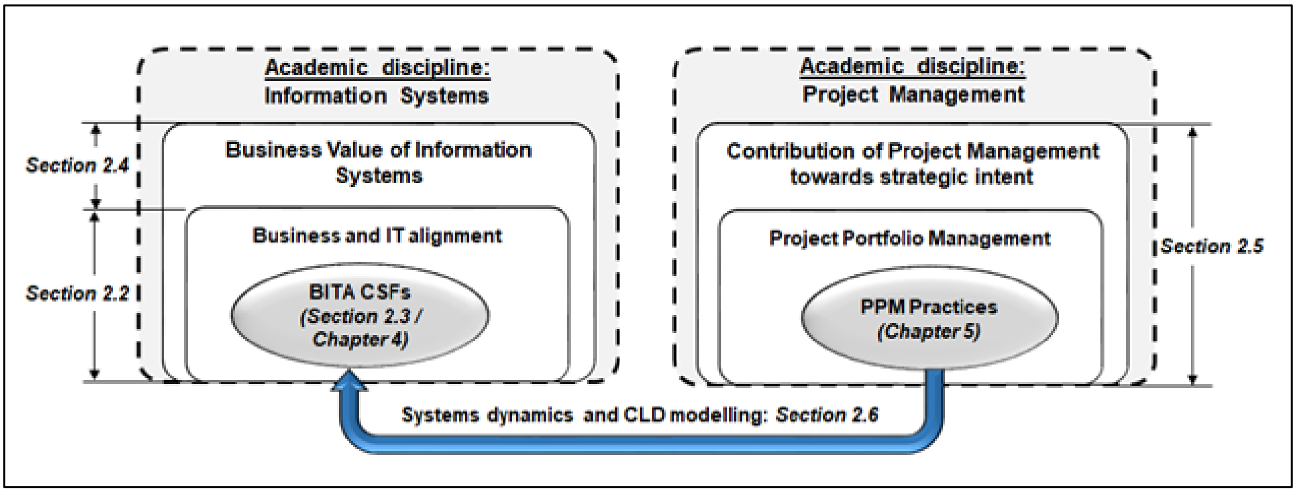

Figure 2.15: Structure of the literature review: System dynamics and CLDs

Prior to presenting key concepts from system dynamics (Section 2.6.2) and explaining the construction, value and limitations of CLDs (Section 2.6.3), it is necessary to acknowledge the concept of dynamic complexity extensively used in this research. It has been argued in both this and the previous chapter that BITA is a complex, and probably at times messy concept, but this is best understood by understanding dynamic complexity (Section 2.6.1).

Section 2.6.4 presents the background on constructing CLDs as well as the basic structure present in CLDs before Section 2.6.5 details the concept of archetypes. Section 2.6.6 covers the limitations of CLDs.

The final section (2.6.7) deals with the prior use of CLDs in IT research. Although the method is novel, it is not unique and through analysing its prior use, insights can be gained on the appropriate use for this research.

2.6.1 Dynamic complexity

Modern businesses comprise a multi-faceted mixture of business processes supported by an infrastructure, often including significant investments in IT. The infrastructure and processes are mostly designed in a careful and systematic manner where complexity is increased as a result of the continuous change in the patterns of service and interdependencies among components El Ata & Perks, 2014, p. 13).

In a perfect world, when processes become embedded in organisations, the efficiency of the entire business system will increase; and the cost of a unit of production or service will decrease as fixed costs are diluted. However, there are some hidden effects negating the expected increase in efficiency over time. For example, in instances where the original design of the system with its known characteristics and formal documentation has changed from inception. Although the changes might be known and their individual effects may be understood, their combined effects on the entire system may not be known and thus realised (El Ata & Perks, 2014, p. 14).

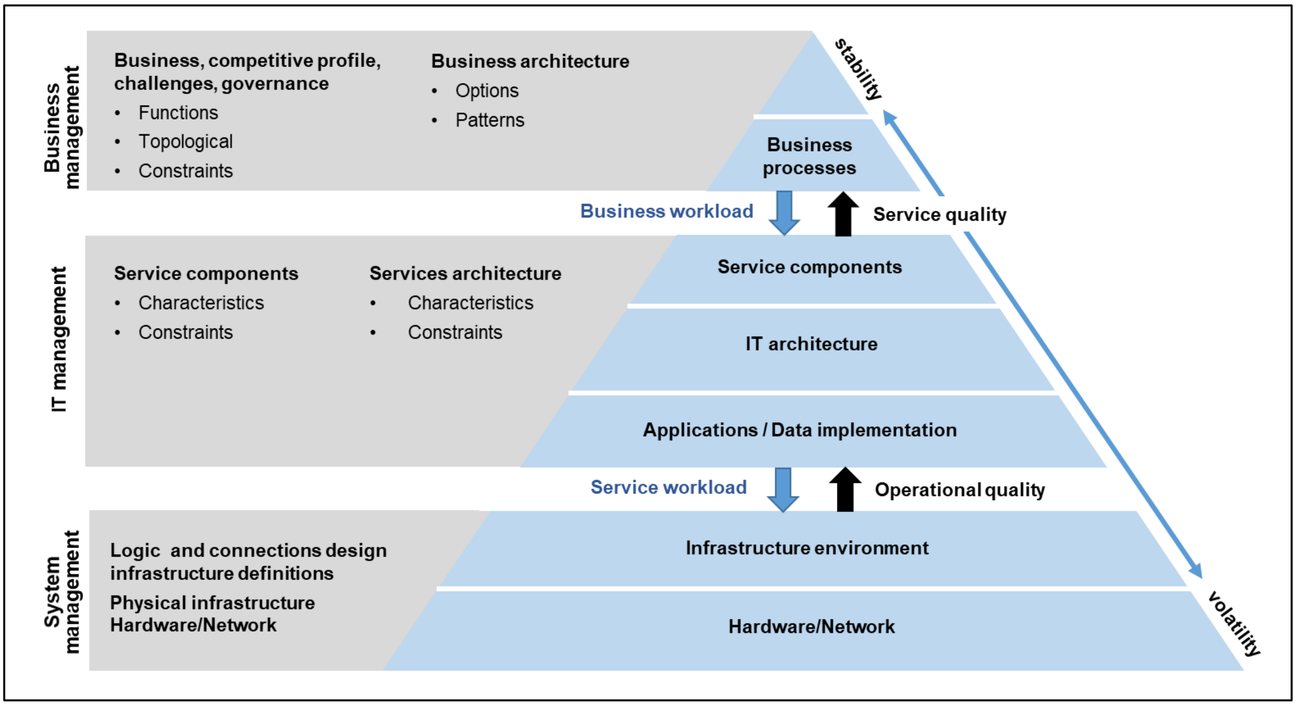

Figure 2.16: Business, IT and Service Architecture

Source: El Ata and Perks (2014, p. 16).

If a business is represented as a three-layer structure as indicated in Figure 2.16, it is not just changes in the interactions among the components of a given layer that needs to be considered; it is the interaction among the different layers that compounds risk and produces unexpected outcomes.

All interactions across the three layers must be understood because they represent the root cause of the complexity changes, the dynamic complexity. The combinations of interactions can produce millions of possible outcomes within a layer and among layers. More importantly, these interactions result in a change in the complexity of the system (El Ata & Perks, 2014, p. 15). The system has become more dynamically complex because some, or all, characteristics have changed. As a result, its behaviour has evolved, its costs are different, and its efficiency has changed in unexpected ways.

A key reason why this happens is an 'ageing' system in which the original infrastructure has changed over time to support evolving business requirements (El Ata & Perks, 2014, p. 16). El Ata and Perks (2014, p. 17) argued that the results of the changes "are an increase in the number of components and connections in the system due to ongoing management decisions". The nett increase in interactions among the components via the connections (business and IT) due to functional changes, maintenance changes and volume changes has an impact on the dynamic complexity of the system. In static systems, there should be efficiency gains in both the medium and long term. In real-life situations where ongoing changes in IT is a reality, this is not necessarily the case due to the dynamic nature of the system not allowing processes to be embedded and achieve higher levels of efficiency. In fact, if not carefully managed, the dynamic nature of IT and strategy could lead to the opposite; a continuous decrease in efficiency.

Complexity, as propagated within complexity theories, is about the emergence, dynamics, non-linearity and other behaviours present in systems of interrelated elements (Geraldi, Maylor & Williams, 2011, p. 968). All situations or systems share certain basic attributes or conditions, called boundaries, relationships and perspectives. Together, these conditions generate patterns of system-wide behaviour that are referred to as situational or system dynamics (Kurtz, & Snowden, 2003, p. 463; El Ata & Perks, 2014, p. 14). The following types of dynamics are present in systems (El Ata and Perks, 2014, p. 14):

- *Simple* dynamics are characterised by fixed, static and mechanistic patterns of behaviour, as well as linear, direct cause-and-effect relationships among system parts.
- *Complicated* systems have circular, interlocking and at times time-delayed relationships among elements, projects or organisations, leading to unexpected results through indirect feedback processes.
- *Complex* adaptive dynamics are characterised by large entangled webs of relationships, from which unpredicted outcomes emerge through the interactions of many parts or actors within and across levels.

According to El Ata and Perks (2014, p. 13), the dynamics of most modern businesses has become more complex than one person, or even a group of people can grasp. They argued that this makes it difficult to accurately assess the possible effect of important decisions. As a result, managers are often surprised when the results of their decisions produce unacceptable levels of risk or unintended consequences. In order to keep track of "these changing dynamics, businesses must be able to understand the hidden challenges of dynamic complexity" (El Ata & Perks, 2014, p. 14). However, the attributes for dynamic complexity are far less developed and specific than those for structural complexity (Brady & Davies, 2014, p. 21).

Due to the new business challenges that arise because of the "interdependencies between business's processes, services and infrastructure that have become overly complex and exist in a constant state of change", El Ata and Perks (2014, p. 13) refer to dynamic complexity as a "hidden time bomb". Effective decision-making and learning in a world of growing dynamic complexity requires an expansion of the boundaries of mental models and the development of tools to understand how the structure of complex systems creates their behaviour (Sterman, 2000). One such tool is the causal loop diagram (CLD), used in this research to model the dynamic complexity inherent in the management decision-making required for organisations to achieve BITA.

The purpose and value of CLDs lie in their presentation of a map of the system structure, including its connections with other systems, together with its feedbacks (Haraldsson, 2004, p. 20). With CLDs, feedback mechanisms and the effect thereof can be recognised in order to understand and investigate how a particular behaviour has revealed itself in a system, to enable the design of actions to work with, or counteract that behaviour. CLDs also provide an indication of how the system modelled is connected with other systems.

Senge (1997) recognised that there is dynamic complexity "when the same action has dramatically different effects in the short run and long run". According to Brady and Davies (2014, p. 24), dynamic complexity is brought about by changing relationships among components within a system and between the system and its environment over time. Geraldi et al. (2011, pp. 966-990) suggested that the concept of dynamic complexity addresses the unpredictable situations and emergent events that occur over time and which are associated with interactions among components of a system and between the system and its environment. Being 'dynamic' is a prevalent behaviour of complex systems.

Understanding project complexity is of interest to both practitioners and academics. For practitioners, there is a need to deal with complexity, to determine how an individual or organisation responds to complexity (Geraldi et al., 2011, p. 968). In the academy, research has focussed on two streams of work: "complexity in projects" and "complexity of projects" (Geraldi et al., 2011, p. 968). The first stream studies projects through the lenses of various complexity theories. The second stream is practitioner driven and aims to identify the characteristics of complex projects and how individuals and organisations respond to this complexity. According to Geraldi et al. (2011, p. 969), the non-linearity and dynamics within complex project systems motivate the need for tools and techniques to deal with project complexity. The *complexity of projects*, and IT projects in particular, no doubt contributes to the dynamic complexity of BITA.

While the literature on complex projects expresses a bias towards minimising and controlling dynamics, the literature on complexity theories in general embraces complexity as an opportunity to establish beneficial system changes. Chan (2001, p. 2), for example, argued that the advantage of a complex system is its adaptability and position far from equilibrium that would otherwise lead to inertia. Using a system dynamics approach to review PPM practices or BITA success factors would thus not limit the analysis through minimising and controlling, but rather embrace the complexity and the potential value inherent to the complexity.

IT literature stresses how increased dynamism in the environment necessitates that businesses are agile and can reconfigure their capabilities and resources rapidly (Daniel et al., 2014, p. 95). However, rapid reconfiguration in the face of dynamic complexity also requires sufficient governance to allow quick and effective decisions, within the governance structure, to ensure value delivery of the IT assets being deployed. System dynamics diagrams could be useful to understand the complexity and provide guidance on the required governance to gain value from the IT assets deployed.

CLDs describe the reality through influences between variables, not only how they form a dynamic circular influence, but also the structures and boundary conditions concerned. According to Haraldsson (2004, p. 21), managers need to observe the world via feedbacks rather than linearly. They need to observe and understand repeated patterns that may be used to predict and thus influence the behaviour of a system. The next section explores the use of CLDs to model the complexity.

2.6.2 System dynamics and causality

2.6.2.1 Context

According to Musango, Brent and Tshangela (2014, p. 746), system dynamics is “a well-established framework for describing, modelling, simulating and analysing dynamically ‘real-world’ complex issues”. This modelling typically involves problem identification and conceptualisation, before mapping the system investigated using qualitative tools such as CLDs and influence diagrams (Musango et al., 2014, p. 746). Before deciding on CLDs as an appropriate mechanism to document the relationship between PPM practices and BITA CSFs, it is necessary to explore the fitness for purpose of CLDs to map the dynamic complexity.

It is also not possible to use the word ‘causal’, or ‘causality’, without stepping into a philosophical minefield. Literature on methods often warns about claiming causality (which this research does not do; refer Section 2.6.2.3). However, causality is briefly discussed with a view on keeping the use of phrases such as ‘cause’, ‘link’ and ‘correlation’ clear and correct. Section 2.6.2.4 deals with causality not as the highly-complex concept grappled with by quantitative researchers, but rather as a principle that is intuitively applied by qualitative researchers – although they steer clear of the word and hence discourse about causality.

The primary reason for having to deal with causality is the method used to construct the relationship between PPM practices and BITA CSFs. The method chosen, causal loop diagrams (CLDs), is described in Section 2.6.3 and has its origins in the principles of influence and causality, making this careful entry into the convolution of casualty necessary.

2.6.2.2 System dynamics

According to Odiit, Mayoka, Rwashana and Ochara (2014), many existing methods of analysis do not have the capacity to analyse complex multi-factor interactions involving non-linear relationships and therefore have limited capacity to inform strategic alignment planning and implementation. They believe that the "complex nature of the organisation environment, and the need for continued monitoring and adjustment of alignment factors, has created a need for a shift from the traditional strategic alignment approaches oriented to understanding linear relationships among alignment factors, to those that can capture dynamic multi-factor interactions among alignment factors within the organisation environment" (Odiit et al., 2014, p. 38).The time is thus ripe to look at alternate methods to analyse the dynamic complexity that is BITA.

Systems thinking represents a holistic approach to analyse the manner in which a system's constituent parts interrelate and how systems work over time and within the context of larger systems (Sterman, 2000). It is an approach that typically yields insights into complex phenomena, not unlike the complex modern enterprise, and by implication, it struggles to align its future intensions with the ongoing investments in technology (Fang et al., 2018:1306). The systems thinking approach contrasts with traditional analysis, which studies systems by breaking them down into their separate elements. In socially constructed systems the traditional analysis would lose a major source of information contained within this interaction (Sterman, 2000).

Since the 1920s, multiple schools of thought have originated on systems thinking, a broad term that has grown to encapsulate a wide spectrum of concepts and instruments. Systems thinkers tend to look at reality from a level of abstraction, fit for the purpose of the systems being studied. There are many different approaches to systems thinking such as cybernetics, system dynamics, open systems theory, Soft Systems Methodology (SSM) and chaos theory (Vermaak, 2007, p. 176). Systems thinking can be thought of as a language to communicate complexities and interdependencies. The focus on interdependencies and the resultant visual language make systems thinking a very valuable framework for discussing and analysing complex issues like BITA. A central premise of system dynamics is that dynamic behaviour can be explained by model structure (Hayward & Boswell, 2014, p. 29), and hence the dynamic complexity of BITA can benefit from being modelled by techniques from SD.

System dynamics provides a method for "thinking about and simulating situations and organisations of all kinds and sizes by visualising how the elements fit together, interact and change over time" (Reynolds & Holwell, 2010, p. 25). System dynamics was developed by Forrester at MIT in 1956 (Lane, 2008), although Richardson (1986, p. 158) believes the field has intellectual origins reaching much further into the past. According to Forrester (1961), system dynamics is a form of simulation modelling which uses the concepts of information feedback and state variables to model social systems and explore the link between system structure and behaviour over time.

The structure of a diagram is the source of the modes of behaviour that the diagram demonstrates (see systems archetypes Section 2.6.5). Those modes are caused by shifts of dominance between different feedback loops, each of which involves non-linearities, delays and accumulation and draining processes. The aim of system dynamics modelling is to explain behaviour by providing a causal theory, and then to use that theory as the basis for designing interventions into the system structure which then change the resulting behaviour and improve performance (Lane, 2008, p. 3). System dynamics also has the ability to help managers and decision-makers better understand various dynamic behaviours and to make better decisions by testing different scenarios in multiple disciplines (Bureš, 2017, p. 3).

Brent, Musango, Smit, Pillay, Botha, Louw and Pretorius (2017, p. 657) found that system dynamics "has been used, or referred to, in the academic literature pertaining to the themes of environment, public policy and resources". However, their analysis of practitioner literature determined that the commercial utilisation of system dynamics is mainly focussed on strategic and tactical projects. They contended that current academic literature does not necessarily represent the industry requirements (Brent et al., 2017, p. 657). Despite the inherent value of these diagrams, there seem to be some disconnect between industry and practice in the use of system dynamics.

Despite limited use in industry, the practical value of system dynamics diagrams is immense (Vermaak, 2007, pp. 175-176). Charts, figures and diagrams can be effective in conveying both qualitative and quantitative information of a complex nature (Odiit et al., 2014, p. 38). A systems diagram is a powerful means of communication because it represents the essence of a system into a format that can be easily remembered, yet is rich in implications and insights. Many of the systems thinking tools, like causal loop diagrams, have a strong visual component. They help clarify complex issues by summarising, concisely and clearly, the key elements involved. It is therefore hardly surprising that within the field of system science, which emphasises interconnectedness, considerable use is made of the diagrammatic presentation of ideas. However, to date this use has been limited in the IT research area.

Although there is a range of diagramming approaches in use in system dynamics, two methods namely Causal Loops and Stocks and Flows are overwhelmingly accepted by the international system dynamics community (Lane, 2008, p. 8). These systems maps include feedback loops of the more formal system dynamics model, which provide a powerful and intuitive explanation of model behaviour in terms of its structure (Hayward & Boswell, 2014, p. 29).

Causal loop diagrams (CLDs) provide a broad representation of the feedback structure of a diagram to provide insight on the behaviour of the model parameters (Lane, 2008, p. 9). CLDs can help in tackling complex issues effectively and ultimately the method found its way into academic literature, although the robustness, if not value, has been questioned (Lane, 2008; Richardson, 1986; Vermaak, 2011).

Recent work by Fang et al. (2018, p. 1303) suggested using system dynamics as a “tool capable of capturing the reciprocal and temporal causal mechanisms that underlie many complex and dynamic systems” in IT research, for both theoretical development and practical application. This provides strong support for the use of CLDs to map PPM practices and their contribution towards BITA CSFs.

2.6.2.3 Causality and correlation

The word ‘causal’ in the causal loop diagram is necessary, since the diagrams are about cause and effect, but also unfortunate, due to the challenge in claiming causality in practice. Causality is a category of human reason, but deeply contentious and often difficult to argue (Tavory & Timmermans, 2014, p. 88). The 18th century philosopher, David Hume, contended that causality is invisible, but it is possible to detect the potential impact of causality as variations over a period of time. Upon these observations, a causal structure can thus then be imposed.

Although various definitions of causality exist in social sciences, qualitative researchers have generally been reluctant to engage in causal arguments. Causality, however, is ubiquitous though implicit in theory emphasising social processes. In fact, Tavory and Timmermans (2014, p. 101) stated that they “have rarely come across qualitative research that doesn’t implicitly make causal arguments, even when its authors carefully avoid the word”. According to these researchers, this reluctance stems from the logical standards of the quantitative domain that is imposed as necessary and sufficient conditions that need to be established experimentally. Causality is then more often than not present by argument in qualitative research, although absent by name.

Quantitative researchers often consider correlation, which indicates the extent to which two variables tend to increase or decrease in unison (Barrowman, 2014, p. 25). This forms the basis for many arguments and models that present findings on how a dependent variable that describes characteristics of the phenomenon being studied, changes in correlation to the change in an independent variable. Causation, however, differs from correlation. Correlation by itself does not imply causation (Barrowman, 2014, p. 25).

Even in complex social systems like a business, significant research (Chae et al., 2014, pp. 305-326; Mithas et al., 2012, pp. 205-224) has focussed on correlating the increase in IT investment with business performance. Although it is difficult to claim, and was not done by these authors, the underlying premise investigated is whether increased investment, leads to improved business performance. In certain instances, correlation is not sufficient for the proposition of the research. It may be required to go further than merely stating a correlation by probing for causality. In the quantitative world this is often done via experiments. Proving that a change in one variable indeed causes a second variable to change is indeed a step towards causality (Tavory & Timmermans, 2014, p. 101).

Causality is a genetic connection of phenomena through which one action (the cause) under certain conditions causes something else (the effect). The essence of causality is the generation and determination of one phenomenon by another. The connection between cause and effect takes place in time. The concepts of cause and effect are used both for defining simultaneous events, events that are contiguous in time, and events whose effects are sometimes divided by a time interval and connected by means of several intermediate links that may cause a delay in the effect (Barrowman, 2014, pp. 24-27). This by no means lessens the causality, in fact, in management literature, it is often argued that it is these kinds of delayed causes that lead to undesirable effects in social systems (Sherwood, 2011).

2.6.2.4 Proving causality

Multiple causality theories, like counterfactual, derivation, manipulation and probabilistic causation exist and the current discourse in philosophy journals is noted, but is beyond the scope of this research. However, a brief exploration of manipulability, proposed by theorists like Menzies and Price (1993, p. 189), is relevant to this research. Menzies and Price (1993) equated causality with manipulability by stating that, if A causes B only in the case that one can change A in order to change B, causality is implied. This coincides with common sense notions of causations, since researchers often ask causal questions in order to change some observed variable. In the context of this research, IT researchers have been investigating for five decades whether investments in IT cause improved business performance.

In the physical sciences, such as physics and chemistry, it is fairly easy to establish causality, because an appropriate experimental design can neutralise any potentially confounding variables. Sociology, at the other extreme, is exceptionally prone to confounding issues because individual humans and social groups vary significantly and are subjected to a wide range of external pressures and influences (Menzies & Price, 1993).

In social sciences, it is impossible to establish complete causality. However, all is not lost for the social researcher that needs to work with causality. According to Janes (2001, p. 192), there are three different elements to every causal argument. Each of these elements needs to be argued or proven persuasively, with appropriate evidence even if *complete causality* cannot be established like in the natural sciences:

- **Correlation**: causation could only exist if there is correlation. This correlation can be either positive or negative and can be linear, curvilinear or even more interesting (Janes, 2001, p. 192).
- **Time order**: to claim that A causes B, it is necessary to demonstrate that A precedes B. This could be a challenge in many social settings. The problem with not knowing the time order is that it could be a self-reinforcing cycle, which means that causality cannot be proven (Janes, 2001, p. 192).
- **Lack of rival explanations**: demonstrating that it is not a false correlation, that there was no other explanation for B changing other than through the change in A. In most instances, and especially when dealing with qualitative data, it is impossible to state this absolutely. However, the researcher needs to explain away as many other potential explanations as possible. This really reduces to a probabilistic argument, i.e. how likely is it that A causes B? (Janes, 2001, p. 193).

Janes (2001, p. 193) alleged that “you will rarely hear good scientists or researchers say that they have proven anything. It is more likely they will say that they have ‘provided strong evidence to indicate that’ something is the case, especially where causality is involved”.

CLDs as a technique certainly claims to encapsulate the first two elements of ‘correlation’ and ‘time order’, but is not hindered by a lack of rival explanations. In fact, rival explanations could enrich the diagram and provide additional insights into the BITA social system. Rival explanations often manifest as feedback loops, where variables have a direct or indirect effect on each other. However, rival explanations could also indicate potential points of leverage to be exploited (see Section 2.6.4).

In terms of exploring the link between PPM practices and BITA CSFs, feedback loops or rival explanations do not pose a problem, in fact, quite the opposite. When factors impacting on each other are discovered, it merely supports the use of CLDs to document these relationships. The value of CLDs is to investigate the nature of the relationship and potentially make sense by equating the circulator structure to one of the established CLD archetypes (Sales & Barbalho, 2019).

The next section explores using CLDs, given that social researchers need to work with cause and effect to develop system dynamics diagrams, without claiming causality, or at least all the conditions that would prove causality.

2.6.3 Causal loop diagrams

2.6.3.1 Background on CLDs

System dynamics, in which CLDs is rooted, has been described as a theory of the structure of systems and their resulting dynamic behaviour (Sterman, 2000). It is a rigorous method for qualitative description, exploration and analysis of complex systems in terms of their processes, information, organisational boundaries and strategies (Odiit et al., 2014, p. 39). CLDs provide a means to gain insights into the complex systems by understanding the linkages, interactions, feedbacks and processes between the elements that comprise the entire system.

According to Diffenbach (1982), CLDs offer a graphic map of the web of interrelationships bearing on an issue, both from a content and process perspective. Its purpose is to make the dynamics of the interrelationships more visible, more explicit, and thus more comprehensible. Vermaak (2011, p. 2) agrees and believes that CLDs are the most striking exponents of systems thinking.

Haraldsson (2004, p. 2) interestingly utilised a CLD to describe how CLDs are used. Figure 2.17 provides a CLD that explains system dynamics as an application of systems thinking and shows the relationship between multiple variables in a typical CLD modelling exercise.

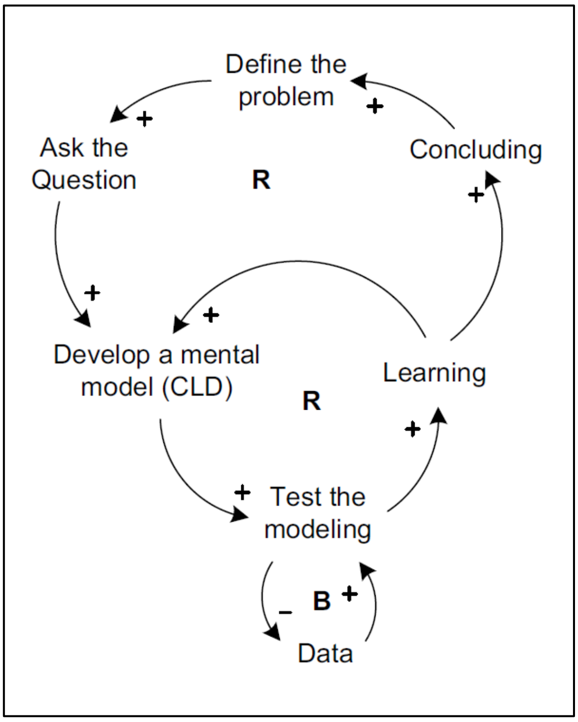

Figure 2.17: CLD of systems thinking

Source: Haraldsson (2004, p. 42).

CLDs are powerful tools to deal with issues characterised by content complexity and process complexity. Content complexity requires working systemically by unravelling the underlying dynamics behind a multitude of symptoms. Process complexity requires working interactively because contributions from different sides are needed to understand and address the issues (Haraldsson, 2004).

Diffenbach (1982, pp. 133-146) was one of the first authors to recommend using CLDs (or as it was known in the 1980s influence diagrams) to map complex strategic issues. CLDs are regarded as an appropriate investigatory approach when there are multiple and interacting processes, time delays and non-linear effects (e.g. feedback loops) involved in the systems to be modelled (Yang et al., 2019). CLDs can be used to deal with multiple conflicting objectives (Buede, 2005, p. 236), which are very typical of an environment where multiple technology intrinsic projects are consuming limited resources.

Diffenbach (1982, p. 133) remarked that any “single strategic issue can appear to be an unending source of confusing detail, vague assumptions, and perplexing contradictions”. He believes that CLDs are a practical decision-making tool for coping with issue complexity. This view is supported by Franco et al. (2018) in their recommendation to use CLDs in IT research. However, only using CLDs and archetypes only represents a subset of systems dynamics, since it excludes the typical third step, performing a simulation of the endogenous variables in a CLD. This is known as qualitative systems dynamics, i.e. not doing the simulation or quantitative step.

Diffenbach (1982, p. 146) believes that CLDs reveal relationships that warrant further examination and thus enhances the efficiency of further analysis beyond the diagram. Importantly, CLDs offer a “systematic tool for uncovering the 'counterintuitive' dynamics that might be overlooked in complex situations”. CLDs have become a popular tool for not only representing, but also solving complex decision-making problems (Bielza, Gomez & Shenoy, 2010, p. 354) as is evident from the *Learning* variable in Figure 2.17.

The system dynamics community has emphasised the advantages of systems thinking, especially its usefulness in coping with complex issues. According to Lane (2008, p. 12) there are very specific benefits to using CLDs to model complexity:

- **Limited detail puts the focus on feedback**: With CLDs the focus is on feedback loops and this can lead to an emphasis on decision points and performance measures. The suppression of detail observed in CLDs can be attractive to observers who aim to gain a strategic overview of a problem rather than wade through detail (Lane, 2008, p. 12). This strategic overview is exactly what is required to make sense of the complex relationships (Vermaak, 2011) embedded in the different dimensions of BITA.
- **Communicates the presence of feedback loops**: CLDs are a good tool for clearly communicating the location of the major feedback loops, which might otherwise be missed (Lane, 2008, p. 12) and is at the centre of the perplexing behaviour of socially-constructed systems (Senge, 1997).

- **Useful for rapid prototyping**: CLDs operate well in the conceptualisation mode and excel in communicating the ideas of a group and an individual, so that links and loops can be considered in more depth (Lane, 2008, p. 12). Because they are persuasive, CLDs can be used for rapid prototyping to determine the impact of decisions rather quickly in order to understand the impact of certain actions that have an influence on variables (Haraldsson (2004) that present the level of BITA.

CLDs accommodate the complexity of relationships by explicitly recognising the importance of feedback in the relationship. This is above all relevant where social and inter-personal factors can be amplified (Wang, Wood, Abdul-Rahman & Lee, 2016, p. 383). The use of CLDs enables managers to better understand key interdependencies and behavioural connections between variables. For example, when aligning strategic intent with IT deployment, targeted improvements need to be made through insight in controlling key variables while considering the system-wide impacts (Wang et al., 2016, p. 384).

Achieving BITA (Section 2.2) and measuring BITA success (Section 2.3) in a dynamic environment with continuous changes in strategic intent (Section 2.4) is no doubt a challenge. Using a technique like CLDs, that embrace the concept of feedbacks and multiple influences on certain variables, presents an interesting potential contribution to both practice, and academia.

2.6.3.2 The elements within CLDs

A typical CLD consists of a set of symbols representing a dynamic system's causal structure. The symbols include variables, causal links with a polarity and symbols that identify feedback loops with their polarity (Belayutham, Gonzalez & Yiu, 2016, p. 137; Wang et al., 2016, p. 384). The causal links have a direction and a polarity, and they could also have a delay mark as indicated in Figure 2.18 (Schaffernicht, 2010, pp. 653-654).

The relationship between variables is shown by connecting them with arrows that indicate the direction of influence. A symbol at the end of the arrow indicates the type of causality. A positive causal link is marked by a plus sign [+], or [s] to mean *same,* where an increase in variable A leads to an increase in variable B, and a decrease in A leads to a decrease in B (see Figure 2.18). The same or plus sign at the arrowhead does not automatically mean that the variables are increasing, only that they are changing in the same direction due to this single influence, in reality, there may be many other influences as well.

A negative causal link, marked by a minus sign [-], or [o] to mean *opposite*, is one of negative or inverse correlation, where an increase in variable C leads to a decrease in variable D, and *vice versa* (Williams & Hummelbrunner, 2010, p. 38). Once again, a change of the variable in the opposite direction will only happen if there are no other influences.

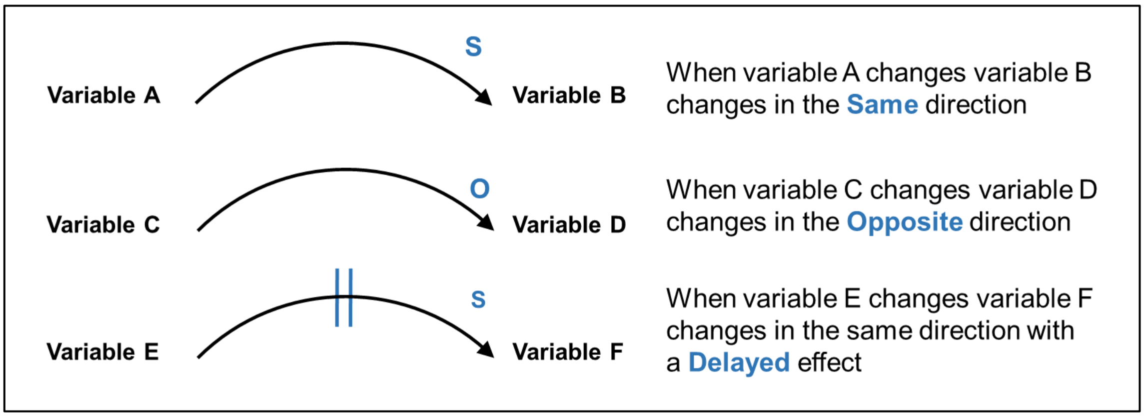

Figure 2.18: Basic elements in CLDs

Source: Adapted from Haraldsson (2004, p. 23) and Williams and Hummelbrunner (2010, p. 39).

Another important element embedded in a CLD is the continuity of an influence over time. An important factor to understanding dynamic behaviour patterns is whether a delay or time lag is to be expected in a link. This is denoted by drawing a short double line across the causal link (Williams & Hummelbrunner, 2010, p. 38). In Figure 2.18 variable E has a delayed impact on variable F.

Communicating the polarities of the constitutive links in a diagram is an important part of representing and confirming the relationships that are being assumed, since it leads to two different types of feedback loops. Balancing feedback loops, or negative feedback loops, are circles of cause and effect that counter a change with a push in the opposite direction. Effectively the harder the push, the harder the system pushes back to remain in balance or equilibrium (Haraldsson, 2004, p. 23).

Reinforcing feedback loops, or positive feedback loops, occur when an initial change is reinvested to further that change in the future. The bigger the initial push, the bigger the consequential push and growth in system variables – in essence reinforcing loops build momentum, in theory exponentially (Fang et al., 2018, p. 1306; Wang et al., 2016, p. 384). In practice, there are often other influences, indicated by additional variables and relationships that will stop most practical systems from exponential growth.

In a CLD, the polarity of each feedback loop is a crucial part of understanding model behaviour. The perturbation of a loop may result in the magnification of the original effect. This growth or decay response is known as a ‘positive feedback loop polarity’ (Haraldsson, 2004, p. 23). Alternatively, a perturbation may be counter-acted, or resisted by the operation of the loop; this equilibrating response is known as a ‘negative feedback loop polarity’ (Haraldsson, 2004, p. 23). Such loop polarities are, in turn, derived from the polarity of each causal link (Fang et al., 2018, p. 1306).

Figure 2.19 provides an example of a CLD with two loops, a reinforcing loop (*Number of eggs* → *Number of chickens* → *Number of eggs*) and a balancing loop (*Number of chickens* → *Road crossings* → *Number of chickens*).

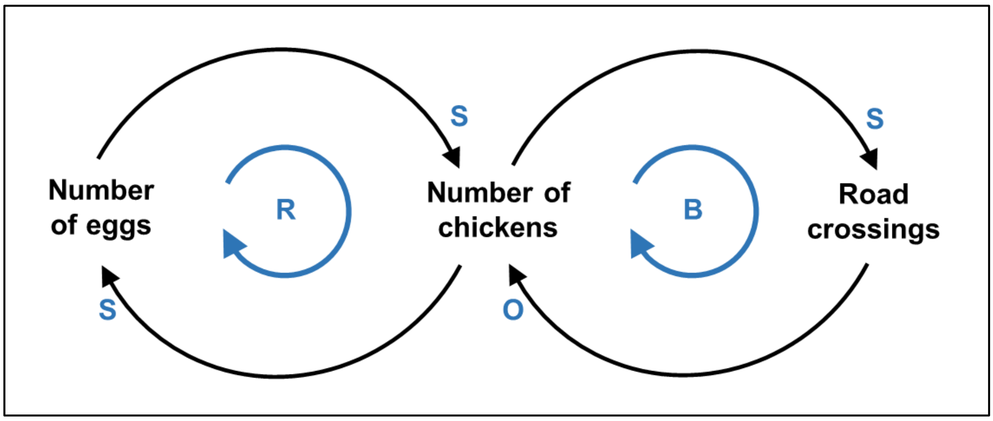

Figure 2.19: Balancing loops and feedback loops in CLDs

Source: Adapted from Haraldsson (2004, p. 23).

Although it can be quite complex to establish the polarity of loops in multi-loop diagrams, the idea is quite simple (Richardson, 1997). In this instance, the two loops have opposite effects on the certain variable, ‘Number of chickens’, since the reinforcing loop tries to increase the variable whilst the balancing loop tries to bring it to a point of equilibrium. The novice interpreter of the CLD would be interested in the value of ‘Number of chickens’ and whether it is set to increase or decrease. The experienced systems thinker’s interest will be in the system structure and what can be inferred from the particular structure and how the ‘Number of chickens’ could be controlled by, for example, creating more roads or removing eggs from the system.

It is the loops, whether reinforcing or balancing, and the causal relationships that are the core elements of the system dynamics approach, “which tries to explain complex behaviors from the interactions (feedbacks) among the components of the system” (Franco, Hirama & Carvalho, 2018, p. 59). The central premise to the use of the CLD in this research study is the ability to tackle complex issues effectively as demonstrated by Vermaak (2007, p. 175) as well as other authors. Section 2.6.7 presents prior research in the IS literature making use of causal loop diagrams.

2.6.4 Constructing CLDs

2.6.4.1 Best practice in creating CLDs

Various authors provide guidance on the drawing of CLDs. Vermaak (2007, p. 175) argued that, for CLDs to be effective it is preferable for multiple role players to participate in creating as well as applying them. Haraldsson (2004, p. 42) stated that drawing CLDs takes practice to acquire skills on how to gain insight and understanding of the problem being analysed. He said that a CLD can only be valuable if it is interpreted appropriately. A key challenge is that it should be reflecting the reality of the stakeholders involved in creating the diagram and care should be taken to not create a forced reality of the CLD (Haraldsson, 2004, p. 42).

Working interactively with CLDs has increasingly gained attention and there is as much learning to be gained from the creation of CLDs, as from the analysis and interpretation. Applying insights or accelerating decision-making also requires working interactively with diagrams. Vermaak (2007, p. 176) is of the opinion that those who facilitate the drawing process “should not only be able to make diagrams, they should also be able to design and facilitate the participation of the parties concerned”.

According to Vermaak (2007, p. 177), CLDs were initially only constructed by experts and other stakeholders were rarely involved. However, there are many reasons why this is highly undesirable. Different actors may have diverse sets of information and varied perspectives that each contribute to provide the bigger picture. Ideally, all the different perspectives should be included in the creation process to allow the finale diagram, and associated insights, to be complete and robust (Vermaak, 2007, p. 177).

Furthermore, Vermaak (2007, p. 192) strongly argued for an iterative approach in creating CLDs and he believes that working interactively with causal loop diagrams is also partly a self-correcting process. The process followed in this research was indeed iterative, with each new organisation representing new information that allowed a further iteration of the diagrams presented in Chapter 6. New CLDs were not constructed for each interview, the diagrams where just refined further and validated when relationships were mentioned again during interviews. However, it was decided to not present the diagrams to subsequent interviewees, so as to not influence participants by relationships identified by prior participants.

The CLDs for this study were drawn following the steps proposed by Belayutham, Gonzalez and Yiu (2016, p. 137) given as follows: (i) select subjects; (ii) determine key variables within the subject; and (iii) document the relationship between the variables with project boundary and level of details. Since the diagrams were not used for simulation, all variable and not just endogenous variables (present in the feedback loops) were included in the final diagrams.

2.6.5 System archetypes and leverage

A fundamental premise of system dynamics is that dynamical behaviour can be explained by diagram structure (Hayward & Boswell, 2014, p. 29). It is the number and particular combinations of reinforcing and balancing processes within a system that cause that system's complex, sometimes inexplicable, behaviour. System archetypes are specific and recurring patterns of systems behaviour that has been observed in multiple other systems as well (Banson, Nguyen & Bosch, 2016, pp. 79-99).

System archetypes thus represent generic structures that describe the common dynamic processes that characterise a system’s behaviour, irrespective of the situation being modelled (Acaroglu, 2017; Setianto, Cameron & Gaughan, 2014, pp. 642-654). Banson et al. (2016, p. 80) contended that archetype analysis can help in the identification of leverage points, in other words, where an intervention can lead to greater influence on the system behaviour. For Wolstenholme (2003, pp. 7-26), such structures consist of intended actions and unexpected reactions, used to help in generating understanding and, thus, accelerate learning within organisations.

Sales and Barbalho (2019) proposed four main characteristics used for identifying basic archetype structures in causal loop diagrams:

i) Archetypes are composed of an intentional feedback cycle, generated by an action which starts in a particular organisational area, with a previously planned consequence.
ii) Archetypes also contain an unintended feedback cycle, resulting from a reaction within or outside the organisation.
iii) There is a delay present in a link between two variables before the unintentional consequence manifests.
iv) There is a limit on organisational knowledge that hides the unintended consequence from the vision of those who planned the intended consequence.

Wolstenholme (2004, p. 341) is of the opinion that “archetypes capture the essence of thinking in systems thinking”. He believes that, even when models are further developed and used for computer simulation, the essence of the thinking is done in the initial design of the CLD. System archetypes can be used as a diagnostic tool to better understand the dynamics of a specific set of behaviours that have manifested an unwanted condition.

In the context of this research, system archetypes were used to investigate the potential systemic issues that influence BITA, as well as the contributions that PPM practices could potentially make as leverage to address undesirable archetype behaviour. Although system dynamics is often used to create simulation models, in this research, insight from systems structures and leverage in the structures is the emphasis and not the quantitative modelling of the behaviour over time of the endogenous variable present in feedback loops.

The theory behind system archetypes is that situations with unwanted results or side effects can be mapped to the common behaviour models. Kontogiannis (2012) established that inadequate knowledge about a complex system may lead even experienced professionals to make poor decisions, when their mental models contain distortions caused by system archetypes. Given the knowledge available about system archetypes, problem-solvers in general can apply its principles and arrive at a rich diagnosis of a situation and plan appropriate action (Haraldsson, 2004, p. 45).

Braun (2002, p. 1) maintained that systems archetypes are highly-effective tools for insight into underlying structures from which ‘behaviour over time’ and discreet events emerge and are powerful to alert managers about unintended consequences.

According to Braun (2002, p. 1), they can be applied in two different ways:

i) **Diagnostically:** archetypes help managers recognise patterns of behaviour that are already present in a particular context. They provide insight into the underlying systems structures from which the archetypical behaviour originates; the insight required when persistent behaviour cannot necessarily be explained through linear relationships. Chapter 6 uses this application to gain higher levels of insight.

ii) **Prospectively:** archetypes help managers to formulate means to accomplish specific objectives. The archetypes can be used to determine whether policies and decisions under consideration may impact the systems structures to produce archetypical behaviour. This allows an appropriate action to be defined prior to dealing with unintended consequences. Chapter 7 contains recommendations and hence use this application to define actions that could improve the system performance.

The knowledge base on common systems archetypes provides guidelines for identifying what archetype is at play and, once identified, how to approach an intervention through a point of leverage (Braun, 2002, p. 1). Archetypes represent the common system behaviour patterns that provide all the compelling, recurring stories of organisational dynamics. Identifying a system archetype and finding the leverage, enables efficient changes in a system. Some of the basic system archetypes common in most literature are depicted in Figures 2.16 to 2.19.

System archetypes are highly-effective tools for gaining insight into patterns of behaviour since each archetype has a specific set of actions that can be used to treat it (Braun, 2002, p. 2). Wolstenholme (2003, p. 14) and Kim (1993, pp. 8-9), for example, defined typical interventions that could be made when recognising systems archetypes. Section 6.2 to Section 6.7 contain typical; archetypes as well as potential actions based on the typical actions associated with each archetype.

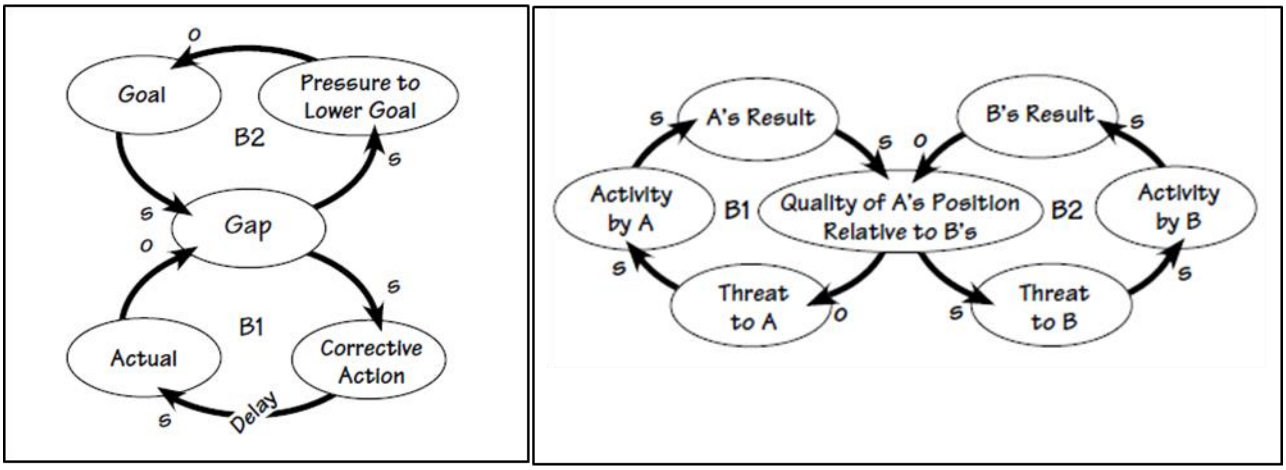

Figure 2.20a: Drifting goals; Figure 2.20b: Escalation

Source: Kim (1993, p. 8).

Figure 2.20 contains the ‘Drifting goals’ and ‘Escalation’ archetypes. In the *Drifting Goals* archetype (Figure 2.20a), a gap between the goal and current reality can be reduced by lowering the goal (balancing loop B1) or executing a corrective action (balancing loop B2) (Braun, 2002, p. 15; Kim, 1993, p. 8; Senge, 1997, p. 358; Wolstenholme, 2003, p. 12). However, the delay in the corrective action balancing loop (B2) makes it easier to lower the goal and hence goals tend to ‘drift’ over a period of time. Lowering the goal will immediately have an impact on the gap, and be perceived as a worthwhile intervention. However, corrective actions that should be applied takes a longer time to have an effect and could be seen as less desirable with dramatic negative long-term consequences.

In the *Escalation* archetype (Figure 2.20b), one party (A) takes actions that are perceived by the other as a threat (Braun, 2002, p. 21; Kim, 1993, p. 8; Senge, 1997, p. 360; Wolstenholme, 2003, p. 12). Party B responds in a similar manner by taking action that is perceived by A to be a threat. This increasing threat to A results in more threatening actions by A. In essence, the two balancing loops sharing a relative variable become a reinforcing loop with negative long-term consequences.

All authors are not in complete agreement with all the types of archetypes that are found in the literature and rather see some of the archetypes as special cases of others. Wolstenholme (2003, p. 15) for example believes that *Limits to success*, *Growth and underinvestment* and *Tragedy of the commons* are all special cases of shifting the burden. Equally, *Fixes that fail*, *Shifting the burden* and *Escalation* are all special cases of *Success to the successful* (Wolstenholme (2003, p. 16). Braun (2002, p. 3) contrariwise maintains that there are ten different archetypes and adds *Accidental adversaries* and *Attractiveness principle* as two archetypes. Given a lack of support from other authors these two archetypes are not included in the types discussed.

Figure 2.21 contains the *Fixes that fail* and *Growth and underinvestment* archetypes. In the *Fixes that fail* archetype (Figure 2.21a), a problem situation is in need of a solution. When the solution (Fix) is quickly implemented to form balancing loop (B1) it also has unintended consequences after a period of time due to the delay in the loop. These unintended consequences influence the problem symptom and a reinforcing loop (R2) that negatively affects the solution (Braun, 2002, p. 39; Kim, 1993, p. 8; Senge, 1997, p. 364).

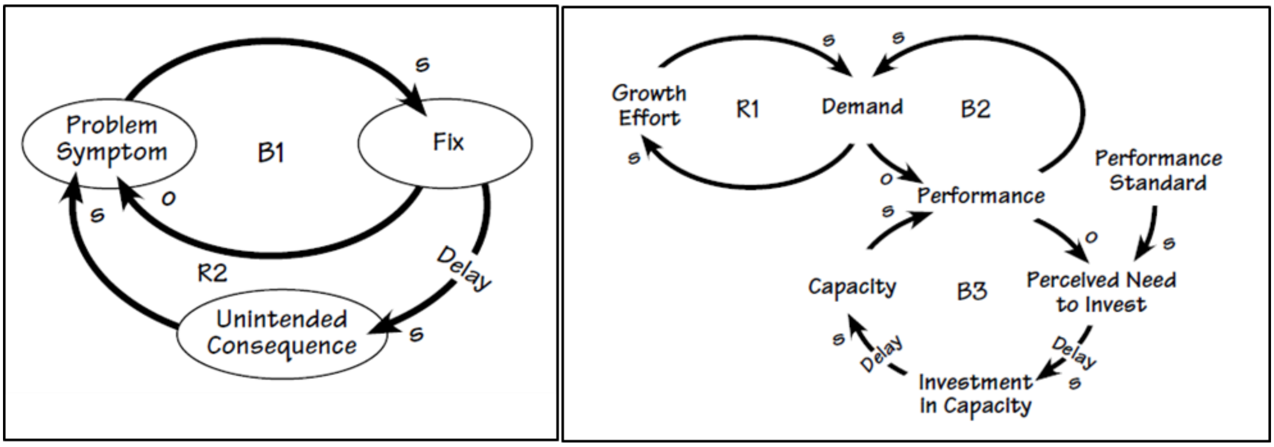

Figure 2.21a: Fixes that fail; Figure 2.21b: Growth and underinvestment

Source: Kim (1993, p. 8).

Ultimately the unintended consequence (loop R2) can overpower the fix (loop B1) that was initially deemed to be successful, due to the delay in the reinforcing loop. In practice, this archetype is experienced as unintended consequences that manifest after a period of time.

In the *Growth and underinvestment* archetype (Figure 2.21b), growth approaches a limit that can be eliminated or pushed into the future if capacity investments are made. Instead, performance standards are lowered to justify the lack of investment (underinvestment), leading to lower performance which further justifies underinvestment based on a lack of growth (Braun, 2002, p. 45; Kim, 1993, p. 8; Senge, 1997, p. 365). The balancing loop B3 with a delay reacts slower than the balancing loop B2 and a lack of subsequent performance seems justified by a drop in performance. Figure 2.22 contains the *Limits to success* and *Success to the successful* archetypes.

In the *Limits to success* archetype (Figure 2.22a), continued efforts create reinforcing loop R1 and initially lead to improved performance. However, over time, the system encounters a physical or physiological limit which causes the performance to slow down or even decline due to a balancing loop (B2) caused by the limiting action (Braun, 2002, p. 2; Kim, 1993, p. 9; Senge, 1997, p. 354). The initial positive results are no longer achieved, leading to a perplexing situation where more of the same intervention is normally attempted, resulting in the same longer-term behaviour due to the impact of balancing loop B2.

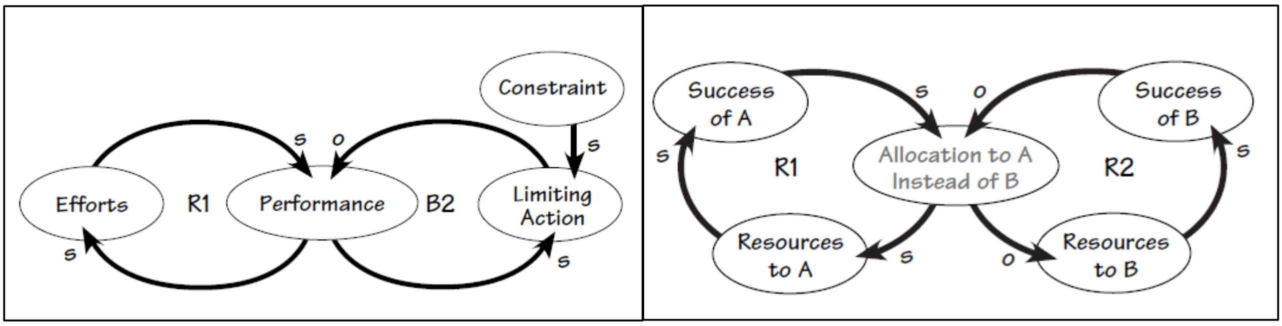

Figure 2.22a: Limits to success; Figure 2.22b: Success to the successful

Source: Kim (1993, p. 9).

In the *Success to the successful* archetype (Figure 2.22b), one person or group (A) is presented with more resources than another person or group (B) and thus has a higher likelihood of succeeding than B (assuming they are equally capable). This initial success justifies devoting more resources to A and less to B and the success of B diminishes, further justifying more resource allocation to A (Braun, 2002, p. 27; Kim, 1993, p. 9; Senge, 1997, p. 361). The perpetuation of past injustices in any unequal system is a perfect example of this archetype in action.

Figure 2.23 contains the *Shifting the burden* and *Tragedy of the commons* archetypes. In the *Shifting the burden* archetype (Figure 2.23a), a problem seems to be solved by an external intervention without a delay (loop B1) rather than the internal solution (loop B2). The external intervention leads to a dependence on the intervention (reinforcing loop R3), leading to less and less focus on finding an internal solution and ultimately a dependency on the external solution (Braun, 2002, p. 9; Kim, 1993, p. 9; Senge, 1997, p. 355).

This archetype and its variants are perhaps the single most pervasive systems structure and it is often referred to as the Hellen Keller archetype, after the famous deaf and blind person who became the role model when a teacher intervened to limit her dependence on the external intervention (loop R3), enabling her to graduate from college and excel in multiple facets of life not deemed possible for deaf and blind people (Kim, 1992, p. 22).

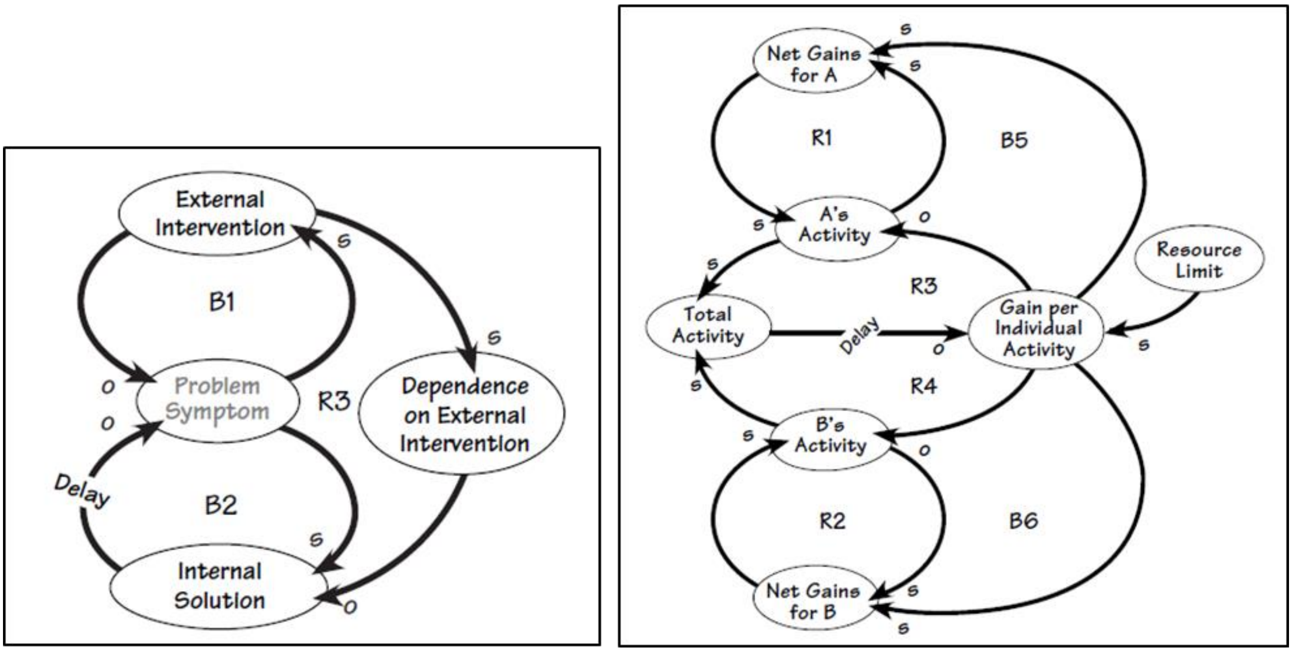

Figure 2.23a: Shifting the burden; Figure 2.23b: Tragedy of the commons

Source: Kim (1992, p. 9).

In the *Tragedy of the commons* archetype (Figure 2.23b), multiple parties (A and B) enjoy the benefits of a common resource, but do not pay attention to the effects they are having on the common resource. Their own individual gain drives their own activity (R1 and R2), which in turn influences the total activity in the system (Braun, 2002, p. 33; Kim, 1993, p. 9; Senge, 1997, p. 363). If the amount of activity grows too large for the system to support, the commons experience diminishing benefits, which has a negative impact on the gain per individual activity over a period of time (R3 and R4). Eventually this resource is exhausted through balancing loops B4 and B5, resulting in the shutdown of the activities of all parties in the system. This archetype is at the core of all sustainability issues and well-known in the literature in that domain.

System archetypes provide a language for members of an organisation to communicate how a system is expected to perform (Vermaak, 2011, p. 3). Unintended consequences in systems archetypes are well-known and can be translated into potential or realised consequences. Having a language to document, communicate and analyse behaviours provides a useful and consequential framework for dealing with changes necessary to prevent or eliminate negative behavioural patterns. Moreover, once the particulars of systems archetypes are mastered by members of an organisation, their knowledge can be leveraged to build robust systems immune to their side effects.

2.6.6 Limitations in using CLDs

The use of CLDs is not without critique (Richardson, 1986, pp. 158-170; Vermaak, 2007, pp. 175-194; Williams & Hummelbrunner, 2010, pp. 45-46). Richardson (1986, p. 159), although an avid user of CLDs for more than three decades, pointed to the fact that the simplicity of CLDs hides an important problem since they "make no distinction between information links and rate-to-level links". This lack of distinction between variables that model physical properties (for example the stock level) and actions (quality control) presents challenges in certain environments where diagrams contain significant information links and rate to level links. However, the CLDs constructed for the BITA critical success factors mostly represent information flows (links) and variables of non-physical entities and hence the CLDs have a limited negative impact on the modelling accuracy for this research.

Vermaak (2011, p. 3) had concerns about using only predefined archetypes. Although the predefined archetypes are useful for reflection purposes and represent the most popularised use of CLDs, no standardised archetype can do complex situations justice and both insight and action perspectives will be limited as a result. According to Vermaak, it is more powerful to draw and use diagrams customised for specific situations and not search for archetypes when creating the diagrams.

Although these and other authors have commented on different limitations, sometimes context specific, Lane (2008, p. 12) best summarised the major issues mentioned by different authors:

- **Lack of precision**: The very simplicity of CLDs can lead to a lack of precision. Hayward and Boswell (2014, p. 30) concurred that the simplicity of CLDs, that also makes them attractive to use, can lead to less precise representation of the systems modelled.
- **Lack of variable and link distinctions**: A more technical disadvantage of CLDs is that the lack of distinction between stocks and flows, and between conserved flows and information links can be unhelpful and even misleading (Richardson 1986, p. 159).
- **Loop polarity errors**: CLDs can lead to mislabelling of loop polarity. This happens because, whilst communicating the location of feedback loops, CLDs do not always communicate the effect of their operation. As a result, within the limited language of CLDs, it is possible to confuse a positive loop for a negative one, and *vice versa* (Richardson, 1997, p. 257).
- **Behaviour is only inferred**: CLDs do not provide a basis for the rigorous deduction of behaviour. Instead, behaviour must be inferred. The problem of behaviour inference does not arise when CLDs are used in the expository mode (Vermaak, 2011, p. 3).

The first of Lane's issues requires more scrutiny as it has the biggest potential impact on this research, and the use of CLDs to present dynamic complexity. Vermaak (2011, p. 7) believes well-developed CLDs for real-life situations generally have multiple loops that can obscure important loops, which are lost in the details of the diagram.

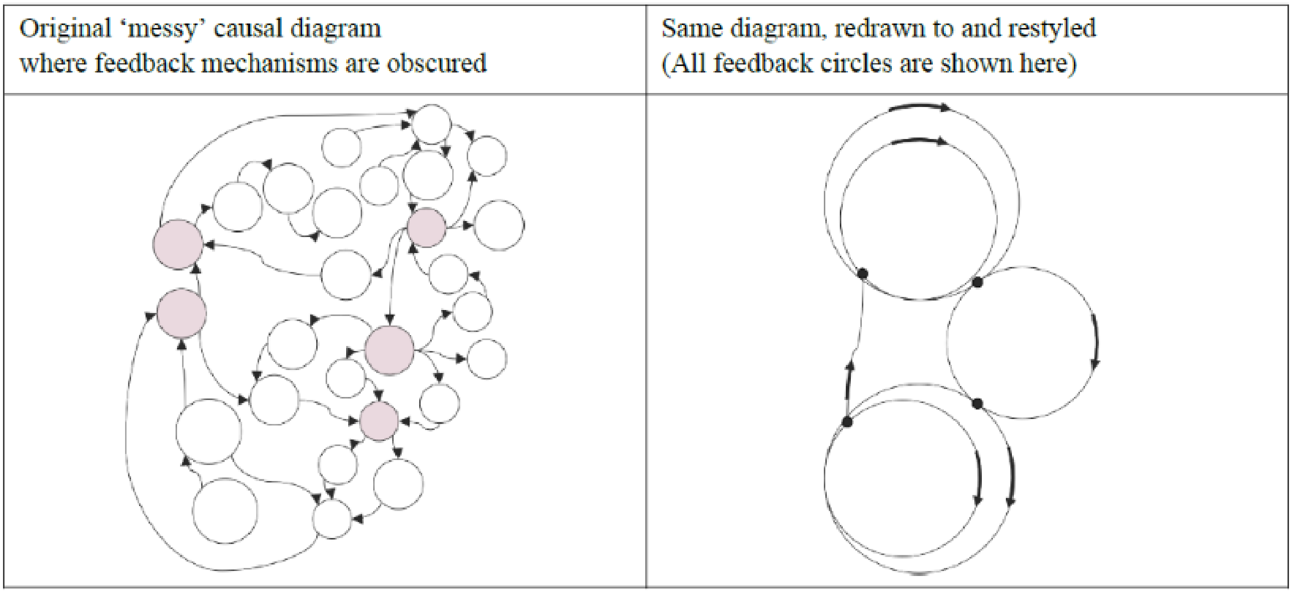

Figure 2.24: Messy diagram redrawn

Source: Vermaak (2011, p. 8).

He provided an example (see Figure 2.24) as well as suggestions on how to deal with this potential challenge. According to Vermaak (2011, p. 8) the diagram in Figure 2.24 is 'messy' and feedback mechanisms are obscured. He suggested redrawing the diagram so that the individual loops stand out as circles, minimising crossing arrows and increasing readability by 'unidirectional flow' through each factor, thus allowing observers of the CLD to see in one glance everything that affects a factor (arrows coming in from one direction). In turn, it becomes possible to see what it in turn affects (arrows going out in the opposite direction). The second diagram very clearly indicates variables common in multiple loops, obscured in the first diagram.

In concluding the review of CLDs, it was decided to investigate the prior use of CLDs in IT research. Section 2.6.7 contains a selection of some of the most recent and cited uses of CLDs in IT research, that remain very limited.

2.6.7 Causal loop diagrams in IS research

Although using CLDs to depict the dynamic complexity in business and IT alignment is a new approach to gain deeper insight, the use of CLDs is not completely new in Information Systems and IT research, as shown in this section. Previous researchers have explored using CLDs through a variety of ways, both diagnostically and prospectively. A selection of prior research is presented both as example of the current academic discourse when using qualitative system dynamics in IT research, but also to learn from other scholars to improve the scientific rigour of this dissertation.

Kiani, Gholamian, Hamzehei and Hosseini (2009, pp. 159-167) used a CLD to capture the structure of e-business systems to achieve a better understanding of an e-business model (see Figure 2.25). They provided managers with significant insight into the e-business models. They argued that using

CLDs will enable managers to understand their business model and also allow insight on the essential elements that it could be composed of.

Multiple balancing and reinforcing loops are presented in Figure 2.25. Kiani et al. (2009) used two icons (for balancing and reinforcing) to indicate this. Although Kiani et al. (2009) did not identify any systems archetypes, the *prosperity* and *offering* loops present the basic structure of the *fixes that fail* archetype sans the delay that creates the archetype. Similarly, the *resource supplement* and activity arrangement balancing loops share the *partnership* common variable that could lead to escalation, but does not seem to be in this instance. Their interest was mainly in conveying the structure of the system, nonetheless, some interesting insight was lost by not looking at the archetype within the system.

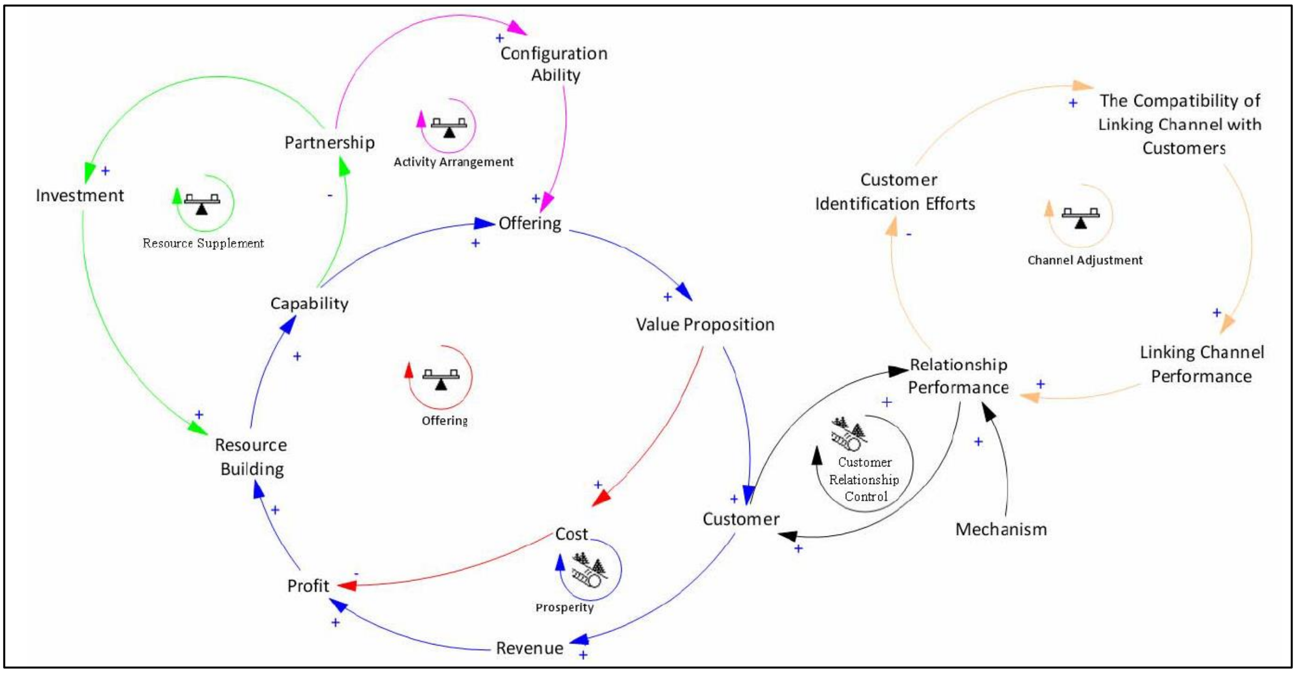

Figure 2.25: Causal loop diagram of an e-business model ontology

Source: Kiani et al. (2009, p. 164).

Kiani et al. (2009, p. 164) believe that depicting the e-business model as a CLD enables it to be shared easily with others, and enables "playing around with it in order to learn about business opportunities", i.e. the prospective use of the diagram. The choices of some of the variables are, however, questionable. Irrespective of what the authors may claim, using variables such as *partnership* and *mechanism* make it difficult to read the diagram without looking at the authors' descriptions, which limits the usefulness.

According to Odiit et al. (2014, p. 38) the alignment of information systems with organisational objectives and strategy is a key factor for the success of information systems, although this is not common in health care. They are of the opinion that most health facilities have not aligned their health information systems (HIS) to organisational-wide strategic goals and objectives. This has led to challenges such as poor planning and inadequate resources, due to the absence of direction by top management in implementing and using HIS (Odiit et al., 2014, p. 38).

Their research involved an assessment of the requirements for strategic alignment of HIS in health facilities and the development and validation of a strategic alignment model, using selected health facilities (Odiit et al., 2014, p. 38). Their mixed-method research approach made use of quantitative and qualitative methods. The quantitative approach provided quantitative data that was used to generate requirements for the development of the model, as well as validating and testing of the system dynamics diagram (Odiit et al., 2014, p. 38). This is not a common technique when creating CLDs and not advisable, since it does not provide for opportunities to discuss and validate relationships in a group setting.

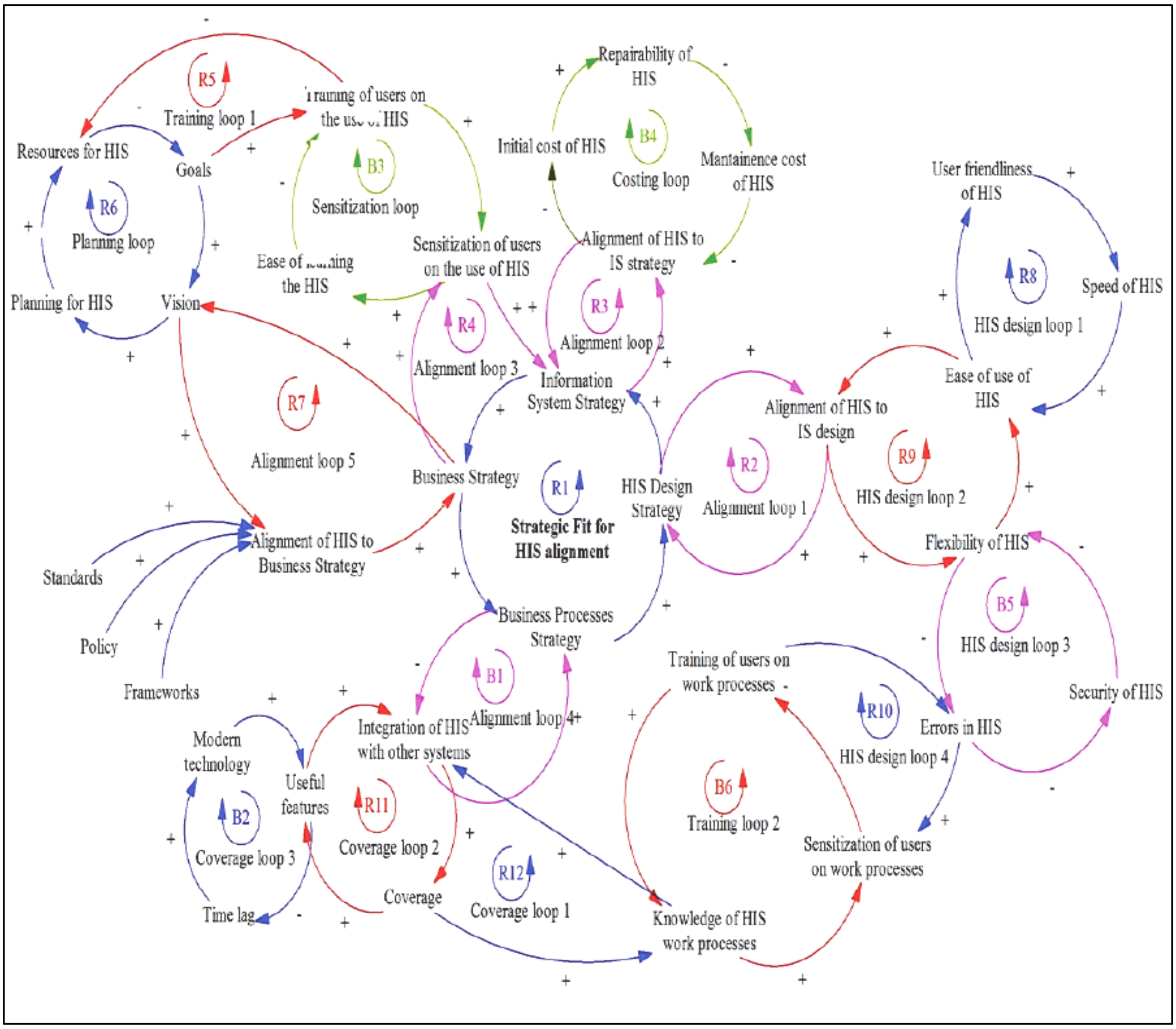

Figure 2.26: Health Information System strategic alignment

Source: Odiit et al. (2014, p. 49).

The authors followed the Dynamic Synthesis Methodology (DSM) as proposed by Rwashana and Williams (2008), which combines the system dynamics and case study methodologies. Although DSM provides clear guidance on combining qualitative and quantitative research strategies, it is not evident how qualitative methods were used in the research, due to a lack of depth on the methods section. This leads to questions about the creation of the diagrams and it is thus important to provide details on the processes that lead to the diagrams.

Odiit et al. (2014) identified the requirements for strategic alignment of HIS as proper planning, establishment of policies, frameworks and standards, resource mobilisation, establishment of work processes, training and sensitisation of staff members about HIS work processes, all indicated in Figure 2.26. Their recommendations included minimising the time lag between HIS and other integrated organisation information systems, improving the use of features and functions of HIS and also ensuring the HIS covers all functions of the health facility (Odiit et al., 2014, p. 38).

A significant number of balancing and reinforcing loops are present in Figure 2.26. However, on inspection, it is evident that they have missed some of the more complex feedback structures. This confirms the opinion of Vermaak (2011), who warned about ‘messy’ diagrams and hidden structures (see Figure 2.24). It is thus important to ensure that all potential feedback mechanisms are included in the analysis.

According to Toole (2005, p. 1), system dynamics principles and analytical tools such as CLDs also have the potential to alleviate several deficiencies in current project management analytical techniques, especially within the IT domain. He created an IT project management CLD that provides a summary of the deficiencies in current IT project management approaches. Toole (2005, p. 7) presented a CLD of a generic project management system (see Figure 2.27).

According to his analysis, the feedback loops in the diagram explain why, what appear to be rational project management actions, could lead to unintended and counterintuitive consequences. It seems that Toole used the diagram to present and discuss direct influences only. There is no discussion of any feedback loops, neither any archetypes in his research.

On inspection of Figure 2.27, it is evident that multiple feedback loops, some balancing and others reinforcing, exist within the CLD created by Toole. By not using one of the most powerful insights provided by CLDs, Toole essentially missed significant insight that was to be gained from looking at the feedback loops and potential archetypes within an otherwise interesting and valuable diagram. Using the principles from Vermaak (2011) it will be possible to redraw the diagram and make the feedback loops more explicit to aid with the diagnostic use of the diagram.

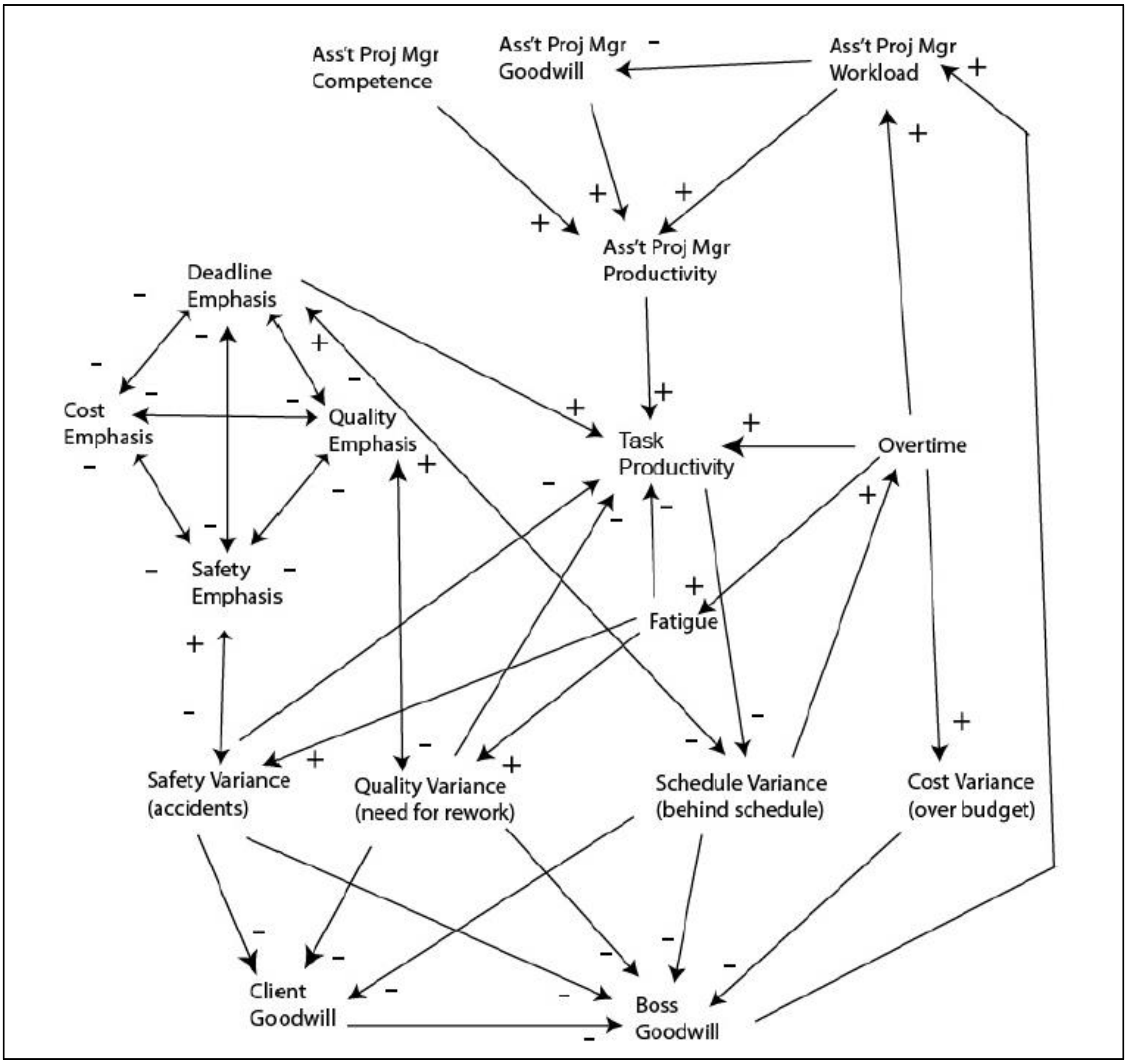

Figure 2.27: Deficiencies in current IT project management approaches

Source: Toole (2005, p. 7).

An important consideration noted by Toole (2007, p. 9), is that Figure 2.27 does not include all variables underlying a project management system. For example, *task productivity* is affected by variables that are not shown in Figure 2.27, such as the characteristics of the construction site, the weather, the building being constructed, and the crew performing the task. *Schedule variance* results not just from lower-than-expected task productivity, but also from scope changes, unforeseen conditions and deficiencies in the design documents. However, according to Toole, the intention of using CLDs was to provide a diagram that depicts the feedback loops within the system because it is the loops that can lead to counterintuitive behaviour. Variables that are not part of feedback loops are therefore not as important for understanding system behaviour and are omitted to keep the diagram from being unnecessarily complex. Toole (2005, p. 7) argued that the goal of the CLD is not to provide a diagram for rigorous quantitative analysis, such as structural equation modelling.

In the context of this research, creating diagrams that do not contain unnecessary variables is important. However, it is easier said than done, since variables first need to be modelled and analysed before it is possible to see that they do not form part of the feedback loops, before it will be possible to remove them. In addition, insight is not just based on variables forming part of loops; it is likely that leverage may sit outside a loop and could be the factor that influences multiple loops.

The problem context for Foroughi's (2008, p. 2) CLD is the insider threat security problem in IT organisations. Due to the dynamic nature of the casual factors, he is of the opinion that system dynamics techniques are highly applicable to understand the problem context better.

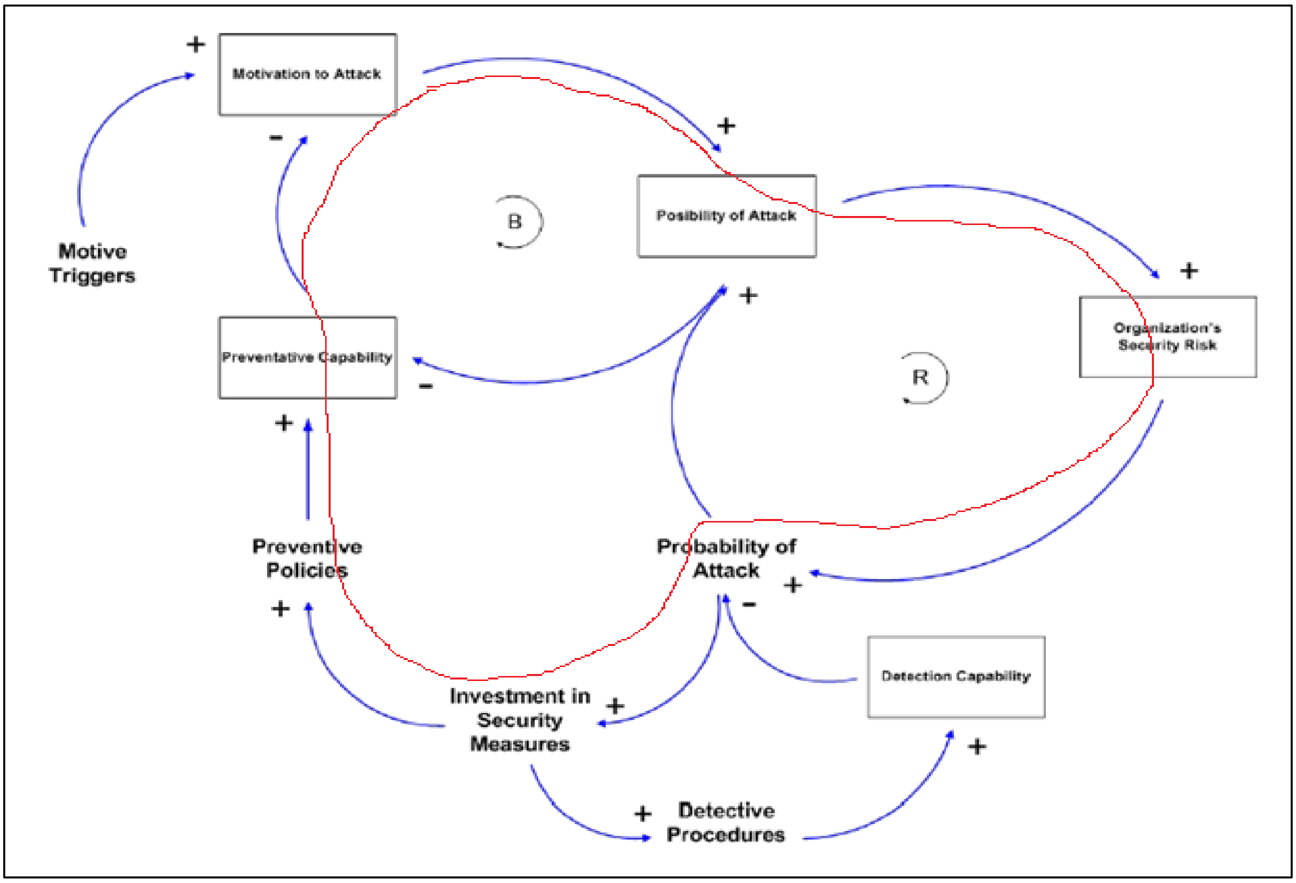

Figure 2.28: Adapted from *The insider attack* CLD

Source: Foroughi (2008, p. 4).

Figure 2.28 depicts the insider threat CLD with two feedback loops indicated. Once again, even in this rather simple diagram, an important reinforcing loop is missed, added in the diagram (in a hand-drawn red line).

According to Foroughi (2008), to be able to manage complex systems, a diagram must be capable of representing the system with all complexities and dynamics components. A CLD should also be understandable and usable by managers. Sometimes this simplicity and desire to be understood can be at odds with the requirement to be comprehensive.

The risk management of the insider-threats problem involves a complex combination of behavioural, technical and operational issues, in Foroughi's (2008, p. 2) opinion. After analysing their diagram behaviour, he believes that CLDs, as a subset of system dynamics, is a valuable tool to analyse insider-threats because of its dynamic attributes and soft problem characteristic (Foroughi, 2008, p. 4). These are important observations in the context of the dynamic nature of BITA in organisations.

Foroughi (2008) argued that it is not possible for academics to critique current research and claim pragmatism, without presenting research to practitioners to comment on the value. He agreed with the value of system dynamics diagrams, including stock and flow diagrams, since it has frequently proven to be an effective analytical tool in a wide variety of situations. The aim of the research by Khan, Flanagan and Lu's (2016) was to determine how system dynamics provides a basis for understanding the management of complexity for the accessibility to information by small and medium enterprises to improve efficiency, performance and productivity. They created the diagram presented in Figure 2.29 and indicated a presence of six different loops with the presence of merely seven different variables (Khan et al., 2016, p. 196). This is a highly-unusual relationship and it does seem that loops may have been forced onto the diagram, or alternatively, multiple additional variables have simply been left out, leaving a very 'clean and simple' diagram.

The CLD by Khan et al. (2016, p. 199) provides a representation of information complexity and methods to manage the complexity through the improvement of project information flow. According to Khan et al. (2016, p. 202), the strength of the diagram lies in its robust feedback mechanism. The CLD provides a systems view with procedures and feedback loops, with the potential to provide and capture real-time information on performance and productivity.

It has been argued before that insight into a complex problem requires focus on relationships and interconnectivity in the entire system, not only on the component parts of the system (Khan et al., 2016, p. 199, 202-203). A conceptual framework was proposed for specialty contractors to improve work package information and document management based on insights from the CLD. Khan et al. (2016) are of the opinion that the diagrams will help improve productivity and performance for specialty contractors.

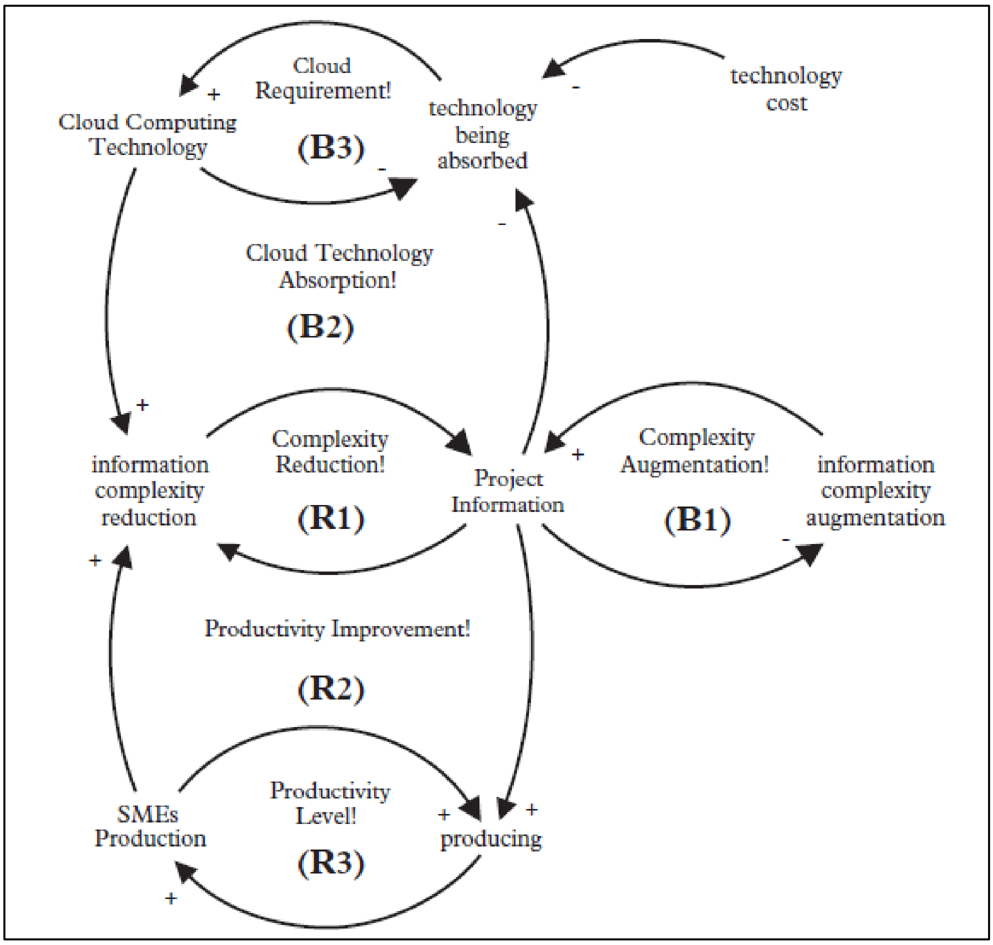

Figure 2.29: Managing information complexity

Source: Khan et al. (2016, p. 198).

As much as Kahn et al. (2016) argued the potential value of the model, it is probably less realistic in terms of presenting the system being modelled than any of the other five diagrams presented in this section. The diagram seems to be built around an intended outcome, and not a modelling process, and leaves serious questions in terms of scientific rigour. It is important that diagrams represent reality and that the process to create the diagrams is described in sufficient detail to show rigour. In this instance, neither was accomplished.

The CLD constructed by Campbell et al. (2005) and depicted in Figure 2.30 at first glance seems to be similar to what this research is setting out to achieve; a system dynamics diagram of BITA from a practitioner perspective.

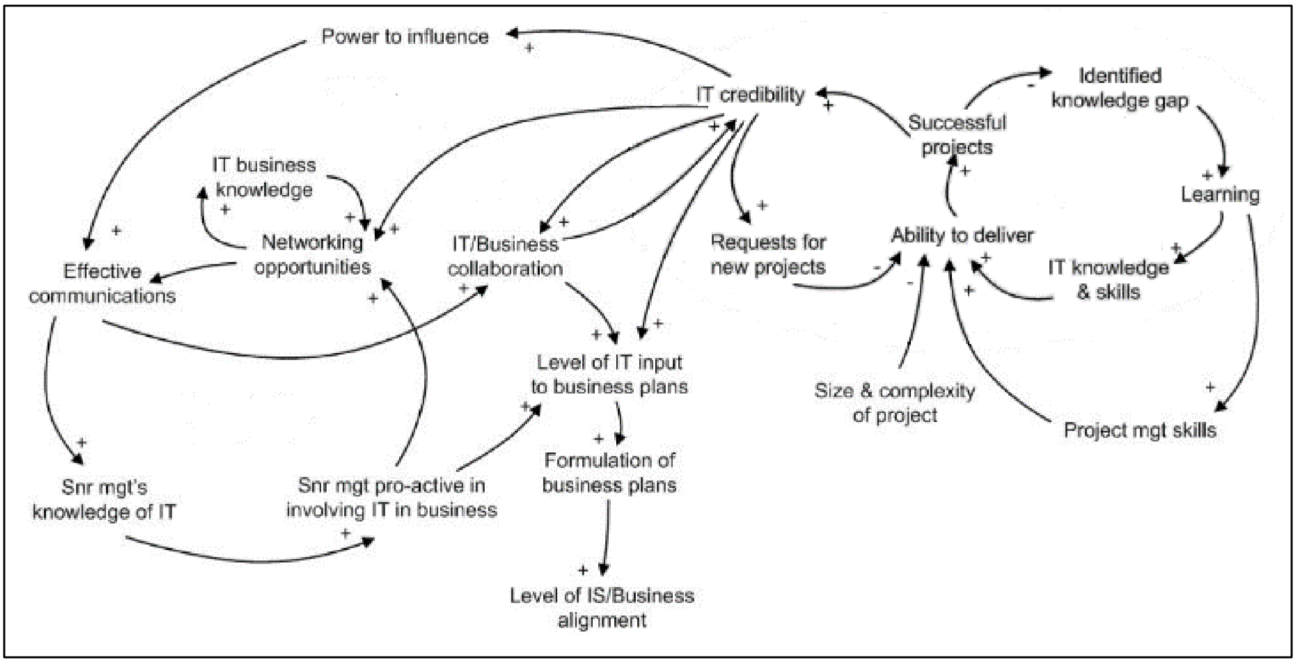

Figure 2.30: Strategic alignment: A perspective by practitioners

Source: Campbell et al. (2005, p. 660).

Their research used a focus group as a mechanism to collect data about BITA relationships. However, unlike most focus group research, rather than just discussing the topic in the presence of an observer who will record the discussion, participants were encouraged to develop a CLD to represent their beliefs about BITA during the group discussion (Campbell et al., 2005, p. 655).

Their diagram was developed over multiple focus group sessions, each with the same group of participants. The selection of participants was purposive, rather than forming a representative sample, and constituted senior IT managers within multi-national organisations. The participants were requested to develop a CLD indicating how, in their experience, BITA could be achieved in business, in general (not for their organisation). Their diagram needed to include both the enablers and inhibitors of alignment that the participants considered the most significant in their experience (Campbell et al., 2005, p. 655). Participants were encouraged to discuss the different influences as well as the polarity of the causal loops connecting the variables (Campbell et al., 2005, p. 656). Figure 2.30 represents the output of their research, a practitioners' perspective on BITA.

One valuable contribution from the research of Campbell et al.'s (2005, pp. 656-657; 659) is the presentation of subsets of the model, that are highlighted without losing sight of the entire model. Figure 2.31 provides an example of one of the three different focus areas (in this instance senior management support) highlighted by Campbell et al. (2005). This method to focus on sections of the CLD and not on a specific loop in particular, represents an interesting approach to gaining insight from CLDs, which was useful in this research study.

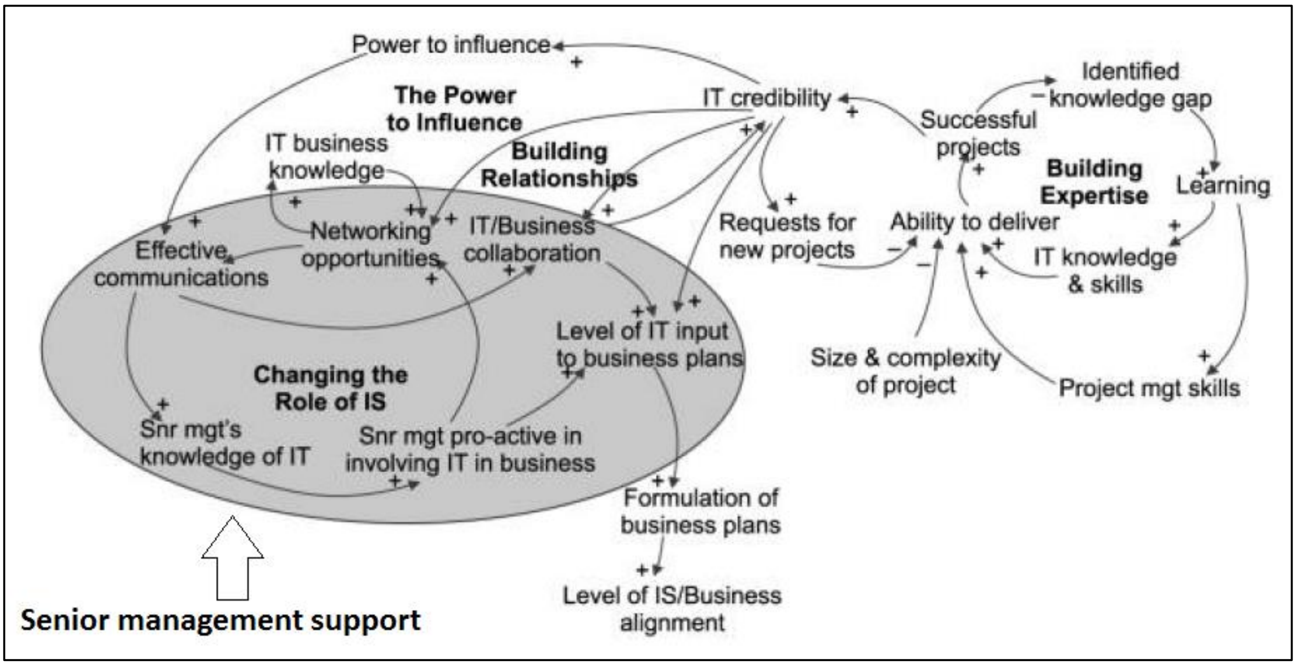

Figure 2.31: Strategic alignment: A perspective by practitioners on *Senior management support focus*

Source: Campbell et al. (2005, p. 660).

It has been argued before that insight into a complex problem requires focus on relationships and interconnectivity in the entire system, not only on the component parts of the system (Khan et al., 2016, p. 199, 202-203). A conceptual framework was proposed for specialty contractors to improve work package information and document management based on insights from the CLD. Khan et al. (2016) are of the opinion that the diagrams will help improve productivity and performance for specialty contractors.

There are three important differences between the diagram by Campbell et al. (2005) and those presented in Chapter 6 of this research. Firstly, the richness of the information was vastly improved due to the number of interviews and the iterative nature of the process. Secondly, the granularity of the diagrams created in this research is significantly more due to using six different starting points to look at the influences on different BITA success factors. Finally, the lack of inclusion of PPM practices in the diagram by Campbell et al. (2005). PPM practices have been included in the diagrams in this research, leading to a different contribution and insights. However, a comparison between the influence identified by Campbell et al. (2005) and those from this research is an interesting exercise, bearing in mind that there is no absolute truth in CLDs; they are merely systems presentations that may be different if done by and for different stakeholders.

Table 2.15 Insights gained from previous CLDs in IS studies

Author / Figure	Insights gained
Kiani et al. (2009) Figure 2.25	• The CLD can be used to both gain insight and communicate mental models and structures to managers • Variables must be carefully chosen to ensure that they are clear, without having to be described • Naming balancing and reinforcing loops (rather than Rx and Bx) helps with the analysis
Odiit (2014) Figure 2.26	• Present sufficient information to justify how the diagram was created • Be careful of overly busy diagrams where it becomes difficult to identify feedback loops and hence systems archetypes
Toole (2005) Figure 2.27	• Be sure to identify loops to allow for deeper analysis • Consider removing variables that are not part of feedback loops, to simplify the diagram • Do not attempt to construct diagrams that could provide the same level of analysis as quantitative techniques
Foroughi (2008) Figure 2.28	• Claiming pragmatism can only be done with confidence once the research has been exposed to the input of practitioners • Be careful to miss hidden loops based on how the diagram is drawn
Khan et al. (2016) Figure 2.29	• Be careful to create a forced diagram that has minimal variables yet maximum feedback loops
Campbell et al. (2005) Figures 2.26/2.27	• Iterative creation of diagrams lead to more robust diagrams • Focussing on certain sections of the diagram and not only loops in isolation also provides an interesting level of analysis
All figures	• Lack of time delays could indicate a lack of accuracy in the modelling process to introduce this important aspect

The six different studies presented in this section provided guidance and insight on both pitfalls to be avoided, and interesting perspectives that could be useful for this research. Table 2.15 contains a synthesis of key aspects gathered from studying previous CLDs used in IT research that were used in the creation and analysis of diagrams in this research study.

An interesting observation gained from the scrutiny of CLDs used in prior IT research is the lack of time delays in the diagrams. Not a single one of the diagrams contains any time delay. According to Yang et al. (2019, p. 2), CLDs are used where there are multiple and interacting processes, time delays and non-linear effects. Given that time delays increase dynamic complexity (Fang et al., 2018, p. 1305) and that this aspect often appears at the centre of systems archetypes, this may be an important oversight in totally understanding the system’s behaviour.

A final observation is the lack of arguing of leverage common in the diagrams presented. By creating and discussing CLDs, it is used diagnostically but not necessarily prospectively as suggested by Braun (2002). Searching for and identifying leverage allow for appropriate actions to be defined.

2.7 CHAPTER SYNTHESIS

Business and IT alignment, the contribution of IT to strategic intent and objectives in an appropriate and harmonious manner, remains one of the evasive issues for both researchers and practitioners in IT. Given the empirical evidences that established the strong relationship between BITA and organisational performance, the continuous attention rendered by scholars since the mid-1980s is justified, but not in all instances. Practitioner surveys among IT executives globally indicate that BITA has been consistently ranked at the top of the list of concerns for decades and that achieving and maintaining alignment remain extremely important for organisations.

The evaluation of the IT business value is a persistent challenge, and at the same time, the applications of information technology are becoming more ubiquitous and integrated in everyday business context. The literature on BITA is immense and many authors have proposed multiple instruments to measure BITA (the KSC) as well as factors to consider (the CSFs) within organisations that strive for alignment.

There are two key business-IT alignment conceptualisations. The first conceptualisation sees alignment as the degree to which the business mission, objectives and plans are supported by the IT mission, objectives and plans. This can be simplified as the extent to which IT supports business. The second conceptualisation proposes a more holistic concept that integrates business strategy, IT strategy, business infrastructure and IT infrastructure. This conceptualisation is best represented by the Strategic Alignment Model (SAM) commonly used in the literature. This conceptualisation represents more than how IT supports the business since it also asks how the business plans for and successfully exploits its IT assets.

As a dynamic process, alignment focuses on activities that management perform to achieve cohesive goals across the IT and other functional areas in the organisation. Evaluating these activities needs assessment methods and techniques that make it possible for an organisation to determine its relative level of alignment and to define actions on how it can be improved. Luftman (2000) developed the Strategic Alignment Maturity Model (SAMM) that explains six dimensions for alignment; communication, competency, governance, partnership, scope, and architecture and skill.

Although there is not a universally-accepted model to measure BITA, a few instruments have been used with various degrees of success. The most common of these is undoubtedly the SAMM developed by Luftman (Section 2.2.4) and various derivatives thereof. Authors agree that BITA is an ongoing management challenge set to continue and probably increase in complexity due to the growing transformational power of IT on the strategic intent of organisations.

The notion of strategic alignment, as exposed in the literature, builds on three central arguments.

i) Organisational performance depends on structures and capabilities that support the successful realisation of strategic decisions.

ii) Alignment is a two-way process, where business and IS strategies can act as mutual drivers that are mutually dependent on each other through common planning and execution.

iii) Strategic IS alignment is not an event but a *process* of continuous adaptation and change.

While the former aspects (structures, capabilities, interdependencies) are mostly well understood, it remains unclear how to achieve and sustain the process of strategic IS alignment over time.

Project management, as a relatively young management discipline, has attracted significant research over the last three decades. As the body of knowledge started to mature for managing projects in isolation, research focus shifted to the interdependency between projects, and in particular, the ongoing alignment of projects with the strategic intent of organisations.

Project portfolio management defines a set of management practices that select, prioritise and even terminate poorly-performing projects. The fundamental objective of PPM is to determine the optimal balance of current and proposed projects to achieve the organisation's strategic goals, considering resource constraints and a complex set of organisational realities.

It is important to note the underlying support for BITA within the PPM literature. Clear evidence from the literature is provided in this chapter that BITA is an ongoing process that consists of various actions (CSFs) and where progress towards improved alignment should be gauged (via KSC) within organisations. BITA is complex and has multiple dimensions. Some proposed models confirm that it is also a continuous process. PPM is also an on-going process that consists of many different practices that are executed to maintain and improve the alignment of projects with the strategic intent and operational resource realities within the organisation. The literature review thus provides support for the research proposition.

Strategic management as a discipline has evolved significantly over the last four decades, moving from the resource-based view and the market-based view towards the latest thinking in dynamic capabilities. This view has a profound impact on BITA. From the one perspective, technology continuous to shape the environment, both the market and resources of firms, and as such, strategic management are dealing with a fluid and complex environment that changes continuously. Achieving alignment is thus like hitting a moving target. However, the technology is also evolving at a rapid pace and continued investments in technology require astute management of the complex sets of IT portfolios that need to deliver on the strategic intent. It is like shooting with a moving gun. However, there are interdependencies between the different IT initiatives and systems, some legacy investments critical for operational performance, and others modern and necessary investments that create immediate customer value. There are thus multiple moving guns, moving relatively to each other, that need to hit a moving target when dealing with BITA from a strategic perspective. In systems thinking, this is referred to as dynamic complexity.

System dynamics is a modelling technique consisting of various modelling techniques, both qualitative and quantitative. CLDs are of particular interest as a qualitative method that should be used in an iterative manner to document the complexities in social systems. Insights can be gained from both the process to create the diagrams as well as the diagrams themselves that may, or may not, contain certain common structures, called systems archetypes. The diagrams are highly suited to deal with dynamic complexity inherent to the BITA challenge for organisations.

CLD have been used before to conduct research in the IT domain. The chapter concludes with six different uses of CLDs in IT intrinsic publications, one which is a practitioners' perspective on BITA. However, after carefully analysing both the articles and the diagrams, certain limitations and shortcomings of the diagrams are highlighted. However, there are also valuable insights to be gained from the prior use of CLDs in IT research, as indicated in Table 2.14.

Chapter 3 presents the research methods that were used, with the exception of details on CLDs that have been covered in this chapter.

CHAPTER 3
RESEARCH DESIGN AND METHODS

3.1 INTRODUCTION

This chapter provides the research approach (point of departure), the research design (**what** was done) and the various research methods (**how** the various techniques were used in conducting the research).

The research questions are given in Section 3.2. The multiple research techniques are introduced in the research process flow (Figure 3.1) that provides a chronological sequence of the steps used to execute the research (Section 3.3). The detailed methods (Section 3.4) are covered in the sequence indicated in the process flow diagram, including how sampling was done, the construction of the research instrument, the documentation and analysis of the research data and the creation and analysis of causal loop diagrams. The chapter also contains the structure of the research report (Section 3.5) and a mapping of the various steps of the research process to chapters in the research report.

In addition to limitations introduced by the specific methods used in the research, the final sections also contain the limitations of this study due to the chosen design (Section 3.6) as well as the ethical considerations (Section 3.7).

3.2 RESEARCH QUESTIONS

Chapter 2 provided the context for the **primary research question** that has been defined as follows:

> *What insights can be gained from system dynamics diagrams when modelling the influence of PPM practices on the alignment between IT investments and an organisation's strategic intent?*

The complexity of the research question (RQ) and state of the current BITA and PPM literature necessitated multiple sub-ordinate questions to be defined as well as multiple research techniques to answer the different questions. The research questions firstly dealt with the lack of clarity on BITA CSFs (RQ1), then the lack of clearly-defined PPM practices (RQ2), followed by the dynamic relationships between these two concepts (RQ3) and finally, insights based on the data analysis (RQ4).

The complexity of the research questions as well as the interdisciplinary nature of the research also required a multi-stage approach to the research: Stage I necessitated two systematic reviews; Stage II comprised in-depth interviews and Stage III included semi-structured interviews. The detail process flow including the different stages are presented in Figure 3.2. Table 3.1 contains the four research questions, the stages associated with each research question and the techniques described in detail in this chapter. Furthermore, Table 3.1 shows the chapter in the document where the results of the methods associated with each research question is presented.

Table 3.1: Research questions

Id	Question	Technique	Stage	Presented
RQ1	What are the critical success factors that contribute towards business and IT alignment according to the academic literature?	Systematic review	I	Chapter 4
RQ2	What collection of practices defines PPM, according to academic and practitioner literature?	Systematic review	I	Chapter 5
RQ3	What are the dynamic relationships between the PPM practices and business and IT alignment CSFs?	In-depth interviews and CLDs	II	Chapter 6
RQ4	What systems archetypes are prevalent within the system dynamics diagrams that depict the PPM practice and BITA CSF relationships	Analysis of CLDs to identify and describe systems archetypes	III	Chapter 6

The research lead to the construction of a set of system dynamics diagrams that can be used by practitioners to align their strategic intent with efforts and investments in IT. The objective is to enable practitioners to take specific actions that would facilitate a higher degree of alignment between strategic intent and IT efforts and investments, over a period of time.

This desire to define actions gravitate towards a pragmatist research approach. According to Goldkuhl (2004, pp. 13-14), pragmatism as a research approach involves an interest in actions, past actions performed, but also future actions to be considered to achieve a particular objective.

3.3 RESEARCH DESIGN AND PROCESS FLOW

3.3.1 Research design decisions

In their seminal article, *Methodological fit in Management Field Research*, Edmundson and McManus (2007, pp. 1158-1161) argued that the state of prior theory has a direct impact on the appropriateness of the research design. According to them, prior research can broadly be classified on a continuum ranging from: (i) *Mature theory research*; (ii) *Intermediate theory research;* to (iii) *Nascent theory research*. ‘BITA’ and ‘IT value’ are not nascent in nature since there is substantial academic interest and growing contributions in this area. It does not fit the criteria for mature theory research either, as is evidenced by the arguments presented in Chapter 2. Within the middle (Intermediate theory) area, Edmundson and McManus (2007, p. 1160) stated that research questions typically propose “relationships between new and established constructs”, which is in line with the primary research question of this study.

Within the *Intermediate theory research* domain, Edmondson and McManus (2007, p. 1164) highlighted that the typical methods for collecting data include “interviews, observations, surveys, [and] obtaining material from field sites relevant to the phenomena of interest”. They remarked that a possible theoretical contribution in the intermediate research domain could be "one that integrates previously separate bodies of work". This integration is in essence a new perspective on an existing problem that is often achieved through exploratory work. It is very clear that the research questions for this research indeed sought a new perspective on a well-researched if not mature area of research and had to be exploratory in nature.

An exploratory study aims to uncover new insights into phenomena, to ask questions, and to evaluate these phenomena from a new perspective (Saunders, Lewis & Thornhill, 2007, p. 598). Exploratory research was used to gain a deeper understanding of a concept, in this instance, BITA and then in particular the impact of PPM practices on BITA. A descriptive study, conversely, produces an accurate representation of situations (Saunders et al., 2007, p. 596).

Although theoretical models and constructs exist for various perspectives of BITA and PPM, there is not a generally-accepted set of BITA CSFs or PPM practices as argued in Chapter 2. However, defining these factors and practices did not require an explorative approach, but rather a systematic and descriptive approach to extract this from existing IT and project management literature. Nevertheless, answering the primary research question to determine whether PPM practices contribute towards BITA, or rather the BITA CSFs, required explorative research to investigate this phenomenon, which led to both exploratory and descriptive research applied as indicated in Figure 3.1.

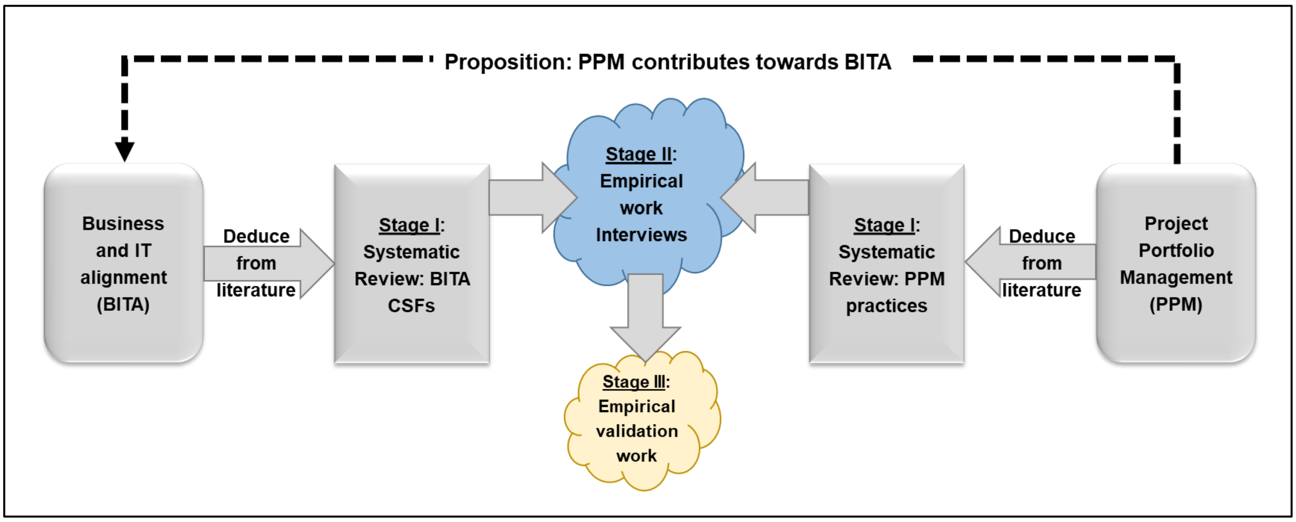

Figure 3.1: Research design

Figure 3.1 provides an overview of the research design. The qualitative empirical work in Stage II explored the influence between the PPM practices and the BITA CSFs. In order to do this, the PPM practices first had to be distilled from project management literature and properly described. Similarly, the BITA CSFs had to be extracted from prior IT research and defined. The qualitative research method of systematic review was followed in Stage I to extract the required factors, prior to doing the empirical work via in-depth interviews in Stage II.

The empirical work also followed a qualitative approach, since it intended to uncover a deeper level of understanding. A final Stage III was required to discuss the potential value with academics and also to validate the application of the key findings with practitioners through semi-structured interviews.

According to Gephart (2004, p. 455), qualitative research in management emphasises the qualities of entities (like alignment) and studies phenomena in the environments in which they naturally occur, through the use of social actors' meanings to understand the phenomena. Although Gephart (2004) argued that the differences between quantitative and qualitative research is often overstated, there are two important factors that very clearly justified the use of qualitative research in this instance. Firstly, qualitative research "infers the meanings in use by societal members to explain" how they observe and react to realities (Gephart, 2004, p. 455); in this instance the strategic employment of IT and presence of PPM practices. It thus builds social science constructs from experience in practice and "focusses on the socially constructed nature of reality" (Gephart, 2004, p. 455). Secondly, qualitative research starts from and return to words, a narrative description of the reality studied, and see this as meaningful representations of phenomena studied. Qualitative research thus "has an inherently literary and humanistic focus" (Gephart, 2004, p. 455).

It is not the intent of this research to validate any theory and to determine the extent, in a quantitative manner, to which certain independent variables contribute to some dependent variable. The focus of the entire design is to probe for deeper insights into a complex management challenge. What is rather unique is how these insights are presented through system dynamics methods to be further analysed.

In essence, five different research design decisions were made for this research:

i) **Qualitative research:** deciding on qualitative research was mandated by the complexity of the primary research question that is concerned with understanding issues or particular situations, by investigating the perspectives and behaviour of the people in these situations and their context. Section 3.3.2 contains the complete description and justification for using qualitative research methods.

ii) **Systematic review (SR):** using a SR design was justified based on the existence of the factors (alignment) and practices (PPM) in multiple peer-reviewed articles, yet an absence of a universally-accepted set of factors and practices within both academia and practice. The SR thus represents a scientific rigorous process to identify the entities required for the interviews. The complete description and justification for using the SR as a research method is contained in Section 3.3.3.

iii) **In-depth interviews:** using in-depth interviews allowed for probing and follow-up questions to uncover the relationships being investigated until the necessary insights had been extracted. The semi-structured nature ensures that all factors and practices are covered. Section 3.3.4 contains justification for using semi-structured in-depth interviews as a research method.

iv) **Semi-structured interviews:** using semi-structured interviews with practitioners allowed for the discussion of the different diagrams and opinion on the short narrative provided for the key insights. Section 3.3.5 contains justification for using semi-structured interviews as a research method.

v) **System dynamics diagrams:** using system dynamics as method to document the interviews is based on the desire to deal with dynamic complexity as justified in Chapter 2. The diagrams ensure that the richness of the data is not lost, whilst providing a visual mapping of the data that will enable further analysis. Section 2.6 and Section 3.3.6 contain the complete description and justification for using system dynamics and CLDs as a research method.

Each of the design decisions are substantiated below, before the detail of execution is covered in depth later in this chapter.

3.3.2 Qualitative research

Contemporary management research demonstrates numerous approaches to doing research of high scholarly quality and practical relevance (Hodgkinson & Rousseau, 2009, p. 534). Ultimately, the research problem, question and objectives define the use of quantitative or qualitative methods and data. Snider (2010) observed that although numbers impress, they unfortunately also conceal far more than they reveal. In the context of this research, numbers would indeed not have been able to present the level of insight required, nor dealt with the dynamic complexity of BITA and the contribution of PPM practices towards alignment, as mandated by the research problem (Section 1.3) and research question (Section 3.2). The desire to understand the complexity and ambiguity and to deal with the socially-constructed realities mandated a qualitative approach that delivers deeper levels of insight.

According to Sarker, Xiao and Beaulieu (2013, p. iii), IT researchers have started to recognise that fast-changing phenomena are difficult to investigate solely through the use of traditional quantitative methods. Qualitative research is a holistic approach of discovery that can be described as an "unfolding model that occurs in a natural setting that enables the researcher to develop a level of detail from high involvement in the actual experiences" (Williams, 2007, p. 67). An important characteristic of qualitative research is that a social phenomenon is investigated from the participant's point of view.

The strong relationship between the observer and the data is a marked difference from quantitative research, where the researcher stands strictly outside of the phenomena being investigated. Qualitative research often takes place in a natural setting that enables the researcher to develop a level of detail from being highly involved in the actual experiences (Creswell, 2003, p. 18). Qualitative research builds its premises on inductive, rather than deductive reasoning. It is from within the observational elements, which pose interesting questions, which the researcher attempts to explain the phenomena being researched. In qualitative research, empirical research data is used to explain phenomena relevant to social behaviours in new and emerging theories (Williams, 2007, p. 68). It does introduce certain complexities in data gathering that is dealt with in Section 3.4.10.

Sarker et al. (2013, p. iii) stated that qualitative research is seen as a legitimate method in the IT research community, as is evident from the presence of qualitative work at leading IT conferences and in prominent IT journals, that had been reluctant to publish this in the past. In fact, they point to editorials that bemoan the lack of sufficient qualitative research for their journals (Sarker et al., 2013, p. iii). Although the outdated debate surrounding the quality of qualitative research is still present in limited academic settings, this research simply deals with that debate by quoting the work of Davies (2007, p. 574), who observed that "good qualitative research has equalled, if not exceeded, quantitative research in status, relevance, and methodological rigor". The challenge of qualitative research does not lay with its rigour; it lies in proving rigour by providing sufficient detail of the steps followed in the analysis.

3.3.3 Systematic review (Stage I)

The lack of universally-accepted sets of success criteria for BITA required for the explorative interviews, as well as the absence of well-defined practices for PPM, necessitated prior descriptive research before conducting the interviews. It was determined that the success factors (BITA) and practices (PPM) are in fact present in academic literature, just not in a succinct manner to be useful in this research.

A systematic review (SR) refers to the process of systematically locating and collating all available information on an effect (Davis, Mengersen, Bennett & Mazerolle, 2014, p. 511). SRs originated in studies relating to health sciences but was subsequently used in multiple other fields of study, including IT. Various guidelines have been developed over time to assist researchers to apply SRs in these fields of study and common challenges have been identified to improve the scientific rigour of the SR (Davis et al., 2014, p. 512). A SR was conducted on prior literature on the topic according to the guidelines provided by Okoli and Schabram (2010), who had defined the conditions for using SR in IT research.

Okoli and Schabram (2010, p. 1) defined a SR as "a systematic, explicit, comprehensive, and reproducible method for identifying, evaluating, and synthesizing the existing body of completed and recorded work produced by researchers, scholars, and practitioners". SRs are secondary studies that require prior research on the topic, in contrast to general literature reviews that can provide the theoretical background for research (for example Chapter 2). Although Okoli and Schabram (2010) regard the SR as an original and respected work of research in itself, for this research study it was simply regarded as a necessary step to establish the success factors (BITA) and practices (PPM) that were used during the interview process that forms the primary research. However, the SR being a rigorous and recognised scientific method, gives credence to the use of the particular method and value from this section of the research.

3.3.4 In-depth interviews (Stage II)

Qualitative research is guided by the philosophical convention of qualitative inquiry: "to understand a complex phenomenon, you must consider the multiple realities experienced by the participants themselves, the insider perspectives" (Suter, 2012, p. 344). The most common sources of qualitative data include interviews, observations and documents to capture the description of people's lived experiences, events or situations (Suter, 2012, p. 344). When using qualitative data, attention is given to rich detail, meaningful contexts and experiences. The goal of qualitative data is to uncover emerging themes, patterns, concepts, insights and understandings (Patton, 2002).

Interviewing differentiates itself from other research methods by engaging participants directly through a discussion with the researcher, who generates deeply contextual, nuanced and accurate accounts of participants' experiences and interpretations of these experiences. Importantly, interviewing does not automatically assure the generation of rich data and significant insights (Schultze & Avital, 2011, p. 1). The well-designed research interview gains a deeper understanding of social phenomena than would be obtained from purely quantitative methods, such as questionnaires (Gill, Stewart, Treasure & Chadwick, 2008, p. 292). Interviews are therefore regarded as most appropriate where little is already known about the study phenomenon or where detailed insights are required from individual participants.

During an in-depth interview, the researcher is required to listen attentively to what interviewees have to say in order to gain more knowledge about the study topic (Gill et al., 2008, p. 292). Interviews are deemed appropriate when the researcher is interested in gaining insights into, or an understanding of opinions, attitudes, experiences, processes, behaviours or predictions (Rowley, 2012, p. 261). In this research study, the investments and efforts from organisations concerning IT required an in-depth discussion due to the complex dynamics in both decision-making and execution when aligning these investments with strategic intent.

Given that no suitable research instrument specific to this context, that would answer the research questions, had been identified in the preliminary literature review, the study included developing a research protocol to be administered via interviews (see Section 3.4.9).

3.3.5 Semi-structured interviews (Stage III)

Rowley (2012, p. 262) stated that interviews are often categorised on the basis of their level of structure. It is normally a continuum from structured interviews, in which a few questions are asked in the same order expecting relatively short answers, to unstructured interviews based on a limited number of topics with the emphasis on encouraging the interviewee to talk around a topic. In the middle of this continuum is the semi-structured interviews' take on a multiplicity of forms.

Semi-structured interviews are useful when the research is exploratory, and it is not possible to draw up a list of possible pre-codes because little is known about the subject area. Semi-structured interviews consist of several key questions that help to define the areas to be explored, but also allow the interviewer or interviewee to diverge in order to pursue an idea or response in more detail (Gill et al., 2008, p. 291).

The semi-structured interview was appropriate to ask academics about the potential academic value of the research as well as how this should be presented to practitioners. Once this insight had been gained, it was also an appropriate method to interview practitioners to determine the potential value from the research.

3.3.6 Causal loop diagrams

A key challenge with qualitative research is that it very quickly generates a very large and unwieldly amount of data, often leading to significant volumes of transcribed text or recorded audio or video. However, the nature of qualitative research dictates that, once it has been decided to perform interviews, the researcher is left with little choice but to deal with the data deluge. Although challenging, this is not undesirable, given the correct context, questions, sampling and research subjects there is richness of information embedded in this vast amount of qualitative data.

The nature of the research question(s) and how the analysis will be done determine the depth, quality and richness of the interviews to be conducted. Miles (1979) depicted qualitative data as an *attractive nuisance*. It is attractive due to this richness; however, significant effort is required to find analytical methods to deal with this richness, hence the nuisance. Therefore, the researcher needs to consider the analysis of data before conducting the interviews.

Analysis of qualitative data can be done via multiple different methods. Zhang and Wildemuth (2009, p. 308) emphasised that the analysis of the transcribed material should not be left until all interview data had been transcribed. Edmundson and McManus (2007, p. 1165) argued that, in qualitative data gathering, it is common to find relationships that describe patterns to suggest variance theories, i.e. an increase in X leads to an increase in Y, as well as process theories, how a particular phenomenon works. The strength of CLDs (see Section 2.6) lies in its ability to capture the richness of the interactions between variables and not become preoccupied by quantitative relationships.

Yang et al. (2019) used CLDs to demonstrate empirical findings from interviews and discussion workshops. They contended that using CLDs is an especially useful method for their study because it is widely applied in situations with interacting processes, time delays and non-linear effects (Yang et al., 2019, p. 499). The methods used in this research, although conducted prior to the publication of the work of Yang et al. (2019) follow a similar pattern. Luna-Reyes and Andersen (2003) provided guidance on using CLDs to present qualitative data that was used to design the transfer of qualitative data from interviews into system dynamics diagrams.

The method used was to review the narrative of the interview and through that, identify the main variables that emerge from the data, before building the causal linkages between variables (see Figure 3.5 and Figure 3.6). The resulting CLD is grounded in the interview data and generates insights about how different managerial mental models interact when some variables are controlled.

A CLD is a graphical method used to show the interrelated factors and causal relationships between system elements (see Figure 2.17 and Figure 2.18). CLDs consist of variables and dynamic links connecting the variables and they are often used to provide insight into the mechanisms that contribute to problems, to enable a more holistic perspective on the problem (Love, Davis, Ellis & Cheung, 2010). CLDs accommodate the complexity of relationships that can be extracted from the interviews but also go beyond the constraints of a linear relationship by explicitly acknowledging the importance of feedback in the relationship (both reinforcing and balancing).

According to Odiit et al. (2014), many current methods of analysis do not have the ability to analyse complex non-linear relationships and therefore have limited capacity to inform strategic alignment planning and implementation. This is particularly relevant in environments where social and inter-personal factors can be amplified. The use of CLDs enables managers to better understand key interdependencies and non-linear behavioural connections between variables, enabling managers to make targeted improvements (see Section 2.6).

Richardson (2011, p. 224) argued the importance of using only endogenous variables in CLDs when “modelling for endogenous insight and understanding”. He continued to provide examples from the early work of Forrester and argued the importance of not introducing exogenous (not part of the feedback loop) variables when searching for, and creating simulation models to gain endogenous insight. A deliberate modelling decision was made in this research to not limit the diagrams constructed to endogenous variables only, but to present the full picture to gain insight into external influences, including potential forms of leverage, as well.

Using CLDs to depict quantitative data is not common, but neither unprecedented. Section 2.6.7 provides examples of the use of this method in IT research. Given the arguments about dynamic complexity in Chapter 2, and the ability of system dynamics to deal with dynamic complexity, it is a very fitting method to depict and analyse the interview data.

3.3.7 Research process

The three-stage research process with 11 steps as well as brief details on the methods are presented in Figure 3.2 and discussed in a sequential manner in this section. In addition, the presentation of the results of each of the steps is also provided to indicate where the results of the particular step are documented.

Step 1: The research commenced with an in-depth literature review intended to not only familiarise the researcher with the current academic discourse in BITA, but also to clearly define the success factors for BITA and identify practices for PPM. The results of this step are contained in **Chapter 1** (the theoretical point of departure) as well as **Chapter 2** (the literature review).

Step 2: It was evident from the research in Step 1, that BITA success factors are not uniquely defined in IT academic literature. A SR was then conducted to define the factors that are used in the empirical work. A total of six different success factors were identified and the process as well as the factors and their descriptors are presented in **Chapter 4**.

Step 3: The literature review also did not find a collection of practices uniformly accepted as the definitive set of PPM practices. A second SR was performed to identify PPM practices that are used in the empirical work. A total of nine different practices were identified and the results and PPM practices are documented in **Chapter 5**.

Step 4: The use of system dynamics, and CLDs in particular, is not common in IT research. This step investigated the fitness for purpose of CLDs as well as the prior use of CLDs in IT research. The limitations and potential value of this method of data analysis was also investigated and documented. The results of this step are presented in **Section 2.6**.

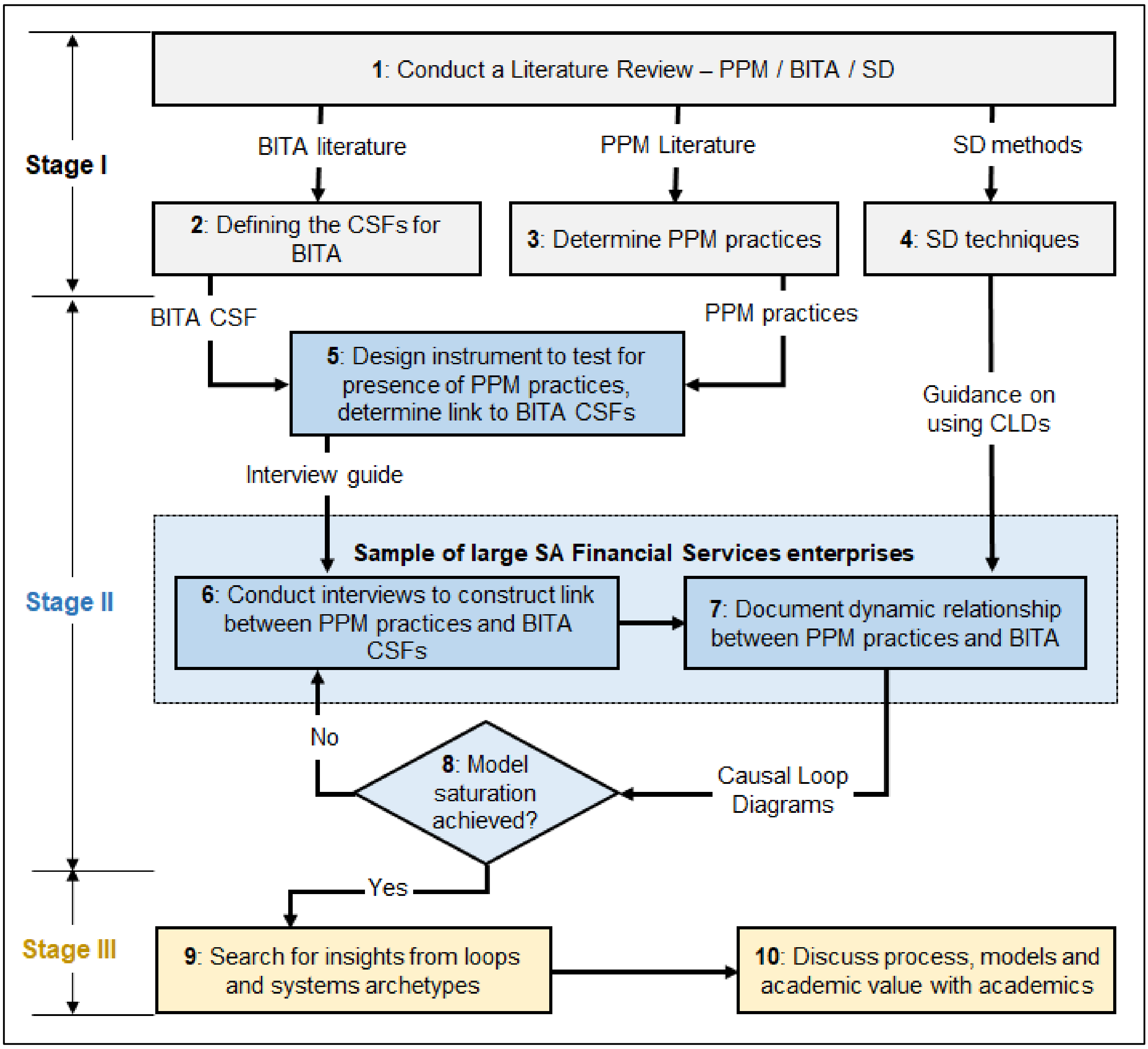

Figure 3.2: Research process flow

Step 5: The CSFs for BITA (output of Step 2) and the PPM practices (output of Step 3) were used to design a research instrument to test both the presence of PPM practices and the contribution of these practices towards BITA (Step 6). The instrument was validated during pilot testing to ensure it could be used to extract the data intended. The instrument consisted of a set of semi-structured interview questions and is contained in **Appendix H**.

Step 6: Semi-structured interviews were conducted with senior managers with IT exposure in financial services firms, using the instrument developed in the previous steps. The data obtained from the interviews was recorded but is not presented in total in the research. **Chapter 6** contains excerpts from the responses from the interviewees made during the interviews and **Table 3.10** presents an overview of the distribution of the participants.

Step 7: The interview data was used to construct a CLD for each of the six BITA success factors. This was done on an ongoing basis, i.e. the construction and update of the diagram was done after every interview (see **Figure 3.5**). The different diagrams, one for each BITA CSF, are presented in **Chapter 6**.

Step 8: After each interview (from the 12th interview onwards) a decision had to be taken in terms of the saturation of the model, i.e. was there new information that influenced the CLD, or not. After interview 21, 22 and 23 it was decided that saturation was achieved since no further changes needed to be made to the diagrams. The diagrams were deemed to be representative of the phenomena investigated.

Step 9: Once finalised, the diagrams were analysed to identify reinforcing loops, balancing loops as well as systems archetypes, to create additional insights and also to determine if there are any leverage points to describe the results of particular actions, true to the pragmatic approach. This analysis is contained in **Section 6.2 to Section 6.9**.

Step 10: The final diagrams, the rigour of the process, as well as the potential value from the diagrams were discussed with a select group of knowledgeable academics in BITA as well as the use of CLDs (see Table 3.11). The discussion probed for both academic and practitioner value and lead to the finalisation of the diagram as presented in **Chapter 6**. The interview sheet used in this step is contained in **Appendix K** and the feedback from the academics is presented in **Section 6.10**.

3.4 RESEARCH METHODS

3.4.1 Methodological fit

Edmondson and McManus (2007) argued that methodological fit, an indirectly valued attribute of high-quality research, has not received adequate attention in management literature. In their definition, methodological fit refers to “internal consistency among elements of a research project” (Edmondson & McManus, 2007, p. 1155). They presented four key elements that should be congruent and mutually reinforcing in appropriate research design (see Table 3.2). These elements are: (i) the research questions; (ii) prior work; (iii) research design; and (iv) contribution to literature. By ensuring the methods presented in this section deals clearly with each of the four elements and descriptions defined by Edmundson and McManus (2007), the risk of research that is not fit for purpose was minimised as is evident in Table 3.2.

Table 3.2: Adapted from Edmundson and McManus

Element	Description	Application in this research
Research questions	• Focuses a study • Narrows the topic area to a meaningful, manageable size • Addresses issues of theoretical and practical significance • Points toward a viable research project; that is, questions that can be answered	Clearly focussed research questions were formulated that address issues of theoretical and practical significance and that can be answered via the methods chosen.
Prior work	• The state of the literature • Existing theoretical and empirical research papers that pertain to the topic of the current study • Aids in identifying unanswered questions, unexplored areas, relevant constructs and areas of low agreement	General literature review, departing from the IT value debate, was performed which covers theoretical and empirical research papers that supported the importance of the research.
Research design	• Type of data to be collected • Data collection tools and procedures • Type of analysis planned • Finding/selecting sites for collecting data	SRs to identify BITA CSFs and PPM practices, and in-depth interviews to study the relationships and dynamic complexity, were employed. Analysis aligned with the research questions and data selection from a dynamic industry that provided rich information.
Contribution to literature	• The theory developed as an outcome of the study • New ideas that contest conventional wisdom, challenge prior assumptions, integrate prior streams of research to produce a new model, or refine understanding of a phenomenon • Suggesting any practical insights that the researcher drew from the findings	Theoretical diagrams were developed to present reality in a new and novel manner that provides new insights. Practical insights and suggestions were made, that could lead to further research as well as practitioner actions to address one of the biggest remaining IT challenges.

Source: Edmundson and McManus (2007, p. 1156).

Although the final heading on Table 3.2 is a contribution to the literature it is evident from Edmunson and McManus description of this element that this includes practitioner literature and a contribution to practice as well, as intended in this research.

3.4.2 Systematic review

As research in IT differs from those in the research fields where SR originated and had traditionally been applied, Okoli and Schabram (2010, pp. 7-8) established that none of the existing guidelines for SR completely meet the distinctive needs of IT researchers. They expanded on the principles of existing SR guidelines in other academic disciplines to develop a set of guidelines for conducting SR in IT research. The two SRs performed for this study closely followed the guidelines developed by Okoli and Schabram (2010, p. 7), indicated in Table 3.3.

Table 3.3 Steps for systematic reviews

Step	Description
Planning	Define the purpose and intended goal of the SR.
Protocol	Develop a protocol detailing the specific steps and procedures to be followed.
Search literature	Search the literature, including describing and justifying the details of the literature review search to ensure the comprehensiveness of the search.
Practical screening	Screen for inclusion to determine which studies are to be included in the review.
Quality appraisal	Determine and score quality of articles for inclusion and exclusion. Spell out the criteria for judging which articles are to be eliminated without further examination due to being of insufficient quality.
Data extraction	Systematically extract the applicable information from the included studies using appropriate techniques.
Analysis	Analyse the data extracted (quantitatively, qualitatively, or both).
Document	Document the process in sufficient detail so that the results can be independently reproduced.

Source: Okoli and Schabram (2010).

The only deviation from the suggested steps from Okoli and Schabram was that the steps *Search literature, Practical screening* and *Quality appraisal* were not always done in sequence, but more in an iterative manner. The step that followed at times influenced the previous step(s) that required repetition. No steps were omitted, some were just repeated to ensure a workable and reliable sample of literature to be analysed.

3.4.2.1 Systematic review 1 (SR1): BITA CSF

Using the SR steps designed by Okoli and Schabram (2010) a systematic review of the BITA literature was performed as outlined in Table 3.4.

Using the initial research protocol for SR1 and the *Publish or Perish* software to search *Google Scholar* more than 1 000 peer-reviewed articles were identified using the full text search for "business and IT alignment". *Publish or Perish* merely provided an interface to search and categorise data via several popular research databases. Google Scholar was used due to its widely-acknowledged access to research data and ability to limit searches to peer-reviewed articles only that was an established criterion for the SRs.

By limiting the publication period to within the previous ten years, a list of 983 articles was still identified, that was too large to consider for review. It was decided to search only for business and IT alignment (words not the string) in the title field only, which could be seen as very limiting. This turned out not to be the case as a total of 123 articles and books were identified in the title-based search. Figure 3.3 contains the search criteria as well as the search results in *Publish or Perish.*

From a practical perspective it was decided to exclude books and once removed, this resulted in a total of 113 articles. The articles were prioritised based on the citations per year, not the total number of citations. This was done to ensure later articles, from the period just before the search, were not excluded due to having a shorter time period for citations. When filtered to have only articles with a total of at least one citation per year, a list of 51 peer-reviewed articles were identified for review.

Table 3.4 Systematic review steps completed for BITA CSF

Step	Execution
Planning	It was decided to use *Google Scholar* due to its wide reach and search for academic articles that contain the factors that lead to improved alignment.
Protocol	Figure 3.3 contains the search protocol as applied using the *Publish or Perish* software and the criteria defined.
Search literature	The search yielded a total of 123 articles and books and once books were removed, a total of 113 articles remained.
Practical screening	The articles, containing between 883 and zero citations, were analysed to determine the number of citations per year and only articles with a minimum of 1 citation per year were included, leaving a total of 51 articles.
Quality appraisal	Each of the 51 articles was analysed individually to determine the focus area and potential contribution towards success factors. Only 23 of the remaining 51 articles met the criteria of containing critical success factors.
Data extraction	Unfortunately, one article was not accessible by any means other than purchasing it directly from the publisher (*InderScience*) and had to be omitted from the selected articles. The data of the remaining 22 articles was extracted using context analysis to first identify success factor codes and then code families to present the success factors.
Analysis	
Document	The results of the process are documented in Chapter 4.

Quality appraisal of the 51 articles was done via abstract perusal and a total of 23 papers relevant to the research question were identified. All relevant articles were downloaded for further scrutiny and review. This resulted in finding appropriate literature in line with the requirements of this research.

The selection criteria ensured that the articles dealt with either CSFs (or antecedents of alignment). These included peer-reviewed journals and peer-reviewed conference papers that deal with BITA from 21 different journals and conference proceedings, with most of these in the information systems domain. Three journals were from general management, two from operations management and one from financial management.

After downloading the articles, it was determined that one of the articles was from a publisher that does not have *Open Access* and that the researcher's institution does not subscribe to. It was thus not possible to access this article and being relatively low on the list of articles from a citing point of view, it was decided that it would not influence the quality of the SR.

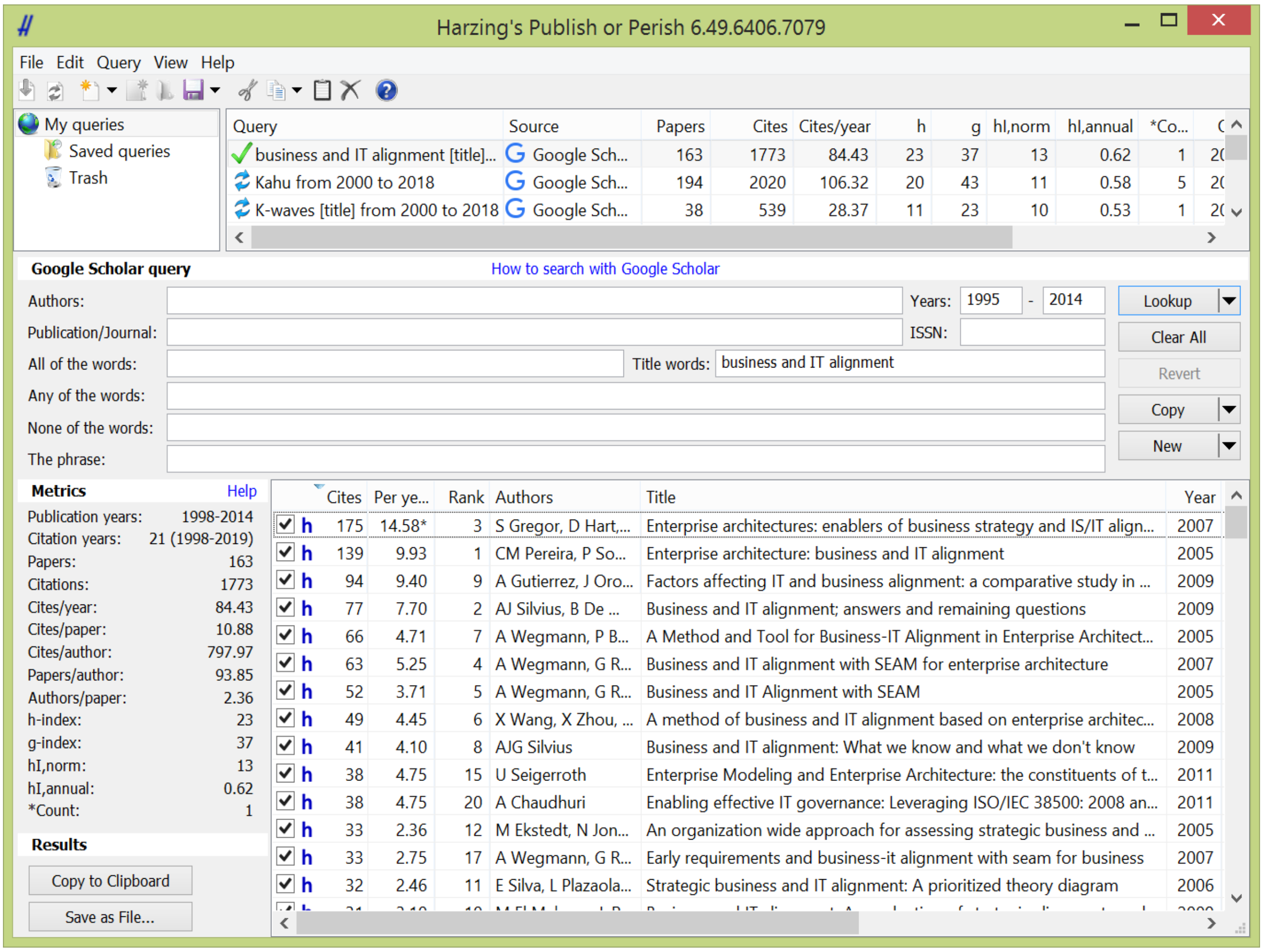

Figure 3.3: BITA SR search protocol in *Publish and Perish*

The remaining 22 articles selected for analysis are presented in Table 3.5. The analysis process and discussion of the critical success factors are described in Section 3.4.3 and is presented in Chapter 4. Appendix B contains the codes and codes families (BITA CSFs), Appendix C contains a mapping of the codes to the selected articles and Appendix D contains an indication of the prevalence of the codes in the articles.

Given a relatively large sample of papers, and the fitness of purpose of the articles that all contained BITA CSFs, it was decided not to perform a systematic forward and backward search following the same or different selection criteria to increase the sample size. This option was left open should there not be saturation towards the end of the analysis, which was indeed achieved after ten articles when no more new codes emerged from the coding process. Appendix C provides evidence that all codes used was indeed identified after the 10th article.

Table 3.5: Articles identified and analysed in the SR for BITA CSF

No	Cites / Year	Authors	Title
1	44.2	Luftman, Papp & Brier (1999)	Achieving and sustaining business-IT alignment
2	23	Wagner, Beimborn & Weitzel (2014)	How social capital among information technology and business units drives operational alignment and IT business value
3	19	De Haes & Van Grembergen (2005)	IT governance structures, processes and relational mechanisms: Achieving IT/business alignment in a major Belgian financial group
4	17.7	Chen (2010)	Business–IT alignment maturity of companies in China
5	15.5	Huang & Hu (2007)	Achieving IT-business strategic alignment via enterprise-wide implementation of balanced scorecards
6	9.1	Tarafdar & Qrunfleh (2009)	IT-business alignment: A two-level analysis
7	8.91	Lee, Kim, Paulson & Park (2008)	Developing a socio-technical framework for business-IT alignment
8	8.44	Saat, Franke, Lagerstrom & Ekstedt (2010)	Enterprise architecture meta models for IT/business alignment situations
9	7.46	Hu & Huang (2006)	Using the balanced scorecard to achieve sustained IT-business alignment: A case study
10	6.43	Schlosser, Wagner & Coltman (2012)	Reconsidering the dimensions of business-IT alignment
11	5.43	Wong, Ngan, Chan & Chong (2012)	A two-stage analysis of the influences of employee alignment on effecting business–IT alignment
12	5.2	Charoensuk, Wongsurawat & Khang (2014)	Business-IT alignment: A practical research approach
13	4.8	Vermerris, Mocker & Van Heck (2014)	No time to waste: the role of timing and complementarity of alignment practices in creating business value in IT projects
14	4.5	Chong, Ooi, Chan & Darmawan (2010)	Does employee alignment affect business-IT alignment? An empirical analysis
15	3.9	Yayla & Hu (2009)	Antecedents and drivers of IT-business strategic alignment: Empirical validation of a theoretical model.
16	3.67	Kurniawan & Suhardi (2013)	Enterprise Architecture design for ensuring strategic business-IT alignment (integrating SAMM with TOGAF 9.1)
17	3.38	Jorfi, Nor & Najjar (2011)	The relationships between IT flexibility, IT-Business strategic alignment, and IT capability
18	3.33	Chebrolu & Ness (2013)	How does alignment of business and IT strategies impact aspects of IT effectiveness?
19	2.67	Schlosser, Wagner, Beimborn & Weitzel (2010)	The role of internal business/IT alignment and IT governance for service quality in IT outsourcing arrangements
20	2.6	Brown & Motjolopane (2005)	Strategic business-IT alignment, and factors of influence: A case study in a public tertiary education institution
21	2	Almajali & Dahalin (2011)	Factors influencing IT-business strategic alignment and sustainable competitive advantage: a structural equation modelling approach
22	1.36	Holland & Skarke (2008)	Business & IT alignment: Then & now, a striking improvement

3.4.2.2 Systematic review 2 (SR2): PPM practices

A systematic review of the PPM literature was performed following the steps as outlined in Table 3.6, based on the SR design of Okoli and Schabram (2010), to define PPM practices. This SR initially only returned nine articles when searching for the words ‘project portfolio management’ practices in the title and the original planning protocol needed to be adapted to ensure enough articles to analyse. The design of the search query and quality appraisal noted the lower prevalence of articles in this space (as compared to BITA) and careful balancing between the search and quality appraisal criteria was thus required.

Table 3.6 Systematic review steps completed for PPM practices

Step	Execution
Planning	It was decided to use *Google Scholar* due to its wide reach and search for academic articles that contain PPM practices.
Protocol	Figure 3.4 contains the search protocol as applied using the *Publish or Perish* software and the criteria as described below.
Search literature	The search initially yielded a total of nine articles and books and needed to be adapted multiple times until a total of 85 items could be identified.
Practical screening	The 85 items included unpublished PhD course work (3), a patent (1) and books (9). Once these were removed a list of 72 articles required further scrutiny.
Quality appraisal	The 72 articles were filtered to show only articles with more than one citation per year and the list was reduced to 47 articles. The abstracts for the 47 articles were downloaded and analysed individually to determine if it contains PPM practices. A total of 31 of the remaining 47 articles met the criteria of containing PPM practices.
Data extraction	The data was extracted using context analysis to first identify PPM practice codes and then code families to present the PPM practices.
Analysis	
Document	The results of the process are documented in Chapter 5.

Using the initial research protocol for SR2 and the *Publish or Perish* software to search *Google Scholar,* more than 1 000 articles were identified using the full text search of “project portfolio management practices” (individual words, not the phrase). By limiting the period of publication to the previous ten years still provided a list of more than 1 000 articles. The search was adapted to search for the phrase “project portfolio management” as well as the word “practices”. A list of 761 articles were still identified, which was too large to consider for review. It was decided to search for these search terms in the previous ten years and anywhere in the text, identifying a manageable list of 122 articles. Figure 3.4 contains the search criteria as well as the search results in *Publish or Perish.*

Once articles with less than one citation per year were removed a list of 85 articles were screened to determine the type. This list included PhD course work (3), a patent (1) and books (9). Once these were removed to only leave peer-reviewed articles, a list of 72 articles remained for further scrutiny.

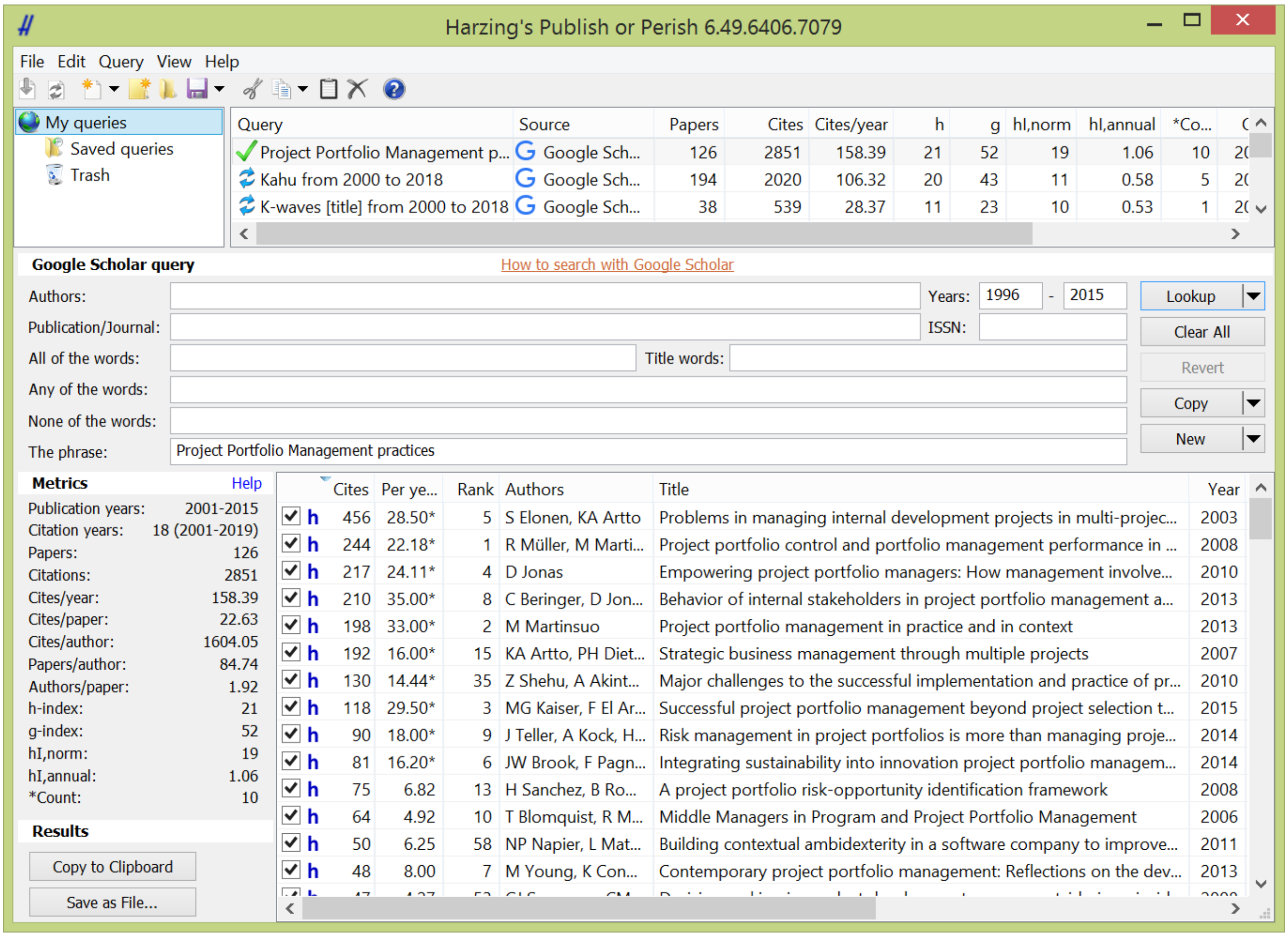

Figure 3.4: PPM SR search protocol

The articles were prioritised based on the citations per year, not the total number of citations. This was done to ensure later articles, from the period just before the search, were not excluded due to having a shorter time period for citations. When filtered to have only articles with a total of at least one citation per year, a list of 47 articles were identified for review.

Quality appraisal of the 47 articles was done via abstract perusal and a total of 37 papers relevant to the research question were identified that potentially contained PPM practices. All relevant articles were downloaded for further scrutiny and review. It was decided to use the 25 most cited articles irrespective and then look for additional articles from the remaining 12 that are the closest aligned to the research question. Another six articles were identified that clearly contained practices that when added to the final list created 31 peer-reviewed articles for the coding. The selection criteria ensured that the articles dealt with either CSFs or antecedents of alignment.

Where the 23 articles from the BITA literature was distributed in 22 different journals and conference proceeding, in the project management literature it was found that one journal dominated the articles identified, namely the *International Journal of Project Management*, with 13 articles from the total of 31 articles. As the most highly-regarded journal in this academic domain, this is not unexpected.

The *Project Management Journal* contained three articles and no other journal or conference proceeding more than two papers each. The other journals, different from the BITA literature that came mostly from IT journals, were spread between IT journals (2), business journals (2), engineering journals (3) and multiple interdisciplinary conference proceedings.

The articles selected for analysis are presented in Table 3.7. The analysis process and discussion of the PPM practices are described in Section 3.4.3 and the results are presented in Chapter 5. Appendix E contains the codes and codes families (PPM practices), Appendix F contains a mapping of the codes to the selected articles and Appendix G contains an indication of the prevalence of the codes, which presents the more granular level of the PPM practices in the selected articles.

Given a relatively large sample of 31 papers and the fitness of purpose of the articles based on the reviews of the abstracts that contained indications of practices that define PPM, it was decided not to perform a systematic forward and backward search. This option was left open should there not be saturation towards the end of the analysis, which was indeed achieved after ten articles. No new code families emerged after the third article and no new codes (sub-practices) emerged after the tenth article. It can thus be stated with a fair amount of certainty that the set of practices presented in Chapter 5 are comprehensive and in all likelihood accurately represent the execution of project portfolio management.

Table 3.7 Articles identified and analysed in the SR for PPM practices

No	Cites / year	Authors	Title
1	39.22	Meskendahl (2010)	The influence of business strategy on project portfolio management and its success: A conceptual framework
2	33	Beringer, Jonas & Kock (2013)	Behaviour of internal stakeholders in project portfolio management and its impact on success
3	30.5	Martinsuo (2013)	Project portfolio management in practice and in context
4	27.5	Kaiser, El Arbi & Ahlemann (2015)	Successful project portfolio management beyond project selection techniques: Understanding the role of structural alignment
5	24.57	Unger, Gemünden & Aubry (2012)	The three roles of a project portfolio management office: Their impact on portfolio management execution and success
6	24.14	Killen, Jugdev, Drouin & Petit (2012)	Advancing project and portfolio management research: Applying strategic management theories
7	23.33	Jonas (2010)	Empowering project portfolio managers: How management involvement impacts project portfolio management performance
8	21.57	Teller, Unger, Kock & Gemünden (2012)	Formalisation of project portfolio management: The moderating role of project portfolio complexity
9	18.43	Heising (2012)	The integration of ideation and project portfolio management: A key factor for sustainable success
10	18.17	Teller & Kock (2013)	An empirical investigation on how portfolio risk management influences project portfolio success

Table 3.7 Articles identified and analysed in the SR for PPM practices (continued)

11	16.5	Costantino, Di Gravio & Nonino (2015)	Project selection in project portfolio management: An artificial neural network model based on critical success factors
12	15	Brook & Pagnanelli (2014)	Integrating sustainability into innovation project portfolio management: A strategic perspective
13	14.67	Teller (2013)	Portfolio risk management and its contribution to project portfolio success: An investigation of organisation, process, and culture
14	12.33	Jonas, Kock & Gemünden (2013)	Predicting project portfolio success by measuring management quality: A longitudinal study
15	11.57	Voss (2012)	Impact of customer integration on project portfolio management and its success: Developing a conceptual framework
16	11.2	Daniel, Ward & Franken (2014)	A dynamic capabilities perspective of IS project portfolio management
17	10.14	Beringer, Jonas & Genunden (2012)	Establishing project portfolio management: An exploratory analysis of the influence of internal stakeholders' interactions
18	9.44	Laslo (2010)	Project portfolio management: An integrated method for resource planning and scheduling to minimise planning/ scheduling-dependent expenses
19	8.83	Killen & Hunt (2010)	Robust project portfolio management: capability evolution and maturity
20	8.67	Killen & Hunt (2013)	Dynamic capability through project portfolio management in service and manufacturing industries
21	8.2	Gutiérrez & Magnusson (2014)	Dealing with legitimacy: A key challenge for project portfolio management decision-makers
22	7.33	Siew (2016)	Integrating sustainability into construction project portfolio management
23	7.33	Young & Conboy (2013)	Contemporary project portfolio management: Reflections on the development of an Australian Competency Standard for project portfolio management
24	7.2	Korhonen, Laine & Matinsuo (2014)	Management control of project portfolio uncertainty: A managerial role perspective
25	5	Pajares & López (2014)	New methodological approaches to project portfolio management: the role of interactions within projects and portfolios
26	4.33	Lerch & Spieth (2013)	Innovation project portfolio management: A qualitative analysis
27	4	LaBrosse (2010)	Project-portfolio management
28	3.6	Hyväri (2014)	Project portfolio management in a company strategy implementation, a case study
29	3.5	Rank, Unger & Gemünden (2015)	Preparedness for the future in project portfolio management: the roles of proactiveness, riskiness and willingness to cannibalize
30	3.43	Frey & Buxmann (2011)	IT Project portfolio Management-a Structured literature Review
31	2	Frey & Buxmann (2012)	The importance of governance structures in IT project portfolio management

3.4.3 Qualitative coding

Edmundson and McManus (2007, p. 1164) asserted that iterative content analysis is a common qualitative data analysis technique. By working through the literature in a systematic manner and coding CSFs in the BITA literature, a comprehensive view of all CSFs was formulated. The same technique was used to scrutinise the PPM literature and code for all practices to distil this from the literature.

Glaser and Laudel (2013, p. 1) defined two, in their opinion mechanistic, qualitative research analytical methods, namely coding and content analysis, a distinction not always made by other authors. Both coding and content analysis create an information base that is structured by categories that are useful in subsequent searches for patterns in data, as well as the integration of the patterns into some structured explanation. The authors distinguished between the two methods by arguing that coding indexes text and preserves the original text with codes describing content segments. Content analysis, conversely, extracts the relevant information from the source text and then only processes the extracted text, not the entire text as when using coding (Glaser & Laudel, 2013, p. 1).

According to Glaser and Laudel (2013, p. 1), content analysis is superior to coding where the research question is embedded in prior theory and can be answered without processing knowledge about the form of statements. Conversely, coding is better suited than content analysis in research that uses this information in later stages of the analysis. This later stage of analysis, in this instance, could mean using the results of the two SRs to interpret the text from the interviews to find relationships between the two code families. Clearly, in this instance coding was the superior choice, based on Glaser and Laudel's (2013) recommendation and was used for the SRs in this research study.

However, care was taken to ensure the categories in the coding scheme are defined in a way that they are internally as homogeneous as possible, and externally as heterogeneous as possible, as recommended by Zhang and Wildemuth (2009, p. 312). The coding of the literature was done using QDA Miner, a qualitative research management software tool developed to perform, amongst other features, content analysis and coding of qualitative data.

3.4.3.1 Coding SR1

Following the coding of the 22 articles on BITA (Table 3.4), a list of 61 different codes were generated. Upon inspection and after allocation to the code families, it was observed that there were clearly terminology issues as well as different levels of granularity in the codes created. The codes were nonetheless assigned to six different code families and then the codes within each family were validated to be as homogeneous as possible following the recommendations from Zhang and Wildemuth (2009, p. 312). It was possible to reduce the 61 initial codes to a final list of 31 codes. Figure 4.1 explains the process flow from the identification of the articles to the final codes and code families.

Chapter 4 contains a detailed description of the prevalence of each code in the literature selected (see Table 4.1) and for each of the code families, which represent critical success factors, a detailed mapping of the codes to the literature has been provided. The chapter contains a detailed description of each of the six critical success factors and concludes with a selected variable that represents the particular factors for inclusion in the CLD (see Section 4.4).

3.4.3.2 Coding SR2

Following the coding of the 31 articles on PPM (Table 3.6), a list of 37 different codes was generated. The 37 codes were grouped into nine different code families, the PPM practices. Appendix E contains the codes generated as well as the code families and Appendix F provides a mapping of all the code families to the 31 different articles.

Chapter 5 contains a detailed description of the prevalence of each code in the literature selected (see Table 5.1) and for each of the code families, which represent PPM practices, a detailed mapping of the codes to the literature has been provided. The chapter contains a detailed description of each of the PPM practices and concludes with an appropriate variable that represents a practice for potential inclusion in the CLD (see Section 5.4).

3.4.4 Research population and sample

This section only deals with the interview population and sample, not the articles used for the SR already been covered.

3.4.4.1 Population

To ensure internal validity and the accuracy, trustworthiness and coherence of information, multiple interviews were undertaken within different companies. The interviewees all comprised management team members with a strong exposure to IT, but not technical IT staff. The selection process carefully dealt with their prior exposure to IT decision making and processes considering the investment and deployment of IT. It was decided to include participants from both business (working outside IT) as well as the IT organisation (working in the IT line function) but only if they have sufficient insight on the technology intrinsic decision processes.

Where a survey design could ‘force’ an incorrect answer from a respondent during an in-depth interview it is possible and in fact desirable for a participant to acknowledge that they do not have knowledge about a particular aspect and is thus unable to answer. However, a careful selection of participants should minimise this occurrence. Table 3.8 presents the detail distribution of the participants interviewed.

The study is not intended to be only of value for any particular industry and the results could be used, with a fair degree of caution, in all organisations. However, in order to select a manageable sample that also meets the criteria of complexity in terms of their investments in IT, it was decided to limit the research to the financial services industry. The industry was chosen for four reasons:

i) The financial services industry is at the forefront of innovation and their strategic intent is probably more **dynamic** than many other industries. Changes in strategic intent ripple down to the IT infrastructure required to execute and typically leads to the BITA disconnect. Although BITA is a concern for all organisations, it is potentially more evident (and certainly not less) than in most other industries.

ii) Financial services are also **heavily invested in IT**. As a percentage of expenditure, as an industry, they are above the mean for IT investments; it thus follows that they will have a significant portfolio of IT projects (Hitt, Frei & Harker, 1999; PricewaterhouseCoopers, 2016, p. 5).

iii) In global measurements of South Africa's competitiveness, financial services and the regulatory environment around the industry have always been a shining light for South Africa. Although theory could be constructed both in terms of poor management practices (practices to avoid) and good management practices (practices to aspire towards), in this instance, the latter was chosen. It was thus assumed that, as an industry, the financial services industry has sufficient **well-defined and executed management practices** that would be beneficial to the research.

iv) **Accessibility**, although not a sound reason to select particular populations, is a reality and the geographical location of the financial services industry and especially their key operations in Cape Town and Johannesburg, as opposed to, for example, mining or energy, made them a practical choice for conducting a sufficient number of interviews.

The sample frame, i.e. organisations where the managers interviewed worked, was defined as (i) large South African (ii) financial services (iii) enterprises, for the following reasons:

- **Large**: In small organisations the magnitude of IT projects and deployments are significantly less. It is thus easier to manage project interdependencies and even the individual business cases of each project. The complexity of large organisations with multiple projects makes it an information-rich environment to study.
- **Financial services**: Although the research is intended to provide value for all enterprises, a decision to restrict the research to a particular sector was made to contain the size of the population and thus ensure sufficient coverage via a more manageable sample.
- **Enterprises:** BITA and PPM practices are organisational attributes that are expressed for an organisation, or at the very least, for a regional or functional structure within an organisation.

The **unit of analysis** for the research is the collection of decisions, actions and processes in organisations related the provision of information technology capabilities with an emphasis on the alignment between what IT provides and what is required by business to execute the strategic intent. However, the questions are not restricted about the organisation in which interviewees work per se, but rather about their personal experience within businesses, of which a significant part may be in the particular organisation. The **unit of observation** is thus purposefully selected individual participants based on their ability to provide insight on the decisions, actions and process associated with IT provision. These individuals were identified based on their ability to provide the required insights.

It was important to deal with employees who were senior enough in their respective organisations to ensure that they had an organisational view and not just a personal perspective at an operational level. Furthermore, to ensure richness in the data, saturation within organisations was not required or desirable. In fact, quite the opposite; a limit of maximum three employees from within one organisation had been set to ensure that multiple organisations were covered.

3.4.4.2 Research sample for interviews (Stage II)

According to Robinson (2014, p. 25), sampling is central to the practice of qualitative methods, but compared with data collection and analysis, its processes have not seen the same level of interest. Robinson proposed the following four-point approach to sampling in qualitative interview-based research:

i) Defining a sample *universe*, by way of specifying inclusion and exclusion criteria for potential participation. This is the population described above.

ii) Deciding upon a sample *size*, through the conjoint consideration of epistemological and practical concerns. The ideal sample size for the research was determined from saturation of the data set. Because analysis was done between interviews, it was possible to continuously check for saturation in the CLD relationships, if not detailed data (see Figure 3.6).

iii) Selecting a sampling *strategy*. The research used theoretical sampling where new organisations and interviewees were selected based on their richness of information.

iv) Sample *sourcing* includes matters of advertising, incentivising, avoidance of bias, and ethical concerns pertaining to informed consent. These aspects were discussed in detail with each selected sample organisation (see Section 3.7).

Robinson (2014, p. 25) stated that the extent to which these four concerns are met, and made explicit in a qualitative study, have implications for its coherence, transparency, impact and trustworthiness. The sample is not a fixed number that has to be obtained, but rather a growing sample that is limited by the concept of saturation (see Figure 3.5) and Section 3.4.6). That is, the research was conducted until the CLDs that had been constructed reached saturation. Pudelko (2014) stressed the importance of not trying to achieve generalisability, but rather, selecting with a theoretical interest, and having faith in the scientific process.

According to Meyer (2001, p. 332), the question of how many interviews to include is complex, since the problem of a single organisation is limited generalisability and several information-processing biases. One way to respond to these biases is by applying a multi-case approach, conducting interviews in multiple organisations. Multiple organisations augment external validity and certainly assist with observer biases within organisations, but requires significant sample sizes.

Given these limitations of the single organisation, it was decided to include more than one organisation in the research. However, the desire for depth, a pluralist perspective and tracking the cases over time imply that the number of cases must be fairly few, according to Meyer. Depth of insight, obtained via in-depth and probing interviews, should not be sacrificed for breath of coverage to satisfy non-case-based research paradigms.

In theoretical sampling, the goal is to choose interviews that are likely to replicate or extend the emergent theory or to fill theoretical categories and provide examples for polar types, in this instance extend the CLD. Hence, whereas quantitative sampling concerns itself with representativeness, qualitative sampling seeks information richness and selects the cases purposefully, rather than randomly (Meyer, 2001, pp. 332-333). Financial services organisations, for the reasons presented, ensured information richness and the selection of the appropriate firms with rich information was more important than the number of cases (see Table 3.7).

Table 3.8: Participant weighted desirability for interviews

Participant profile			**Other industry**	**Financial Services Industry**			
				Other Financial Services *(incl. credit ratings, advisory services)*	**Wealth Management & Mutual Funds** *(incl. investments banks)*	**Insurance** *(including micro insurers)*	**Banking** *(retail, commercial & investment)*
	BITA potential insight	Participant profile weighting	Not acceptable (0)	Acceptable (1)	Satisfactory (2)	Preferred (3)	Preferred (3)
Role in business	IT operational / business with limited IT exposure	Not acceptable (0)	0	0	0	0	0
	IT Leadership	Satisfactory (1)	0	1	2	3	3
	Senior Management with IT exposure	Acceptable (2)	0	2	4	6	6
	Senior Management with IT role	Preferred (3)	0	3	6	9	9

The ideal participant was seen as not in an IT role, but was in a senior business management function (including the CIO that is a business function) with a significant exposure to IT. Candidates for interviews were identified based on their role and company profiles as indicated in Table 3.8 below. The participant scorecard was be used to tentatively rate candidates' perceived level of relevant knowledge both during sampling, and after the interview, if the initial indication turned out to be flawed. For an individual to have been considered as a candidate, a score of greater or equal to one was required. Any candidate not working in the financial services organisations listed, or working primarily in an IT only function, or a business function with limited exposure, was not considered for the interviews (*Not acceptable* category).

Based on the arguments presented here, a total of 23 expert interviews were conducted. They involved IT leadership, senior management with IT reporting roles and senior management with IT exposure. No minimum amount of experience in the industry was defined since the seniority of the role mandated sufficient experience. In addition, the first three questions in the interview sheet were qualifying questions to determine if the interviewee met the required criteria. Due to the careful selection of the participants, every interviewee met the stated criteria.

3.4.5 Interview approach for data gathering

Pragmatism is a philosophical tradition that originated in the United States around 1870. Although the influence of pragmatism declined during the first two-thirds of the twentieth century, it has undergone a revival since the 1970s, with researchers increasingly willing to use the writings and ideas of the classical pragmatists (Hookway, 2008). Goldkuhl (2004) observed a growing interest in pragmatism in IT research and is of the opinion that it is a viable alternative to positivist and interpretivist approaches dominating IS research. Some other authors do not necessarily see pragmatism as a philosophy of equal standing with established research philosophies.

Traditionally, researchers either followed an interpretivist or positivist approach in research. An important difference between interpretivist and positivist approaches is their different epistemological stances (Walsham, 1995). From this perspective, a positivist point of departure is of the position that facts and values are distinct, and scientific knowledge consists of facts. A researcher with a positivist perspective believes the person (researcher) and reality studied are separate and data measures reality and should be treated as such (Weber, 2004, p. iv).

The epistemological point of departure for the interpretivist researcher is based on the assumption that social reality is not singular or objective, but is rather shaped by human experiences and social contexts. It should thus be studied within its socio-historic context by reconciling the subjective interpretations of the participants. Interpretive researchers thus view social reality as embedded within, and impossible to abstract from, their social settings and important in the gathering and interpretation thereof (Weber, 2004, p. iv).

The importance of social issues related to IT has led some IT researchers to adopt empirical approaches which focus particularly on human interpretations and meanings, the socio-technical perspective. Given the socio-technical nature of IT in practice, the prominence of the interpretive empirical school in IT research is to be expected, if not free of controversy. The approach of the interpretive researcher is to attempt the difficult task of assessing other people's interpretations, faulting them through their own conceptual models and presenting a version of events back to others (Walsham, 1995). It thus becomes important for the interpretive researcher to review their own role in gathering and analysing information during their research. When in-depth interviews are used, like in this research, it is not possible to take a purely positivist approach, since the researcher influenced the data gathering and even recording when using certain techniques.

While a lively debate about the relative merits of interpretivist versus positivist approaches to IT research is noted, the important argument for this research approach is taking a position on the influence of the researcher on the phenomenon being studied. That is, when conducting in-depth interviews and using graphical methods to present data, the researcher is not independent of the process and probably leans towards the interpretivist approach, irrespective of their personal position. Although researchers often provide arguments to support their own point of departure, it is actually strongly influenced by the choice of research methods, such as in-depth interviews that cannot really be done from a positivist perspective.

Weber (2004) highlighted the lack of value in the positivism versus interpretivism debate. He stated that researchers should reflect on whether the current rhetoric has any substance and believes it to be “built on straw-man arguments” (Weber, 2004, p. iv). According to Weber (2004), it is necessary to revisit the key assumptions and arguments that underlie the rhetoric and assess their value, since both positivist and interpretive approaches have considerable value. Importantly, they also have profound similarities, rather than mere fundamental differences frequently highlighted in often meaningless academic debates (Weber, 2004).

Feilzer (2010, p. 6) explored the practical relevance of pragmatism as a research paradigm. She argued that “pragmatism as a research paradigm supports the use of a mix of different research methods as well as modes of analysis … while being guided primarily by the researcher’s desire to produce socially useful knowledge”. Feilzer (2010) argued that pragmatism can serve as a rationale for formal research design and result in a more grounded approach to research. Pragmatism suggests that concepts are only relevant where they support action (Saunders et al., 2007, p. 151) and this aligns strongly with the action-orientated nature of system dynamics diagrams used in this research.

The value of diagrams like CLDs is embedded in the insight about future actions, as well as the potential leverage that will yield the best return for effort in a given system. To this extent, the desire to produce a model of practical value is a key parameter in the research design. However, pragmatism in research does not mean taking shortcuts, but rather leaving something of value (Saunders et al., 2007, p. 145).

Goldkuhl (2012, p. 135) supported Feilzer by arguing for alternatives to interpretivism in qualitative IT research and is of the opinion that qualitative research in IT can be performed following a paradigm of pragmatism. According to Goldkuhl (2012), this pragmatism paradigm is associated with action, intervention and constructive knowledge. Hookway (2008, p. 14) concurred and stated that the essence of pragmatism is the "pragmatist maxim, a rule for clarifying the contents of hypotheses by tracing their practical consequences".

Morgan (2014) strongly supported pragmatism as a research philosophy but took strong exception against narrow approaches that reduce pragmatism to practicality. He argued that pragmatism holds its own as a research philosophy due to unique ontology, epistemology and methodology (Morgan, 2014, p. 1045) and presents a coherent philosophy that extends far beyond what is practical. "[P]ragmatism points to the importance of joining beliefs and actions in a process of inquiry that underlies any search for knowledge…" (Morgan, 2014, p. 1045). This view of Morgan (2014) supports the chosen method of analysis from system dynamics as CLDs also deal with relationships between beliefs (information links) and physical actions (action links).

A final and important argument in favour of pragmatism as the appropriate research approach is the very well-known academic merit versus practical application debate in research. According to Panda and Gupta (2014, p. 156), academic research in management is steeped in scientific and methodological rigour, yet mostly of little relevance to practice. Robey and Markus (1998, p. 6) indicated that researchers in IT are facing apparently contradictory pressures when asked to "generate scholarly articles that are academically rigorous; [while] on the other [hand], we are urged to make our research more relevant to practice". Importantly Robey and Markus (1998, p. 7) argued that there is really no intrinsic conflict between these two concepts. They believe that it is not just possible, but also necessary, for IT research to meet both objectives. However, they acknowledged that the relevance to practice should be considered in the initial research design.

The research design and research methods, and in particular qualitative research via in-depth interviews documented using system dynamics diagrams, were thus carefully chosen to ensure sufficient scientific rigour, yet deliver research results presented in a manner that yields practical value.

The absence in dealing with the difference in ontology and other dimensions of positivism versus interpretivism in this chapter is not an oversight; it is an acknowledgement of the work by Weber (2004), who pointed to the common ground between the positivist and interpretive philosophies and the lack of value in focussing in depth on the differences to justify a particular position. In similar vein the use of pragmatism is not justified in contrast to positivism versus interpretivism, but the focus is rather on the fit for the particular research problem and the desire to create something of value for practitioners, whilst acknowledging the rather narrow view that this represents within the pragmatism paradigm.

3.4.6 Richness of information and saturation

3.4.6.1 Theoretical sampling

Etikan, Musa and Alkassim (2016, p. 2) emphasised that the selections made to obtain data should be sound as no amount of analysis can compensate for inadequately collected data, or data collected from incorrect sources. The interview protocol (Appendix H) deals with the collection of data and the rest of this section with the sampling and participants chosen for the interviews.

The purposive sampling used is a non-random technique that does not need underlying theories or a set number of participants (Etikan et al., 2016, p. 2). The technique is used when the researcher decides what needs to be established and identifies participants willing to provide the information by virtue of their knowledge and experience. Purposive sampling is especially valuable to identify and select information-rich cases (Etikan et al., 2016, p. 2). This involves the identification and selection of individuals that are proficient and knowledgeable about the phenomenon of interest. Schultze and Avital (2011, p. 13) argued that sufficient attention needs to be paid to means of generating rich data during interviews to meet the claims that IS researchers make about the richness of the data gathered. This is important in the context of explorative research that tries to uncover the interviewee's beliefs and experiences captured in this research.

Marshall, Cardon, Poddar and Fontenot (2013, p. 12) believe that, while "qualitative methodologists are unlikely to agree on exact sample sizes needed for qualitative studies, they generally agree that a number of factors can affect the number of interviews needed to achieve saturation". They defined these factors as the nature and scope of the research, quality of interviews, sampling procedures and researcher experience.

In all qualitative studies, there are strong grounds for monitoring data collection as it progresses and altering the sample size within agreed parameters on theoretical or practical grounds (Robinson, 2014, p. 31). The sample size in qualitative research is often justified by continuing until data saturation is reached (Francis, Johnston, Robertson, Glidewell, Entwistle & Grimshaw, 2010, p. 1229). The concept of saturation is complex but required when doing theoretical sampling in qualitative research using interviews (Francis et al., 2010, p. 1229). However, Bowen (2014, p. 137) cautioned against the qualitative researcher that mentions saturation, yet fails to provide evidence how this was achieved. Care was thus taken to define, and provide proof of saturation for this study.

Robinson (2014, p. 25) presented a four-point guide that addresses all the key aspects to be considered when doing theoretical sampling. The framework includes: (i) defining a sample universe; (ii) deciding on a sample size; (iii) devising a sample strategy; and (iv) sourcing the sample. Table 3.9 summarises the definitions of these points from Robison as well as the application for the sampling of participants for the in-depth interviews conducted in Stage II of this research.

Table 3.9: Robinson's four-point approach to qualitative sampling

Point	Name	Definition	Application
1	Define a sample universe	Establish a sample universe, specifically by way of a set of inclusion and/or exclusion criteria	Senior managers who have significant IT exposure in financial services firms in South Africa
2	Decide on a sample size	Choose a sample size or sample size range, by taking into account what is ideal and what is practical	The minimum sample size was 12 based on the categories for the interviews and saturation in CLDs was used to determine the maximum sample size
3	Devise a sample strategy	Select a purposive sampling strategy to specify categories of persons to be included in the sample	The inclusion was based on meeting the set criteria, experience and willingness to assist with the research through a 60-minute interview
4	Source the sample	Recruit participants from the target population.	Direct approaches using existing data bases, personal networks and social networks

Source: Adapted from Robinson (2014, p. 26).

Despite the need to argue saturation, there is no generally-accepted method to establish saturation. Francis et al. (2010, p. 1230) recommend a two-step process: Firstly, define the minimum number of interviews to be conducted to ensure sufficient richness of the information. Secondly, decide how many interviews will be conducted without introducing new data into the analysis before making a claim of saturation. In this research study, it was decided to use the minimum number of interviews to cover all the different categories of participants. It is evident from Table 3.8 that there are 12 different categories and hence at least 12 interviews were required.

In order to cover all categories, it was necessary to move sequentially through all the categories and the research was planned accordingly. Due to scheduling realities and cancellations of scheduled interviews, the final category was only reached by the 18th interview (see to Table 3.10). Although initially defined as 12 interviews, the interviews conducted to fill all categories became the minimum number of interviews (as suggested by Francis et al., 2010). Table 3.10 shows that a total of 23 in-depth interviews were conducted with the majority sitting in the highly-desirable part of the matrix.

During the interviews, reflective conversations were conducted to reveal the underlying drivers of the different BITA success factors, as well as the results of these success factors (what does it drive) in line with the suggested guidelines from Sterman (Appendix M). The extensive exposure to IT within the financial services industry, diversity of firms, and diversity of participants led to a rich set of data that presented multiple cause-and-effect relationships. The 23 participants represent 16 different firms and cover a large spectrum of South African financial services organisations.

Table 3.10: Final list of interviewees

Participant profile			Financial Services Industry			
			Other Financial Services	**Wealth Management**	**Insurance**	**Banking**
BITA potential insight		Participant profile weighting	Acceptable (1)	Satisfactory (2)	Preferred (3)	Preferred (3)
Role in business	IT Leadership	Satisfactory (1)	I18	I11, I20	I15	I14, I17, I23
	Senior Management with IT exposure	Acceptable (2)	I12	I10	I5	I4, I9, I19
	Senior Management with IT role	Preferred (3)	I16	I6, I8	I3, I13	I1, I2, I7, I21, I22

Once all categories had been covered by interviews, it became necessary to decide when saturation is reached, i.e. when no more new insights is uncovered by additional interviews. In terms of saturation, the challenge was that new relationships could continue to emerge from the interviews depending on the level of granularity that the interviewee was responding to. In addition, new relationships and data within an interview, do not necessarily result in updates to the CLDs.

It was thus possible to have substantial additional interviews, creating data at a very fine granular level, without influencing the final analysis done by CLD. This required a restatement of the second principle of Francis et al., i.e. how many more interviews should be conducted without adding new insight (their stopping criterion) before the diagrams are no longer updated. Figure 3.5 explains the process of analysis in a graphical format. The figure indicates the interactive process used to create the CLDs presented in Chapter 6.

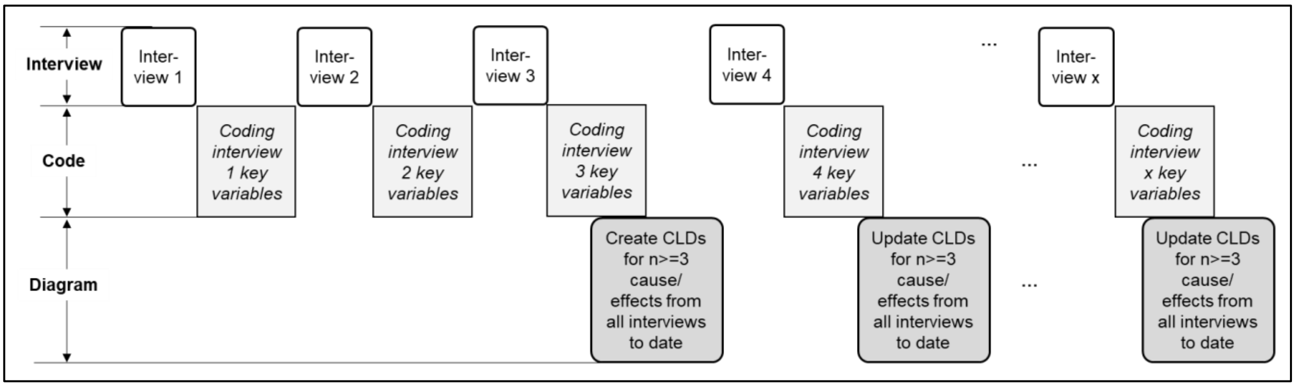

Figure 3.5: Interviews, coding and diagrams

Because coding of the interview data and creation of the CLDs were performed concurrently, it was possible to determine if an interview created data that would impact on the CLD. That is, data was continuously analysed to determine if there were any new relationships in the two prior interviews, which did not emerge in a third interview. After reaching the minimum of 18 interviews to cover the categories, it was decided that if three additional interviews did not add information to the CLD, it would be sufficient to claim saturation.

Interview 19 added two additional relationships by presenting a third occurrence of relationships from prior interviews, but none of interviews 20, 21 or 22 added to the CLD. Saturation, as defined for this study's stopping criterion, was thus achieved. However, since interview 23 was already scheduled, and also fell in the highly-desirable group (see Table 3.7) it was decided to proceed with interview 23 as well. This interview was also coded and confirmed that saturation had indeed been achieved since it yielded some new perspectives at a very granular level, but failed to make a difference to the diagrams that last required an update after interview 19. Interviews 20, 21, 22 and 23 confirmed a significant number of the previous relationships in the diagrams and at a granular level provided new insight, but they failed to change the CLDs.

It can thus be stated with a fair amount of certainty that the relationships depicted in the CLDs (see Chapter 6) are comprehensive and in all likelihood accurately represent the dynamic complexity and influencing (cause) and influenced (effect) variables for each of the six BITA success factors, given that saturation was likely achieved for the interview guide that had been used.

3.4.7 Research sample for academic discussions

For the academic interviews, a purposive sample was selected of prominent academics that could potentially provide insights on the process and diagrams. An element of convenience is also acknowledged since academics who the researcher could potentially get access to were selected.

Etikan et al. (2016, pp. 1-4) stated that non-probability sampling, like the purposive and convenience sample used in this research, has limitations based on the subjective nature in choosing a sample. However, in their opinion it can be useful when randomisation is impossible due to large populations or limited time and resources. Although there was a preference for academics with a strong research profile in either IT value or business and IT alignment, access and availability played a key role in conducting these interviews.

A final interview was conducted with one of the key authors in the CLD space and although not an IT researcher, he provided valuable inputs about the CLDs and their use in practice. Despite being willing to be interviewed, a sixth academic could not make time available for the interview in the period that the interviews were conducted. A total of five of the six academics targeted were thus able to provide valuable inputs about the diagrams (see Section 6.10).

The interview protocol for all academic discussions is contained in Appendix K. Table 3.11 lists the six academics with whom the research was discussed as well as the reasons for their respective selection.

Table 3.11: Academic interviewees

Interview	Academic	Reason for selection	Access	Method
A1	Prof Rik Maes	Key author on BITA, highly-published author	Known to researcher	Face to face
A2	Prof Bart van den Hooff	Highly-published IT researcher including BITA articles	Access via Dr Eoin Whelan	Face to face
A3	Dr Eoin Whelan	Highly-published IT scholar with publications in top practitioner journals	Known to researcher	Video conferencing
A4	Prof Bjorn Clumps	Completed a PhD in BITA and currently works in the FinTech space and is up to date with technical challenges of European financial services organisations	Email invitation accepted	Video conferencing
A5	Dr Hans Vermaak	Expert on using CLDs and have used them extensively in his own research published in top journals.	Email invitation accepted	Video conferencing
A6	Dr Ali Elquammah	Expert IT researcher with a strong interest in pragmatism in IT research	Approached at business conference	Video conferencing

The feedback from the interviews with the academics was not formally analysed but used to decide how to present the final diagrams, how to argue the academic contribution, and how to approach the practitioners with the final diagrams. After the academic interviews, it was decided to create a short textual narrative for each diagram for the benefit of the practitioner interviews (see Section 6.10).

3.4.8 Research protocol

The research protocol used to administer the interviews was developed for this research study (Step 5 in Figure 3.2) and is based on both the BITA CSFs (Chapter 4) and the PPM practices (Chapter 5) and is presented in Appendix H. The intent of the interviews was to probe for the relationships between PPM practices and BITA CSFs via semi-structured interviews, using open-ended questions. This was achieved via four distinct sets of questions (Sections A to D of Appendix H).

The first set of qualifying questions (Section A: Questions 1 to 5) led the interviewee into the BITA theme by asking general questions about the challenges and opportunities presented by IT within their business domain. The questions also acted as a filter to ensure that the participants were able to answer the questions that followed. If a participant was not able to relate to the questions asked in this section, they were excluded from the sample as not having sufficient knowledge to contribute towards the research. Only one participant voluntarily withdrew at this stage citing an inability to answer the questions based on a new role and very limited previous IT exposure. She did ask for the results of the study since she believes there may be value in the research, despite her personal inability to contribute.

The next set of questions (Section B: Questions 8 to 14) tested for the prevalence of the nine PPM practices by asking directly about the presence of the practices within their organisation. Although the interview protocol contains all the codes that contribute to a practice, this was only used as guide during the interview and not to post leading questions. Participants needed to identify the practices themselves, or at least identify the actions associated with specific practices.

The next set of questions (Section C: Questions 15 to 20) tested for the drivers that influence the six BITA critical success factors by asking directly what the drivers are of each of the identified success factors. This was followed by a question to ask about the impact of the presence of the CSF, i.e. what the results of an increase or decrease in the particular factor would be. Participants were not provided with the 34 codes associated with the detail of the success factors although the interview protocol contains all the codes. Once again this was used as guide during the interview and not to post leading questions. Participants needed to identify the drivers (influences) of the CSFs themselves, as well as the factors influenced by the presence and prominence of each of the success factors in isolation.

The final set of questions (Section D: Questions 21 to 23) was intended to be a catch-all set of questions should there be any influences that has an impact on BITA alignment, that had not been covered during the interview. These questions focussed on BITA in particular and was an optional set of questions put to the participants to ensure that any applicable information that they might have, had been captured.

The instrument was pilot tested with the CIO of an organisation (outside the financial services industry) as well as a business representative with an IT function and some questions were refined during this pilot testing. It was also established during pilot testing that the interviews could be significantly longer than the 60 minutes planned. Given the limited time available from the senior managers, it was decided to move very quickly through questions 1 to 14, and then allow ample time to spend in the BITA CSF questions (15 to 20). This was done, since it was deemed impossible to leave out specific questions and still achieve the research objectives.

3.4.9 Data collection Interviews (Stage II)

Data collection was done via interviews to determine the presence of PPM practices and the impact of these practices on BITA success factors. Based on the initial insights from literature and using the instrument developed, a series of 24 expert interviews were scheduled and in the end 23 successful interviews were conducted. The interviews were conducted over ten (10) months from June 2018 to March 2019 in South Africa, either in person or using video conferencing. The interviews each lasted between 54 and 78 minutes. The interviews were recorded with the permission of the participants, and the recordings were used to identify the variables and their influences.

In the mostly open-ended questions, interviewees described their experiences with business and IT alignment. They particularly focussed on organisational structure and processes, challenges and success factors, as well as the prevalence of PPM practices. The emphases throughout the interviews was on cause-and-effect relationships. The interviewer often asked what causes X to happen, or what would cause variable X to change. When causes and effects were not clear, follow-up questions were asked for clarity.

At the conclusion of each interview, an open discussion about BITA was conducted (using questions 21 to 23) to determine whether there were any drivers that had not been covered from the different perspectives presented. These drivers were also allocated to higher-level BITA success factors.

Interviews were recorded, but not transcribed in detail. Between interviews, the key variables were documented individually, not in CLDs. This was required since only relationships that manifested three times were captured on the CLDs.

The transcription was done only for variables that had cause-and-effect relationships. Initially the variables were identified using Atlas.ti since it has the ability to code voice and video recordings. However, Atlas.ti does not have the ability to make cause-and-effect relationships that include direction as well as opposite or same influences, required to construct CLDs. It was thus decided to perform a manual coding process for each interview with coloured notes to represent the relationships from the interview (see to Figure 3.6).

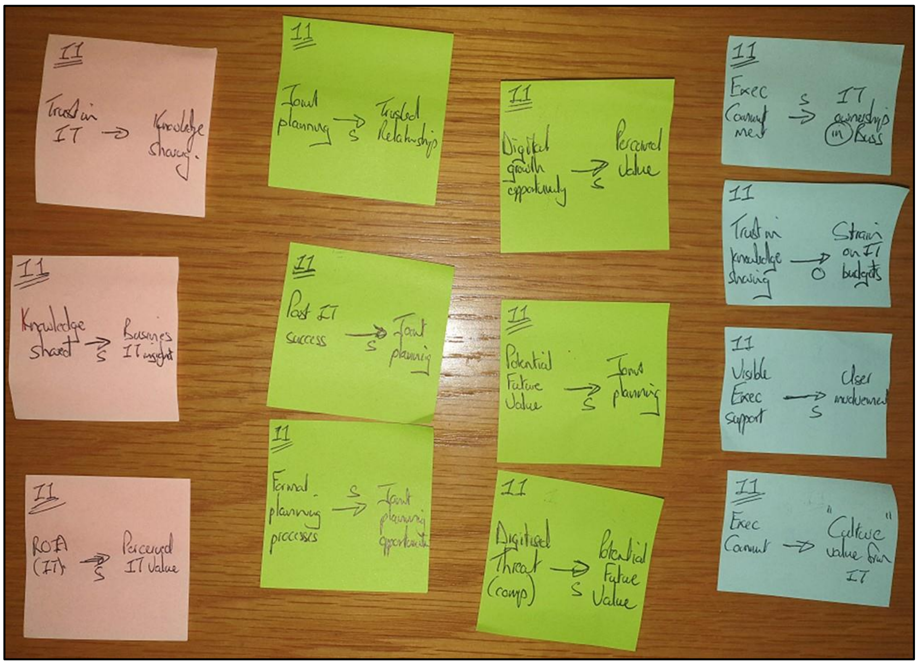

Figure 3.6: Working paper relationships for key variables

Two key challenges in this process was the difference in terminology and the differences in granularity. At times, these differences were evident during the interviews and thus discussed and resolved within the interview. In terms of granularity, care was taken to combine items without losing relevant information. Although a principle decision was taken to also split variables should it be required, this proved impossible, since the original transcript contained the higher-level variable. Splitting into a lower level would introduce observer bias and inaccuracy and the creation of variables not mentioned by interviewees.

In the process there was some divergence regarding the variables due to differences in terminology. It became important to review the variables to ensure that different terms used by interviewees were merged into single variables to reach the required level of communality. Care was taken to resolve terminology differences to ensure that information was not lost, but also that unnecessary complexity was also not created by having two variables that are essentially the same. In this process, it was often required to return to the data to check for and resolve any contradictions.

3.4.10 Researcher influence on data gathering

Qualitative research provides an interpretation of the social world of research participants and their constructed realities when reporting social science research findings. Traditional methods like qualitative coding is used to search for themes and perspectives in the recorded data. A long-standing concern in qualitative research is the role of the researcher in assigning value to one of what may be many possible meaningful interpretations of the same data (Wheeldon & Faubert, 2009, p. 69) To address this concern, qualitative researchers study the experiences, influences and activities of research participants while explicitly considering personal and epistemological reflexivity to acknowledge their own biases.

The interviewer is not a passive player in the interview, but an instrument using his or her abilities, experiences and competencies in the interview situation (Fusch & Ness, 2015, pp. 1410-1411). In qualitative research, the researcher is the prime instrument of data collection. Consequently, the interviewer needs to be reflective, conscious and aware about how his or her role might impact the conversation between the interviewer and interviewee. In this respect Fusch and Ness (2015) urged interviewers to make use of their background, albeit, in a considerate way.

During the interviews care was taken to not contaminate, or introduce bias to the data, but rather to act as a co-creator of data together with the interviewee. Where the interviewer's previous knowledge might have played an important part in understanding the context or the experiences of the interviewee, it was used to obtain clarity, not to influence data.

Given the extensive research on BITA and PPM performed prior to the interviews and the fact that the research is dealing with a socially-constructed problem, there is no doubt a level of researcher influence on the process. This influence could be used to make the process more effective without influencing the data. It becomes important to introduce mechanistic elements into the research to protect the rigour of the scientific process. Such decisions about sample sizes, theoretical sampling for richness of data, interviewing different representatives from different organisations, keeping to the interview protocol, and following a very mechanistic process for coding and documenting variables and influences, were used to deal with potential researcher bias.

Given the myriad of research decisions that are made in the construction and analysis of any study, the acknowledgement of the potential for researcher bias is an important contribution to social science research (Wheeldon & Faubert, 2009, p. 69). The validations of the diagrams with practitioners and academics also served to address potential researcher bias.

3.4.11 Data representation

The process recommended by Sterman (2000) to convert the interview data to CLDs was followed. Several recurring variables and influences emerged from the interview data and all variables, both in feedback loops (endogenous) and external to feedback loops (exogenous), were included in the diagrams. The variables and influences are displayed in six different diagrams in Chapter 6 for each of the six BITA success factors constructed by the process indicated in Figure 3.5. However, no causal link was modelled prior to being mentioned at least three times in different interviews. The variables were thus manually coded after interviews (see Figure 3.6), but only once they had manifested in three different interviews, were they added to the formal diagram for the specific BITA CSF as sufficiently present in the interview data.

The choice of variable for use in CLDs depends on the situation and the core relationships to be captured. This could not be done in a single attempt and required an iterative approach that included eliminating variables that could be left out, without significant effects on the whole. It was also useful to look at the situation from different perspectives and compare views on what was considered relevant (Williams & Hummelbrunner, 2010, p. 38). The relationship between variables are showed by connecting them with arrows that indicate the direction of influence (see Figure 2.18).

The relationships from all prior interview data were compared to see if there were occurrences of at least three or higher to warrant inclusion in the diagram. These themes and links formed the basis for the CLDs that were developed. As the different diagrams emerged, each link in the CLD was reviewed to assess whether the observed relationship was supported by the field data from all preceding interviews. This step helped to ensure that the diagram was grounded in the collected data.

As with causal loop diagrams (CLDs), it is important to not attempt to model the entire situation within which the system of interest sits, but rather to define a clear boundary and remain focussed on elements that are relevant to the problem or the issue to be modelled (Williams & Hummelbrunner, 2010, p. 49). The decision to only model relationships that had been mentioned at least three times created a level of protection against too much detail, and the natural boundaries of the diagrams were created by the data gathered during the interviews.

3.4.12 Data analysis via CLDs

According to Vermaak (2011), CLDs are the most prominent component of system dynamics. CLDs were popularised in the management arena by Senge in the 1990s and have been recognised as a powerful tool to address complex issues. However, this recognition never translated itself into wide application in academia nor practice (Warren, 2004; Zoch & Rautenberg, 2004). One explanation is that it tries to bridge contrasting worlds as an analytical method is applied to deal with socially-constructed problems. CLDs are a systemic approach to understand issues that would remain partly unknowable and unmanageable. This gives CLDs immense value, but also leads to some discomfort since CLDs may feel too fuzzy for analytical researchers, yet too technical for social researchers.

Not only does this lead to CLDs being underused; it also leads to certain difficulties. One of these difficulties is not addressing context complexity, which happens when it is used only as a discussion mechanism without the necessary analytical rigour. Using CLDs in this manner is well established via in-depth and structured reviews, although it introduces the challenge of observer bias since a final product is never presented for review. The contrary challenge is not addressing process complexity, which happens when experts take an unnecessary level of abstraction from reality in apparent service of research rigour. Following this path leads to extremely complex diagrams, which more often than not, means losing sight of the underlying structure that leads to the interesting behaviour.

According to Vermaak (2011), CLDs assist in straddling the analytical and social domains. It is certainly an excellent technique to visualise a rather complex system, a value contribution that is highly applicable to this research. In this study, the researcher is interested in alignment as a system, represented by multiple subsystems, and the behaviour of factors that influence it. Some of these influences can be changed, some cannot be changed, and some can be minimised. These are the insights that could be of more value for practitioners.

A CLD brings out the systematic feedback in processes by showing how variable A (for example a PPM practice) affects variable B and, in turn, how variable B affects variable C (for example a BITA CSF) through a chain of causes and effects. By looking at all the interactions of the variables, the behaviour of the entire system can be discovered, documented and analysed. At this highest level of abstraction, the proposition of this research can be seen as presented in Figure 3.7.

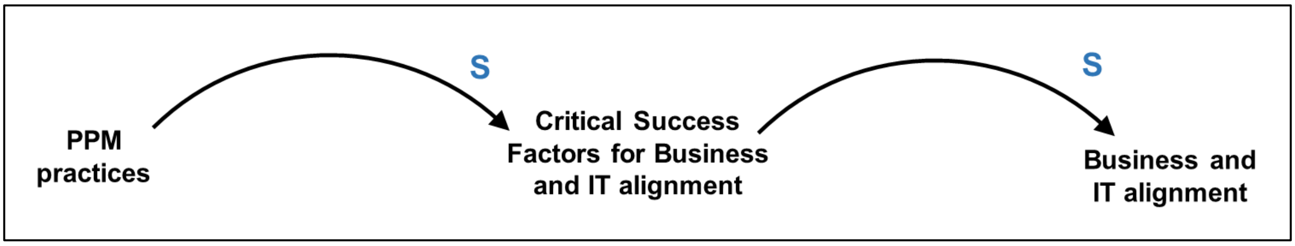

Figure 3.7: The research question expressed as a CLD

With a CLD, a practitioner no longer needs to focus only on one interaction between two variables, but can focus on the entire system, along with its many variables and its many causes and effects. The intent then is to not define one diminutive link, but rather to describe the delicate system that is at play in organisations striving for alignment between strategic intent and the investments in IT, at an appropriate level of detail to provide new insights.

This study utilised the CLD modelling approach and the results were further categorised into a diagram for each BITA success factor. The CLD, discussed in detail in Section 2.6, is a systematic description of a system, taking a 'bird's view' perspective where details that are not shown in the CLD are collapsed into driving variables. A CLD thus elucidates the main feedback loop processes where cause and effect are variables that either change in the same or opposite directions (see Figure 2.18). For the CLD to be effective as analysis tool, the variables must be on the same level of observation, i.e. not mixing different spatial and temporal scales (Wardman, 1994, p. 1). The analysis of CLDs also requires good background knowledge, and proper framing of the problem and key questions, otherwise the analysis risks being superficial and not capturing the important drivers or feedback loops (Wardman, 1994, p. 2). The researcher has more than six years of experience in using CLDs both in practice and in academia.

A final step in the CLD analysis is looking for interpreting systems archetypes (see Section 2.6.5). System archetypes represent generic structures that describe the common dynamic processes that characterise a system behaviour, irrespective of the situation being modelled (Setianto et al., 2014, pp. 642-654). Banson et al. (2016, p. 80) contended that archetype analysis can help in the identification of leverage points, in other words, where an intervention can lead to greater influence on the system behaviour. For Wolstenholme (2003, pp. 7-26), such structures consist of intended actions and unexpected reactions, used to help in generating understanding and, thus, accelerate learning within organisations. The archetypes could help to define the actions that practitioners can take to improve a system's performance, in this instance, the alignment of IT efforts with strategic intent.

3.5 DEMARCATION OF THE RESEARCH

Exploratory research is not intended to provide conclusive evidence; however, it provides a better understanding of the problem (Saunders et al., 2007, p. 134). The research does not provide another BITA model, nor does it intend to validate or expand upon the limited numbers of models or theoretical frameworks currently available.

Similarly, the research conducted does not define the absolute set of BITA CSFs (Chapter 4). Ullah and Lai (2013), for example, compiled an in-depth review of BITA literature through the analysis of 116 papers, and identified ten different aspects in BITA. This is not the intent of Chapter 4 (research question 1) which merely defines a common set of CSFs to guide the interviews (Appendix C).

The PPM practices that were identified via a structured review of PPM literature (Chapter 5) are also not presented as a complete set of practices. Although the methods are rigorous and the practices rather comprehensive, the method did not strive for saturation in practices between the numerous articles; it is just a list of practices from the articles selected. The fact that saturation was achieved is noted, but was not a necessary condition for extracting the practices. The practices are definitely sufficiently accurate for the purpose of the research, but are not presented as the total collection of practices and the absolute list of PPM practices.

The research results are not presented as an alignment model or maturity model, but as a set of CLDs that explore relationships between practices in the business environment, from different perspectives in a dynamic environment. Although the use of CLDs in research is limited, and even questioned, it provides a powerful mechanism to model, study and manage complex feedback systems that are common in business and other social systems (Odiit et al., 2014, p. 39). It is not the intent of the research to contribute towards, or resolve issues in using CLDs that have been well documented. However, following on the interviews with academics, it was decided to produce a short narrative of the insights that emerged during the research and provide this to practitioners as value from the research. The interview with Vermaak (see Table 3.11), a key author in academia that makes extensive use of CLDs, was key in making this decision.

Hayward and Boswell (2014, p. 29) explained that system dynamics of informal maps and formal diagrams is used to uncover and understand endogenous sources of system behaviour. These informal maps include the CLDs, which provide a powerful and intuitive explanation of model behaviour in terms of its structure. However, the formal system dynamics diagram is more than feedback loops and includes stocks, flows and non-linearities since they help explain observed phenomena. This research does not include these more formal aspects of system dynamics, like Stock and Flow diagrams. Although CLDs alone are not sufficient to explain system behaviour, according to Hayward and Boswell (2014), they are sufficient to describe the relationship proposed as well as the typical behaviour associated with these structures.

The research was limited to the financial services sector in order to have a sample that is potentially rich in information, that could be observed and was manageable in size. The sector demarcation was made after careful consideration with the intent to limit the sample and thus strive for saturation, without purposely limiting the ability to extrapolate the results (see Section 3.4.6).

Finally, the author has noted the causality debate and is not striving to state unconditional causality between PPM practices and BITA CSFs. Entering into this minefield would potentially require some experimentation at business level, which is in all likelihood not feasible, and does not form part of the methods (see Section 2.6.2.3).

3.6 RESEARCH ETHICS

Ethical dilemmas and challenges are part of the everyday practice of research (Brinkmann & Kvale, 2005, p. 157). The research process often leads to conflicting requirements between the research objective (the value created for academia and practice), the research methods (how it is conducted) and the rights of participants to maintain privacy, or not be exploited in any other manner. Orb, Eisenhauer and Wynaden (2001, p. 93) best summarised the conflicting forces by stating that "[e]thics pertains to doing good and avoiding harm". They argued that harm can be minimised, or even avoided completely, by applying appropriate ethical principles to protect the participants in any research study.

Guillemin and Gillam (2010, p. 263) identified a minimum of two major classifications of ethics in qualitative research. Their first dimension is *procedural ethics*, which normally involves requesting approval from a relevant ethics governance structure to commence with the research, or at least the data gathering process. The second dimension is *ethics in practice* and describes the practical issues faced in the execution of the research.

Given the use of qualitative interviews in this research, the *ethics in practice* is of paramount importance (Qu & Dumay, 2011). Multiple issues come into play when conducting interviews, as are evidenced by the countless warnings from multiple authors about the challenges with qualitative interviews (Haggerty, 2004; Qu & Dumay, 2011, pp. 241-243; Rowley 2012, pp. 260 – 269; Sabar, & Sabar Ben-Yehoshua, 2017). Although Saba and Sabar Ben-Yehoshua (2017, pp. 411-412) defined an interview as "a friendly conversation that aims to show an interest in understanding other peoples' experiences and the meanings they give to them", they warned that the interview process is not always valuable to the research participant, as often claimed. They asked for a carefully-designed balance in claiming value and imposing on the interviewee. Important in the interview is the opportunity to withdraw at any stage, should that participant either feel uncomfortable, or that they cannot add value, or even gain value from their time spent in the interview (Qu & Dumay, 2011, p. 252). This ability to withdraw from the interview should be stressed upfront and be part of the informed consent process.

Another aspect of *ethics in practice* important for this research, is the design of the interview (Qu & Dumay, 2011, p. 254). Given that the nature of the interviews in the research does not require personally sensitive information, the biggest ethical concern for this research is not confidentially of information, although it remains important. The interviewees' answers still contained personal perceptions about organisational processes and culture, with the exception of the academics (Stage III). Therefore, all interviewees were provided with complete anonymity for themselves as well as for their organisations. This step was required to ensure accurate information without the fear of being identified or victimised.

An important consideration with interviewees' feedback is the *verbatim* use of their comments (Orb et al., 2001, p. 94), which is extensively done in Chapter 6. Using their comments *verbatim* was not necessarily cleared with the initial interviewees and utmost care was taken to ensure that they are not identifiable, in spite of the potentially harmless nature of the comments. Where a company had been named, this was replaced by a placeholder, [Company Name], and in one instance where the company was identifiable due to their rather unique positioning in the retail banking industry, it was decided to not use the direct quotation, in spite of the potential value it may have to support a particular relationship.

Rowley (2012, p. 265) warned against industry-specific terminology and jargon that could impact on the accuracy and efficiency of the interview. This aspect of the practice of ethics was considered in the protocol design and when conducting the interviews. The financial services industry, the IT domain and the project management function are well known for industry and domain jargon and acronyms. For example, the BITA and PPM used extensively in this research, are not necessarily that well known or at least understood in the industry and by interviewees. Care was thus taken to ensure that all acronyms used in the interview protocol were explained before using them during the interview to ensure accuracy of data.

Another consideration of *ethics in practice*, as per Rowley's (2012, p. 265) recommendation, is that the order of the questions should be carefully chosen to ensure the interviewee understands the underlying logic and sequence in the questions. Qu and Dumay (2011, p. 246) agreed that semi-structured interviews should be guided by identified themes in a consistent and systematic manner and that the interview protocol should incorporate a series of broad themes to be covered during the interview to help direct the conversation. This was indeed incorporated in the protocol to ensure that the interviews added value, questions were clear and not ambiguous, and did not waste the interviewees' time.

The final consideration of *ethics in practice*, relevant to this research, is the treatment and storage of data (Orb et al., 2001, pp. 94-95). Since all interviews were recorded, either on audio (when face to face) or on video when using video conferencing technology, the researcher is in possession of confidential data on both a personal mobile phone (face-to-face interviews) and personal laptop (video interviews). Silverman (2016, p. 148) defined the necessary conditions for treating data as confidential, secure and responsibly, in accordance with data protection guidelines and meeting any legal requirements. The data for this research was stored in a password-protected online cloud-based application that ensured both limited access but also integrity, since the data is not kept on any personal devices. The data will be deleted twelve (12) months after completion of the research and each interviewee will be provided with confirmation that their data has been deleted.

An aspect often overlooked in research ethics is the obligation to society to ensure that good quality research is conducted (Greenwoord, 2016, p. 512). As much as ethics is about not causing harm, this harm includes spending institutional time and resources conducting research of no discernible value. The justification for this research is strongly grounded in decades of IT value research still in search of deeper insight on BITA as well as the practitioner interest that was argued in Chapter 1 and Chapter 2. This research therefore also meets the requirements towards society at large.

Research ethics is of paramount importance. Research ethics is an overarching principle that guides all actions from design, interviews, data management and ultimately the reporting of the research results (Qu & Dumay, 2011). This principle was met in the execution of this study.

CHAPTER 4
BUSINESS AND IT ALIGNMENT SUCCESS FACTORS

4.1 INTRODUCTION

Research question 1 (see Table 3.1) deals with identifying the BITA critical success factors used in the interviews (Stage II). These success factors were required to structure the interviews and it was necessary to define RQ1 due to the absence of a set of universally-accepted business and IT alignment (BITA) critical success factors (CSFs) as argued in Chapter 2.

In this chapter, the systematic review of the articles selected (see Section 3.3.3 and Table 3.5) to define the BITA CSFs are documented. Section 4.2 describes the different CSFs identified from the systematic review, as well as the prevalence of these practices in the articles selected. Appendix C contains the detailed mapping of all the identified codes (sub-factors) and the code families (CSFs) to the selection of articles.

In Section 4.3 the terms 'CSF' and 'code family' as well as 'codes' and 'sub-factors' are used interchangeably. Although al the codes used are not necessarily success factors, and could rather been seen as attributes of the particular BITA CSF, some of the codes are indeed (sub-) success factors and the discussion treats them as such. The details of the coding process followed to create this chapter is contained in Section 3.4.3.

Section 4.3 provides a narrative description of each CSF supported by the codes as well as details of the success factors from the selected articles and some additional literature from Chapter 2 that was not used to identify factors, but was useful at times due to its focussed nature and excellent description of certain CSFs and sub-factors.

Section 4.4 provides a final list of the CSFs, as well as variables that define the measurable dimension of each success factor, to allow it to be included in a CLD, in order to answer first research question (Table 3.1).

4.2 BUSINESS AND IT ALIGNMENT SUCCESS FACTORS

Leidecker and Bruno (1984, p. 24) defined CSFs as "those characteristics, conditions, or variables that when properly sustained, maintained, or managed can have a significant impact on the success of a firm competing in a particular industry". According to Rahi (2019), the terms 'key performance indicators' (KPIs), 'key success indicators' (KSIs) and 'critical success factors' (CSFs) are often used interchangeably and erroneously in business vocabulary. He explained that CSFs are the variables, or required circumstances, to lead to a desirable outcome for an organisation. According to Rahi (2019), CSFs are "the expected causal variables of a particular desired outcome". The term 'CSF' is common in IT literature and is often then used by authors to define the conditions or variables that lead to a particular desirable outcome. In this research, that desirable outcome is an alignment between the business strategy (see Section 1.6.1), and the IT (see Section 1.6.4) efforts and investments of the business, or BITA.

The coding for the various attributes that define each of the descriptors was done in a first pass and a list of 61 codes was created. The 61 codes were grouped into six (6) different code families to define CSFs. The codes belonging to each code family were then scrutinised to check for duplication as well as different levels of granularity. Following this exercise, it was possible to reduce the codes from 61 to 33 codes due to different levels of granularity and some terminology differences between different authors.

It was decided to perform a second pass of the coding exercise. Following the guidelines from Zhang and Wildemuth (2009, p. 312) and using the constant comparative method, each new code created during the second pass was first compared with the codes belonging to the family. During this second pass, using the consolidated list of codes from the first pass it was not necessary to create a single new code and all factors from the 22 articles could be mapped to the 33 codes (sub-factors) and six code families (CSFs) as indicated in Figure 4.1.

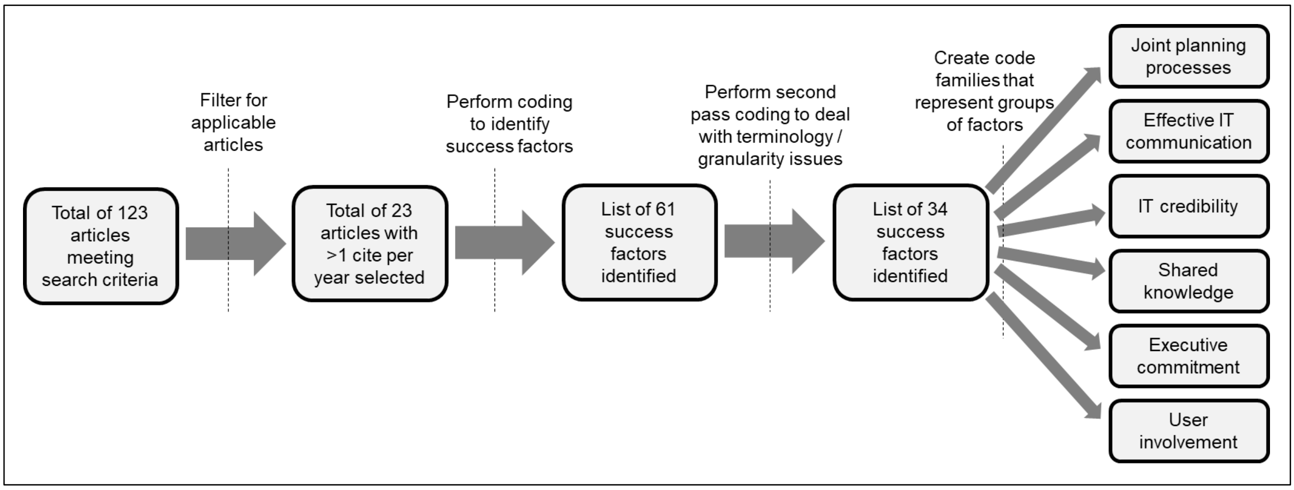

Figure 4.1: Search and SR process for BITA CSFs

The only remaining challenge was dealing with certain text strings that mapped to two, and in limited instances, three different codes. The challenge of multiple codes for the same text is acknowledged as a common occurrence and scientifically acceptable in qualitative analyses (Tesch, 2013, p. 124; Zhang & Wildemuth, 2009, p. 312). Care was taken to ensure that the categories in the coding scheme were defined to be internally as homogeneous as possible and externally as heterogeneous as possible, as recommended by Zhang and Wildemuth (2009, p. 312).

Although codes are uniquely assigned to code families, there are certain codes that do not necessarily fit perfectly within a family and arguments could be made for allocation to a different family. An example would be *Clear and stable business objectives known to IT management* that was allocated to *Shared knowledge* (Table 4.5) code family, but could also be argued to form part of the *Collaborative planning processes* (Table 4.2) code family. However, these code families represent two different CSFs as is evident from the other codes (sub-factors) that are clearly distinct.

The CSFs in the selected articles (see Section 3.3.3 and Table 3.5) are indicated in Table 4.1. Appendix B contains the complete list of sub-factors as well as CSFs and Appendix C contains the mapping of the CSFs and sub-factors to the articles from which they were extracted.

The most common CSF present in 21 out of 22 articles (95%) is *Collaborative planning processes* and this was also the primary focus of two of the articles. The prevalence of this CSF is not unexpected since it deals with the more explicit actions of joint planning and the involvement of business in IT, as well as IT in business. It thus represents the more structural or explicit part of BITA, although the factor of *Business and IT Management partnering* that is more tacit in nature also forms part of this code family.

The second-most common CSFs are *Effective communication* and *IT credibility* with 20 out of 22 articles (91%) containing some of the sub-practices. *IT credibility* is particularly evident in the literature with five of the articles having a primary focus on sub-factors in this code family.

Table 4.1: Overview of BITA CSFs

BITA CSF identified	Prevalence	Practice as a primary focus in the article coded
Collaborative planning processes	95%	Huang & Hu (2007); Wong, Ngan, Chan & Chong (2012)
Effective communication	91%	Wong, Ngan, Chan & Chong (2012)
IT credibility	91%	De Haes & Van Grembergen (2005); Vermerris, Mocker & Van Heck (2014); Jorfi, Nor & Najjar (2011); Chebrolu & Ness (2013); Schlosser, Wagner, Beimborn & Weitzel (2010)
Shared knowledge	86%	Wagner, Beimborn & Weitzel (2014); Huang & Hu (2007)
Executive commitment	82%	Kurniawan & Suhardi (2013)
User involvement	73%	Chong, Ooi, Chan & Darmawan (2010); Chebrolu & Ness (2013)

Executive commitment, a CSF with some codes that are particularly challenging due to their lack of homogeneous nature, is present in 18 of the 22 articles (82%) and a single article (Kurniawan & Suhardi, 2013) had one of the sub-practices as a primary focus. This CSF also presented a challenge from a modelling perspective (see Chapter 6) since this commitment from top management often leads to some of the other sub-factors and could even be seen as a pre-requisite for the presence and execution of other CSFs.

The CSF with the lowest prevalence, yet still present in 16 of the 22 articles is *User involvement*. The challenge with *User involvement* is complex. Firstly, when dealing with application development and systems implementations, this CSF is common and acknowledged strongly. However, there are other infrastructural and more enabling or 'back-end' IT deployments that require very limited or no user involvement. Contrary to the preceding five CSFs, users are not really required in all circumstances. The second complicating factor is that *User involvement* effectively covers the user contribution, being part of development and implementation, but also usage, the extent to which systems are actually used to achieve their stated objectives. Some of these sub-factors relating to systems use (by users) was mapped on *IT credibility* and not *User involvement* to keep codes internally as homogeneous as possible.

The next section discusses each of the CSFs and their sub-factors in detail.

4.3 BITA CRITICAL SUCCESS FACTORS

4.3.1 Collaboration planning processes

There is a clear need for business and IT executives to work together to prioritise, and map out IT deployment and strategy. Working together to plan and identify the necessary actions and strategies leads to better IT alignment. It also enables the other CSFs such as *Shared knowledge, Executive commitment* and *Effective communication*.

Table 4.2 contains the codes identified in the coding of the *Collaboration planning processes* CSF as well as the prevalence of these codes in the articles analysed. Appendix C contains the details of the analysis and shows how the codes manifested across the 22 articles analysed. In the articles by Huang and Hu (2007) as well as Wong et al. (2012) a subset of *Collaboration planning processes* was the primary focus area of the article.

Table 4.2: Collaboration planning processes BITA CSF codes

Practice	Sub-practices	Prevalence
Collaboration planning processes	Planning sophistication	55%
	Understanding IT in strategy development	68%
	Business and IT management partnering to prioritise IT systems	68%
	Business managers' participation in strategic IT planning	73%
	IT managers' participation in business planning	45%

Several authors (Basu, Hartono, Lederer & Sethi, 2002, p. 514; Charoensuk et al., 2014, p. 17; Huang & Hu, 2007, p. 175;) who defined the ability to plan strategically for IT, defined the collective use of all IT assets to contribute towards strategic intent, as a CSF. For the practitioner, it is necessary to ensure that planning and strategy development for both IT and business are carried out together by both IT and business executives. Only then, can this be quantified in a measure of alignment.

Luftman et al. (1999, pp. 17-18) posited it concisely by defining the considerations in the planning process as: “IT participating in the creation of business strategies, defining and supporting effective IT governance processes, establishing binding IT-business partnership, relationship, trust effective marketing of the value of IT”. Planning processes is an important CSF based on the number of occurrences in the literature, along with the necessary involvement of both the IT and business executives in the activity, as argued under the *Shared knowledge* CSF as well.

Chan et al. (2006, p. 29) defined planning as “the discipline and vision to foresee problems and opportunities within a turbulent and complex environment,” and noted that it was among the most highly-ranked factors by managers and practitioners alike. Advanced planning processes involve both business and IT executives who try and take advantage of IT-related opportunities and address difficulties. Lee et al. (2008, p. 1176) stated that BITA is not serendipitous. To achieve higher degrees of alignment, IT and business must work together in unison to ensure that new technology is addressing a business requirement and will improve the business performance.

Luftman et al. (1999, p. 14) agreed that there is need for IT and business managers to work together cooperatively in the planning process. Alignment is reached if cross-functional teams are involved in strategy formulation (Luftman et al., 1999, p. 17). This view is shared by Teo and Ang (1999, p. 181), who established that joint management enables IT to prioritise applications development creating better alignment. In fact, it was ranked in the top ten in their study. This is similar to what Lederer and Mandelow (1989, p. 12) established, namely that an open relation between ITO leaders and business executives was essential for constructive outcomes from planning activities that would contribute towards improved alignment.

Yayla and Hu (2009, p. 166) maintained that integrating the IT and business planning processes, is more important for BITA than the level of communication between the IT and business executives according to their empirical work. Lederer and Mandelow (1989, p. 6) preferred the term ‘coordination’ of IT plans and business plans and noted this as an enabler of alignment. Wagner et al. (2014, p. 242) argued that better cross-domain interconnectedness will result in a more sophisticated use of their IT and ultimately, better alignment.

Lederer and Mandelow (1989, p. 6) contended that IT strategy initiatives have to be informed by the business strategy goals for coordination to take place. This ensures that IT delivers the applications that are crucial to the business. In addition, business strategy is often dynamic (as argued in Chapter 2) and a lack of coordination may result in inadequate IT support of the business. This failure could lead to a lack of support from business executives (see Section 4.3.5) and ultimately the failure to achieve alignment.

Lederer and Mandelow (1989, p. 6) further argued that, without synchronicity, the finished project may not reflect the requirements and goals of the business, ending up being useless to the organisation. Huang and Hu (2007, p. 175) affirmed the arguments by Lederer and Mandelow and saw a reflection of business objectives and strategies in the IT planning and operations as the most fundamental step to BITA. Huang and Hu (2007, p. 175) reaffirmed that the presence of an IT plan, as well as its integration with the business plan, is central to many of the proposed BITA frameworks. Chan (2002, pp. 10) advocated the partnership of business and IT as pre-condition of alignment in successful companies, saying that linkage and participation in planning was necessary.

Charoensuk et al. (2014, p. 17) warned that this integration and joint planning does not provide IT management with the authority to dominate the business unit. Businesses need to strive for a good balance between the power of the business domain and the IT domain. They believe that the "domination of business could make IT lose an opportunity to demonstrate its ability while the domination of IT could limit business flexibility" (Charoensuk et al., 2014, p. 17).

Scott (2005, pp. 923-924) found that knowledge is important for planning success and thus achieving alignment. It was seen to be a prerequisite for the proper connection of business and IT plans. This was confirmed by Teo and Ang (1999, p. 180) who stated that, if there was mutual comprehension of the process, realised through communication, then alignment could be attained. This is necessary because shared understanding allows for shared language to be used, resulting in more effective communication.

Once again, the CSF does not operate in a vacuum. Yayla and Hu (2009, p. 167) believe the development of relationships makes BITA more tangible due to the understanding of existing communication channels and networked relations in organisations. They posit that "the active relationship management by IT and business managers enhances the connections between IT and business planning, and improves their communications" (Yayla & Hu, 2009, p. 167).

Kearns and Sabherwal (2007, p. 135) argued that the more business knowledge IT executives had, the better the association between the two departments. Burn and Szeto (2000, p. 197) and Chan (2002, p. 98) all argued a causal link with performance, which was attributed to the result of business-IT alignment. Though the granularity may be different in all the studies, it is clear that the planning process is one of the CSFs for the achievement of business-IT alignment.

4.3.2 Effective communication

Communication from business executives to IT executives helps the linkage of business and IT plans (Lederer & Mandelow, 1989, p. 12). Even well-defined plans must be reviewed to ensure that the entire organisation has shared understanding. The criticality of communication cannot be overstated (Reich & Benbasat, 2000, p. 107). However, communication hinges on other CSFs for it to be effective.

Table 4.3 contains the codes identified in the coding of the *Effective communication* CSF as well as the prevalence of these codes in the articles analysed. Appendix C contains the details of the analysis and shows how the codes manifested across the 22 articles analysed. The article from Wong et al. (2012) had communication as a primary focus by using a specific technique that could, in the opinion of the authors, contribute significantly to the quality of communication.

Table 4.3: Effective communication BITA CSF and codes

Practice	Sub-practices	Prevalence
Effective communication	Quality of IT communication	64%
	Frequent communication between users and IT departments	36%
	Communication and understanding between line and IT executives	27%
	Business IT social capital (trust/respect)	77%

Teo and Ang (1999, p. 180) advocated that communication between users and IT departments needed to be frequent in order to achieve alignment. The IT department must be attuned to the needs of the user in order to provide adequate solutions, and only by close liaison can this be possible. Close communication between users and IT makes it easier for IT to conform to user requirements and aid them in the execution of their tasks. If these needs are not catered for, it can lead to underused and wasted resources (Teo & Ang, 1999, p. 180).

Luftman and Brier (1999, p. 118) took it one step further and stated that, for BITA to be achieved "a climate of clear communication is an absolute necessity". This climate is created by a history of clear and appropriate communication. An example of this would be communicating the IT strategy to middle and junior IT managers such that they can contribute to building the social capital with business by guiding managers in their choice of technology aligned with higher-level plans (Tarafdar & Qrunfleh, 2009, p. 348). Scott (2005, pp. 917) stated that "the preferred culture should be one of being *all in* together and of camaraderie. In this way, people work together and collectively do what is most useful for the company."

Constant communication also leads to the development of shared knowledge as both departments become aware of the inner working of each other's divisions. This will help collaborations and aid in the use of IT to reach the strategic goals of the organisation and create value. Chan (2002, p. 102) found that excellent formal and informal communication lines were a common factor in firms that had high levels of alignment. These users had an overview of the company's processes and gained insight into their contribution to the firm, which resulted in closer relationships being formed and more confidence in IT.

The research by Wong et al. (2012, p. 495) established empirical evidence that communication is fundamental to many of the factors that lead to BITA such as trust (Table 4.4) and knowledge (Table 4.5). Once again there is an interdependence since trust as a prerequisite for effective communications is important in enabling effective "exchange of ideas, information and knowledge among various parties" (Wong et al., 2012, p. 495).

The depth of knowledge of IT executives about 'the company way' and the overall ethos of the company has an influence on communication (Scott, 2005, p. 917). The number of times IT executives interact and communicate with business executives, users, and other role players has an impact on the effectiveness of the communication making it a potentially influential CSF.

Wagner et al. (2014, p. 260) described the key result of their research as finding empirical evidence that "the structural dimensions of social capital between business and IT is the enabler of the cognitive and relational dimensions and that those, in turn, influence business understanding of IT, which eventually creates better business process performance". The feedback nature and interdependency of many of the CSFs and success sub-factors again provide a strong argument for using a technique like CLDs to depict these interdependencies.

The vocabulary used during planning and training also plays a part in the cultural aspect and helps forge better relationships and aids the effectiveness of communication, leading the alignment between business and IT.

Wagner et al. (2014, p. 262) established, contrary to conventional wisdom, and earlier arguments from other authors, that the frequency of communication between IT and business staff has no direct impact on business performance. It is evident from their research that only increasing the number of business and IT meetings does not create value. Huang and Hu (2007, p. 175) agreed that relationships are vital since it leads to the informal structures that nurture and revitalise the state of alignment on an ongoing basis. The value is unlocked through trust and knowledge. Unless communication takes place in a trusted environment and knowledge is shared or preferably created, it does not lead to improved BITA.

Wagner et al. (2014, pp. 241) transcended the predominantly executive management focus through the development of an operational alignment model. This model includes a social perspective of BITA and states the importance of interaction between business and IT staff at operational levels. They drew on social capital theory to explain how alignment affects organisational performance and argued that it is the social capital between IT and business units that leads to alignment and ultimately IT business value (Wagner et al., 2014, p. 241).

Reich and Benbasat (2000, p. 108) warned that, unless the necessary preconditions for clear communication exists, mechanisms such as IT steering committees may "degrade into project review or budget approval committees". Members of the organisation thus must be willing to take time to garner the necessary knowledge that will ensure that a shared language will be used, making communication effective.

According to Almajali and Dahalin (2011, p. 4), "[v]alues and beliefs can significantly shape how attitudes develop and hence behaviour and practices". They stated that managers' beliefs are formed by their IT experiences and if they have past exposure of insufficient structures and suboptimal processes, this will impede on the effective delivery of IT services, even if there are similar values and beliefs between the IT organisation and the rest of the business (Almajali & Dahalin, 2011, p. 4).

All references to the communications CSF were easily singled out due to their use of the term. For the practitioner, it is important to realise that, while communication is integral to the attainment of alignment, it is inextricably tied to several of the other CSFs, which also have to be present. This is because to be useful, communication has to be effective, and for this to happen there has to be both shared knowledge and well as a history of prior IT success.

Communication may be central to alignment, but it also serves as the conduit between the rest of the CSFs in order for alignment to be realised and for the success of the organisation. As Scott (2005, p. 920) cautioned, the extent of this CSF can vary from company to company given the many other CSFs that it influences and is influenced by. Thus, the practitioner has to make sure that the other CSFs are attended to, while ensuring that effective communication brings about the full presence of the other factors.

4.3.3 IT credibility

Prior IT success is a CSF that has been demonstrated to increase the confidence in the IT organisation and its capacity to deliver value to an organisation (Reich & Benbasat, 2000, p. 104). This prior success, however, cannot be used as a high-level CSF since the actual variable influenced by prior success is IT credibility. None of the studies refer to IT credibility, yet 41 percent referred to prior IT success. By recognising the higher-level factor of IT credibility, it was possible to map a large number of codes onto this CSF. An interesting variable missing from the literature that manifested during the interviews, is the impact of the lack of success or rather failure and its strong relationships with IT credibility (see Chapter 6).

Table 4.4 contains the codes identified in the coding of the *IT credibility* CSF as well as the prevalence of these codes in the articles analysed. Appendix C contains the details of the analysis and shows how the codes manifested across the 22 articles analysed. In the articles by Chebrolu and Ness (2013), De Haes and Van Grembergen (2005), Jorfi et al. (2011), Schlosser, Wagner, Beimborn and Weitzel (2010) as well as Vermerris et al. (2014), a subset of IT credibility was the primary focus area of the article.

Table 4.4: IT credibility BITA CSF and codes

Practice	Sub-practices	Prevalence
IT credibility	IT implementation success	41%
	IT sophistication and adaptability to keep up with changes	41%
	The IT department's efficiency and reliability	45%
	IT demonstrates leadership	27%
	Well-prioritised IT projects from a business perspective	50%
	IT department able to identify creative ways to use IT strategically	27%
	IT flexibility to meet changing operational and strategic needs	50%
	Extent of IT systems' usage for real business value	23%
	IT governance processes	36%

IT organisations and departments are reliable and credible when they have a history of delivery of their commitments on time to create a positive impression on business executives (Yayla & Hu, 2009). The net result of this positive impression is business executives who will consult with IT executives in their endeavour to gain value from technology. Conversely an IT department unable to deliver its promises is not consulted by business executives and the role of IT can be marginalised to the disadvantage of the organisation (Yayla & Hu, 2009). Chan et al. (2006, p. 29) agreed with this, citing the record of accomplishment of the IT department as a critical factor success factor. The lack of success highlights the importance of this CSF because a lack of success is a problem for continued interaction between business and IT and it undermines believability, collaboration and backing from senior executives and users (Reich & Benbasat, 2000, p. 86).

Credibility is eroded, and only those IT members who are thought to be capable are brought in to take part in planning sessions. This leads to misalignment, as they are the only ones who will be aware of the strategic direction that the company wishes to follow. IT executives must be aware of this and potentially leverage new achievements to become an integral part of the organisation's decision-making team (Chan et al., 2006, pp. 29-30).

Hussin, King and Cragg (2002, p. 119) found that the level of IT sophistication had an impact on the shared learning of IT. This sophistication was determined using measures such as type, source and level of decision-making authority. There was evidence that IT maturity played a role in the success and the esteem of the IT department. Their evidence suggested that alignment was affected by IT maturity and the chief executive officer's knowledge (Hussin et al., 2002, p. 119). Teo and Ang, (1999, pp. 180-181) found that the ability of the IT department to keep up with the advances in the industry was another sub-factor leading to IT credibility. The IT credibility is linked to the prior success of IT due to the necessary maturity level of the IT department that is needed for the department to be knowledgeable and keep abreast of IT advances. IT is becoming more instrumental to organisations and thus IT is expected to take on a more assertive role in the organisation (Teo & Ang, 1999, pp. 180). IT success is more likely due to the IT executives being able to give informed recommendations for IT systems that enable the business strategies and vision.

Developments in the IT industry happen at a rapid pace and existing systems become obsolete fast (Teo & Ang, 1999, p. 181), thus the likelihood of success is increased by the knowledge of IT executives and their ability to seize upon advancements for the betterment of their organisation. The IT department must be able to generate innovative ideas to apply new and existing technologies for the strategic benefit of the company. This factor influences IT success as well as the IT department's ability to recognise new advancements (Teo & Ang, 1999, p. 182).

Creative ideas can be a source of competitive advancement for the organisation, which in turn affects the shared knowledge and confidence that the business executives have in the IT capabilities. It is important that the value added is also evaluated from a business perspective and not an IT perspective. De Haes and Van Grembergen (2005, p. 6) stated the importance of the senior leadership that should prioritise the IT investments based on the business case and an additional assessment measure that they call an 'information economics' assessment. An "information economics [assessment] is a scoring technique resulting in a weighted total score based on the scores for the ROI and some qualitative criteria," although they are not clear on the additional criteria (De Haes & Van Grembergen, 2005, p. 6).

The relevance of the department to the organisation becomes apparent (Teo & Ang, 1999, p. 182). This usefulness to the company is manifested in multiple categories for the organisation, such as adding value and thus adding to the viability, or in terms of more specific applications such as performance improvement. IT success links to other CSFs in a two-way connection.

Wagner et al. (2014, p. 247) stressed the important difference between availability of IT resources (often reported on) and the actual *utilization* of IT, since value is gained through use, not availability. They argued that the business value accruing from IT resources is "determined by how well people use it in the business context" (Wagner et al., 2014, p. 247). IT use leads to operational effectiveness, the improvement of business processes and ultimately operating efficiency, which should be primary indicators of long-term IT value (Wagner et al., 2014, p. 247).

There is a risk inherent in an 'efficiency mind-set' that could lose sight of the fluidity of the operating environment and thus strategic intent. Wagner et al. (2014, p. 247) suggested the flexible IT deployments enables business processes to be broken down and modularised into individual activities. When processes exist of individual activities, they can be rearranged and recombined to create new business processes aligned with changes in tactical or operational requirements. The resultant IT flexibility will present the responsiveness to changing business requirements and influences the real and opportunity cost of potentially value from IT-intrinsic innovations (Wagner et al., 2014, pp. 247-248).

Huang and Hu (2007, p. 175) contended that, despite the best efforts to create flexible IT environments "temporary misalignment would inevitably occur as a company moves through different product and market life cycles". An effective alignment process must thus include the ability to adapt and rejuvenate in an environment of change, that is inevitable (Huang & Hu, 2007, p. 175). Jorfi et al. (2011, p. 18) fully concurred with the flexibility argument necessitated by the introduction of new products or services. They stressed that "IT has to be able to embrace the underlying changes in business strategy in order to provide support for it all the time" (Jorfi et al., 2011, p. 18).

A final important sub-factor coded in the large IT credibility CSF family is governance. Governance, at times seen as the opposite of innovation and flexibility, is an integral part of IT processes and organisational governance. Governance consists of "the leadership and organizational structures and processes that ensure that the organization's IT sustains and extends the organization's strategy and objectives" (De Haes & Van Grembergen, 2005, p.1). In the opinion of De Haes and Van Grembergen (2005), governance thus contributes to flexibility and does not impede flexibility. Schlosser, Wagner, Beimborn and Weitzel (2010, p. 2) believe that the definition from De Haes and Van Grembergen (2005) reflects an important shift from seeing IT governance as an end to itself, towards a more business-orientated process with a clear emphasis on the interests of the entire organisation.

IT credibility is tied to other CSFs in multiple cause-and-effect relationships. The success of the department fosters greater commitment to IT initiatives and thus more interaction and shared understanding. Communication and user involvement are other CSFs that are impacted on and impact on the success of IT (Chan et al., 2006, pp. 29-30; Reich & Benbasat, 2000, p. 107-108). The absence of IT success makes alignment harder to achieve due to less credibility and consequently less communication and awareness of the business plans and vice versa.

For the practitioner it is important to leverage the other CSFs, which will in turn aid in the success of the IT department's initiatives and will lead to a reinforcing loop. The success of IT can be measured using performance metrics as well as the measurement criteria that were specified in Chapter 2.

4.3.4 Shared knowledge

The concept of '*shared knowledge'* acknowledges that if business executives are well-informed about business and IT, there is greater likelihood of shared understanding and vision (Chan et al., 2006, p. 39). As with all the CSFs, this particular factor is interconnected and dependent on other CSFs.

Table 4.5 contains the codes identified in the coding of the *Shared knowledge* CSF as well as the prevalence of these codes in the articles analysed. Appendix C contains the details of the analysis and shows how the codes manifested across the 22 articles analysed. In the articles by Wagner et al. (2014) and Huang and Hu (2007) a subset of shared knowledge was the primary focus area of the article.

Table 4.5: Shared knowledge BITA CSF codes

Practice	Sub-practices	Prevalence
Shared knowledge	Shared domain knowledge	32%
	Social systems of knowing	50%
	Structural systems of knowing	27%
	Shared understanding	41%
	Top management's knowledge of IT	23%
	IT management's knowledge of business	55%
	Clear and stable business objectives known to IT management	55%

Shared knowledge, from a practitioners' perspective, is the ability to have a base of mutual understanding of business and IT processes, strategies and goals. This understanding will foster knowledge of business and IT and allow executives to receive new knowledge and increase the absorptive capacity needed to integrate new information as it emerges. Kearns and Sabherwal (2007, p. 132) argued that this CSF "involves the superior ability to integrate multiple knowledge streams, for the application of existing knowledge to tasks as well as for the creation of new knowledge".

The importance of knowledge in strategic alignment has been well-documented (Preston & Karahanna, 2009, p. 160) and the authors of most of the articles selected all posited knowledge between business and IT executives as a critical success factor. In fact, the construct of shared knowledge has been acknowledged by IT researchers shortly after the IT value debate emerged in the literature (Reich & Benbasat, 2000, p. 86).

According to Chan et al. (2006, p. 39), when senior business and IT management are well-informed about the business and IT, there is greater likelihood of shared understanding and vision and improved correlation between objectives and actions. Luftman et al. (1999, p. 18) discussed how IT executives' understanding of business issues enables alignment. They believe that IT-knowledgeable business leaders' participation in IT planning, and support for IT, will likely increase and this would in turn foster alignment (Luftman et al., 1999, pp. 18-20).

In line with these arguments, Reich and Benbasat (2000, p. 100) established that shared domain knowledge, which they defined as "the ability of IT and business executives, at a deep level, to understand and be able to participate in the other's key processes and to respect each other's unique contribution and challenges," will promote short-term and long-term alignment.

Different authors have the same conception of what shared knowledge and understanding are, which indicates the significance of this factor. Reich and Benbasat (2000, p. 104) contended that a firm's degree of shared knowledge has an impact on communication between top executives and on the efficiency of strategic planning processes. Wagner et al. (2014, p. 244) preferred to refer to the shared knowledge as social capital and claimed that "social capital among IT and business units consist of formal and informal relationships along different dimensions, such as interaction patterns, mutual trust, and shared language". Buying into the argument of social capital, or networks of relationships, it is evident that relationships are important and even a precondition for knowledge sharing.

Shared understanding was addressed by Preston and Karahanna (2009, p. 162), who used a nomological network, a concept not completely different to a CLD, that put shared knowledge forward as an important antecedent of alignment. Their argument was that the antecedents of shared understanding help the knowledge exchange and comprehension between the IT leaders and business leaders. These factors will thus enable the development of common understanding of the contribution of IT within the organisation and its value-adding role. They posited that shared understanding "has four primary antecedents: (i) shared language; (ii) shared domain knowledge manifested as the CIO's business knowledge and [Top Management Team] TMT's strategic IS knowledge; (iii) systems of knowing (structural and social); and (iv) experiential similarity" (Preston & Karahanna, 2009, p. 167).

The factors that Preston and Karahanna proposed focussed on processes that encourage the transfer and integration of knowledge between the business and IT executives and the evolvement of shared cognition. Preston and Karahanna (2009, pp. 162-163) identified shared understanding as a key method to realise intellectual alignment. Their definition of shared knowledge is "the degree of shared cognition between the CIO and the TMT on the role of IS in the organisation" (Preston & Karahanna, 2009, pp. 162-163), with their view on cognition being similar to that of Tan and Gallupe (2006, p. 223).

Tan and Gallupe (2006, p. 230) proved "a positive correlation between the shared cognitive structures and cognitive contents of business and IS executives and the intellectual dimension of strategic alignment". It can thus be anticipated that shared understanding will affect strategic alignment of business and IT. Social capital also has a cognitive dimension that embodies shared terminology, language and perspectives and refers to the "extent to which IT and business staff know each other's interpretations of reality" (Wagner et al., 2014, p. 245). This cognitive dimension, or shared knowledge, includes IT resources' ability to discuss technical issues in business language, rather than their own familiar terminology. However, it also includes how business staff has a working knowledge and familiarity of IT projects, their outcomes and their value to the business (Wagner et al., 2014, p. 245).

Preston and Karahanna (2009, p. 163) bolstered this view that research has shown that shared knowledge allows the CIO to have a role in strategy formulation, and serves as a signal to senior executives to achieve shared goals through improved planning and allows for alignment of business and IT strategy. Teo and Ang (1999, p. 179) found that the CIO with a higher degree of business knowledge had more presence in executive teams (a factor coded for in the *Executive commitment*

CSF see Table 4.6). Shared knowledge was also observed to impact on the use of IT for strategy execution and other business activities.

The impact of shared knowledge was ascertained to be the most highly-ranked CSF by CIOs and chief executive officers (CEOs) for strategic alignment in a study by Preston and Karahanna (2009, p. 173). This stems from the fact that the CIO must be able to elucidate his needs in language that translates to the business executives in order for them to support the CIO's requirements to further the strategic goals of the organisation.

The inverse, business executive's knowledge of IT, was also found to be an important factor. Teo and Ang (1999) established that IT knowledge of business is more important than business knowledge of IT. This was contradicted in a study done by Kearns and Sabherwal (2007, p. 135) that reached the opposite conclusion. Kearns and Sabherwal (2007, p. 135) stated that, while it was a CSF, the effect had less influence and may not directly raise the expectations of business executives in regard to IT, or their backing of IT initiatives. Both studies dealt with IT knowledge from business managers and business knowledge from IT managers as independent CSFs, and not as a subset of the CSF of *Shared knowledge*.

Both these studies failed to acknowledge an important contribution from Wagner et al. (2014, p. 246) that indicated the importance to distinguish between *shared* knowledge, the information uniquely held by individuals, and *combined* knowledge that is the result of human interaction and when information is combined to create new knowledge. The important aspect is clearly *shared knowledge*; less important is the origin of the initiative to share the knowledge.

Luftman et al. (1999, p. 18) were more succinct in their study, which listed four aspects of shared understanding: (i) IT understands the business; (ii) business understands IT; (iii) IT communicates in business terms; and (iv) IT focuses on applying technical understanding to identify business opportunities. Luftman and Brier (1999, p. 115) added a fifth dimension when they argued the significance of defining clear objectives before investing in IT and the application of IT (see Table 4.5).

Shared knowledge also shows the interdependence of the CSFs of strategic alignment. It plays a role in enhancing communication (Kearns & Sabherwal, 2007, p. 139) and in the strategic planning process (Chan et al., 2006, p. 39). In addition, it also plays a part in fostering *Executive commitment* to IT-related projects and ultimately helps achieve alignment. The interaction of CSFs works in both directions with the other CSFs also helping entrench shared understanding. Kearns and Sabherwal (2007, p. 138) found that knowledge integration would be improved if business managers were involved in IT planning and IT managers did the same with business planning.

Wong, Ngan, Chan and Chong (2012, p. 495) also argued a relationship to the *Effective communication* CSFs that a "lack of common knowledge (i.e. those elements of knowledge common to all organisational members) can hinder communications among parties within a company". In fact, based on the preceding argument a shared understanding probably has an impact on each of the other CSFs, and *vice versa*.

4.3.5 Executive commitment

The commitment of top business management to the IT department and how their commitment can help the firm is of paramount importance. Chan (2002, p. 105), Luftman et al. (1999, p. 4), Teo and Ang (1999, p. 178) all saw this as the number one success factor in their studies. For Kurniawan and Suhardi (2013) this was the primary focus of their article. Gomolski (2005, p. 36) believes that alignment can only be achieved once business leaders recognise and accept their role with regards to ownership in IT. Gomolski (2005, p. 36) provided the following anecdote that perfectly explains the concept of commitment, using the following example: “Business leaders would not acquire a piece of physical real estate and then walk away from it. They must understand that it is not OK to walk away from IT.”

Top management’s dedication to IT was deemed to be the factor that would enable the alignment of business and IT plans. This is not surprising, because it has been well documented how executive support is instrumental in developmental and implementation processes (Teo & Ang, 1999, p. 178). Table 4.6 contains the codes identified in the coding of the *Executive commitment* CSF as well as the prevalence of these codes in the articles analysed. Appendix C contains the details of the analysis and shows how the codes manifested across the 22 articles analysed.

Table 4.6: Executive commitment BITA CSF codes

Practice	Sub-practices	Prevalence
Executive commitment	Line executive commitment to IS issues and initiatives	36%
	Top management commitment to the strategic use of IT	27%
	Joint architecture/portfolio selection	36%
	CIO is a member of senior management	23%
	Senior executive support for IT	45%

Although the CSF indicates *Executive commitment,* an interesting contribution from Holland and Skarke (2008, p. 48) referred to advocating, that is, being the voice of IT in certain instances. They stated that “executives advocating business-IT alignment initiatives are a necessity” (Holland & Skarke, 2008, p. 48). The reality of the dynamic complexity that is BITA, and the complexity within the deployment of IT, is that conflicts will inevitably occur and IT will need a partner at the executive-level to get support and make quick decisions when required (Holland & Skarke, 2008, pp. 48).

Without the necessary support from senior executives for the use of IT to further the business goals, sufficient value will not be realised (Luftman et al., 1999, p. 17). Business executives need an understanding of what IT can do for the company to aid in its strategic goals. This commitment will result in IT being aware of the direction the company wants to take and will result in the proper IT resources being availed (Luftman et al., 1999, p. 17).

Steering committees and project sponsors are also ways that the executives can show their support for the IT department. They are indicators that members of senior management are willing to see an initiative to fruition and remove any hindrances to its success (Scott, 2005, p. 917).

This commitment can be manifest in several ways (Teo & Ang, 1999, p. 178). One way is to have the CIO report directly to the CEO. This is similar to the argument from Scott (2005, p. 916), which was to make the CIO part of the senior management team. This will foster closer relationships with end-user departments and give the rest of the management team better introspection into the needs of the IT department. In principle, the management team will be more amenable to providing necessary support for strategic applications (Teo & Ang, 1999, p. 178). However, Huang and Hu (2007, p. 182) warned that it is important to clarify the expectations for the CIO. The CIO should be seen and treated as an information officer, not an IT manager. Although the CIO and IT department manages technology, and rightly so, their contribution to the business is not IT, but information to support decision-making (Huang & Hu, 2007, p. 182).

Tarafdar and Qrunfleh (2009, p. 342) believe that some newly-elevated CIOs are so excited to be included in the executive-level, they forget to collaborate and communicate with their peers. They could potentially argue that if the COO and CFO “do not proactively collaborate, why should the CIO?” (Tarafdar & Qrunfleh, 2009, p. 342). Tarafdar and Qrunfleh (2009, p. 342) reminded the reader that the CIO position is not as well recognised as these other positions and the CIO is therefore obligated to establish communication channels to other senior executives. This was mirrored by Scott (2005, p. 916) who determined that communication to improve planning becomes better when structures are created to link business and IT.

If the CIO is a member of the executive team, this allows for more familiarity with the proposed direction of the company and the CIO would be better placed to make the right recommendations for the right strategic IT choice (Scott, 2005, p. 916). This is also a clear sign of the confidence that the executives have in the IT department, which is an additional factor identified separately by Teo and Ang (1999, p. 179). Being part of the team shows and inspires confidence in the role that the IT department can play in the strategic realisations of the organisation. If this confidence does not exist, the IT department would soon see itself without adequate resources needed to carry out their role to support the company, and potentially lead to delays due to a lack of direct access to the upper echelons of the business (Teo & Ang, 1999, p. 179).

If this confidence is not present, then the perceptions of the CEO may be detrimentally affected. The success of the company through the use of IT will form the impressions of the CEO, thus IT needs to be in tandem with the business and for this to happen the CIO has to have a direct link to the CEO (Burn & Szeto, 2000, p. 206). In line with the previous arguments from Holland and Skarke (2008,

p. 48) about advocating for IT from within business, there could be no better indication of executive commitment, than an CEO being the IT advocate.

Karahanna and Preston (2013) suggested that a proper working relationship between the CIO and the rest of the executive management is important to facilitate the process of deploying IT assets and using derived capabilities to achieve strategic value from IS. Scott (2005, p. 916) believes the participation of the CIO serves as a show of commitment by the CEO, and encourages the rest of the IT department to be involved in the business aspects of the company, furthering shared knowledge and understanding. These activities could be "establishing IT steering committees that include managers of business operations and thereby promote communication about these operating activities, and assigning IT group members to temporary line assignments in the operating departments of the company" (Scott, 2005, pp. 916-917).

Another way senior executives commit to IT is through collaborative architecture/portfolio selection (Scott, 2005, p. 918). This shows real commitment, because for this to happen, there must be a solid understanding of present architecture and knowledge of the intended actions needed to fulfil the strategic goals. The participation of business managers shows their willingness to know more about IT and to facilitate its support of business activities (Scott, 2005, p. 916). The selection of architectures and portfolios has an impact on current and future resources and capabilities (Scott, 2005, p. 918). Business and IT thus must work together to form a close linkage between IT architecture and business plans.

Prioritisation of IT projects allows firms to keep up with competition in the external environment and this is enabled by the commitment factor (Luftman et al., 1999, p. 20). Prioritising projects signifies confidence in IT and its ability to operationalise the firm's strategic needs. Governance processes are made effective by the support of business managers through raising the priority. By being prioritised, the leadership role that IT plays in the firm can be visible through the innovative use of the IT department to realise the organisation's strategic intent (Luftman et al., 1999, p. 20).

The sub-factor *CIO is a member of senior management* is strongly tied to the *Executive commitment* CSF. Being included in the senior position allows the CIO to participate in planning and also fosters better shared understanding and buy-in from the top executives for the initiatives of the IT department. Joint architecture and portfolio selection serve the same purpose, since being included in the decision process makes business executives buy into the decisions made and more likely to want to propel them to succeed.

Chen et al. (2010, pp. 231) suggested an updated model that emphasised the role of the CIO. According to them, the maturity of CIOs as both a supply- and demand-side leader, is important. Whilst this study focussed on the antecedents of this alignment, it also took into account when these were successful and looked at two effects: (i) the strategic growth of the organisation; and (ii) the contribution of IT towards firm efficiency. The antecedents of alignment, measured as strategic growth and increased efficiency, were "the capability of the CIO, the structural power or influence in the company's structure held, as well as the support by the organisation for the IT department" (Chen et al., 2010, p. 231). An interesting observation in their research is the gap between the expectations of executive management that expect the CIO to contribute towards demand-side leadership, in contrast to the poor ranking of CIOs when it came to demand-side responsibilities.

Commitment of the senior executive is interdependent on several of the other CSFs. It is contingent upon *Shared knowledge*, *Effective communication* between business and IT, previous IT success leading to *IT credibility* and *User involvement*. The absence of *Executive commitment* would have great ramifications for the achievement of alignment.

4.3.6 User involvement

The influence of the user towards BITA is complex. More than any of the other CSFs, the involvement of the user is highly dependent on the type of IT initiative and category of IT asset deployed. Although Zhang and Wildemuth (2009, p. 312) stressed the importance of codes that are internally as homogeneous as possible, the codes listed in Table 4.7 are not necessarily sufficiently homogeneous to meet their requirements. However, externally there is sufficient heterogeneity to not map any of the codes to another code family or CSF.

Table 4.7 contains the codes identified in the coding of the *User involvement* CSF as well as the prevalence of these codes in the articles analysed. Appendix C contains the details of the analysis and shows how the codes manifested across the 22 articles analysed. In the articles by Chong, Ooi, Chan and Darmawan (2010) as well as Chebrolu and Ness (2013) a subset of *User involvement* was the primary focus area of the article.

Table 4.7: User involvement BITA CSFs and codes

Practice	Sub-practices	Prevalence
User involvement	Deep end-user involvement	36%
	The IT department is responsive to user needs	23%
	Realistic expectations and sophistication of user managers	27%

Chong et al. (2010) raised an interesting debate when they asked if the literature and practitioner vocabulary should not rather move towards employee alignment and away from the traditional user involvement. According to Chong et al. (2010, p. 16), most of the academic research cited user involvement but never ask if there is sufficient alignment between employees at all levels of the organisations and the organisations' business-IT strategies.

Relevant information can be obtained from the user as to which systems would be ideal, the operational requirements and the desired results (Scott, 2005, pp. 917-918). This input is vital to develop portfolios, support business operation and aid in strategic realisation. Users need to be consulted as they are the most able to articulate certain nuances about their needs and expectations. Wagner et al. (2014, p. 245) argued that both formal and informal meetings help business users see beyond the context of their immediate work environment and thus they start to consider the impact of their work on others, "thereby reducing the risk of myopic views of the business and of working and thinking in silos".

Connections and communication lines should be opened to aid this feedback between users and IT planners. This feedback can then be relayed and taken into consideration when involved in strategic IT planning. Scott (2005, p. 918) identified one of these linkages as the service level agreements that set the expectations and deliverables to end-users. Linkages across the hierarchical chain should also be put in place such that the information relayed to analysts from the users ends up with the planner.

Teo and Ang (1999, p. 182) found that the IT department's ability to be responsive to user needs is critical for strategic alignment. The delivery of efficient services allows the IT department's reputation and perceived usefulness to rise in the eyes of the organisation and, in particular, in those of the business executives. The delivery of efficient services, however, is only useful if the services are also effective. IT's ability to affect positive outcomes on the organisation has come full circle from a backroom support role to one where they offer tailored frontline services (Teo & Ang, 1999, p. 182).

For this reason, IT must be both responsive to user needs as well as reliable and efficient. Being responsive with provide and element of mitigation against the risk of any user department seeking its own solutions to implement, the 'shadow IT. If it does this, a situation of non-congruence of systems and communication will occur (Teo & Ang, 1999, p. 180). If the users are not involved, performance of IT will suffer and this will erode confidence in the department leading to less support given to IT, negatively affecting the long-term alignment in the organisation.

User involvement also tempers the expectations of the users and the business executives about the capabilities of the IT department. Lederer and Mandelow (1989, pp. 7–8) established that managers with insufficient knowledge of time and cost frequently wanted services from IT that could not be delivered. Shared understanding plays a part in ensuring that requested systems and services are anticipated in a realistic and achievable way. Management are sometimes more concerned with short-term problems (Lederer & Mandelow, 1989, p. 14) and neglectful of long-term goals.

Getting the users involved makes them cognisant of the need to take a holistic view of the organisation's operations. Involvement helps the users make reasonable demands and lessens the risk of inadequate resources being apportioned as insufficient resources result in misalignment of business-IT plans (Lederer & Mandelow, 1989, p. 8).

Huang and Hu (2007, p. 181) reminded the reader that "alignment is a two-way street: IT needs to be business savvy, and business has to become technology aware". They stated that, even though the obligation to investigate and deliver the innovative use of IT assets to deliver business value resides with the CIO, other executives also need to take the impact of IT into consideration when formulating and executing business strategies. The user in this instance becomes the manager and the concept is thus very closely aligned the to the CSF of *Executive commitment* (Huang & Hu, 2007, p. 181).

The interactions between CSFs need to be taken into account to ensure that the path to alignment yields success. This was highlighted by Chan and Reich (2007: 306), Scott (2005: 917), Teo and Ang (1999: 182). It can be deduced then, that without user buy-in, CSFs such as *Effective communication* and *Shared knowledge* (understanding) will also be weakened.

The established relationship between the *User involvement* CSF and the other CSFs in this chapter is once again evident. This interdependency includes the CSFs of *Effective communication*, *Shared knowledge* and *Collaboration planning processes* and *IT credibility*. This was highlighted by Scott (2005, pp. 917–918), Teo and Ang (1999, p. 182), as well as by Chan and Reich (2007, p. 306). It is important to take into account these interactions between CSFs to make sure the path to alignment yields success. It can be surmised that without user buy-in, CSFs such as communication and shared understanding will also be weakened.

4.4 SYNTHESIS, PRACTICES AND VARIABLES

For the purpose of this research study, 22 different peer-reviewed academic papers were deemed relevant (see Table 3.5). The different antecedents, enablers, behaviours and critical success factors were all collated into one comprehensive list consisting of 33 critical success factors.

CSFs have been described using different terms in the literature. In the study by Reich and Benbasat (2000), they referred to them as antecedents, and they divided them further into background and foreground antecedents. In other studies, researchers referred to them as behaviours (Chan & Reich, 2007), while others referred to them as enablers (Luftman et al., 1999), and Teo and Ang (1999) simply listed them as critical success factors. These different terms all refer to what have been theoretically and empirically tested to be the actions, behaviours and elements necessary for alignment to be reached between business and IT.

The academic literature on BITA CSFs was used in this systematic review to extract the CSFs from highly-cited peer-reviewed papers in business and IT-alignment. On analysis, after completion of the coding exercise it is evident that all the code families (CSFs) were identified by the third article and all the codes by the ninth article. There may be less disparity in the BITA literature than initially indicated and a fair amount of commonality in the factors that lead to success, even in the absence of common terminology. However, not a single source contained all the practices listed in Table 4.1. Appendix C shows the distribution of the codes as well as code families among the different articles coded from the 22 carefully-selected articles curated from the articles considered (see Section 3.4.2).

The individually-identified success factors share common themes, although the constituent concepts are given various names in the considered literature. The golden thread that aligns them into a specific factor was used as the guiding principle to group them accordingly following an inductive approach.

However, in order to create CLDs it was necessary to define variables that represent the key changing variable associated with the execution of the actions associated with the CSF (see Section 2.6) since the success factors can only be presented as variables on the diagrams. Wardman (1994, pp. 1-2) argued that a significant part of the clarity of a CLD is based on the careful selection of variables. Following her guidance, an iterative process was followed to define the most appropriate variable as indicated in Table 4.8. Sherwood (2011, p. 127) stressed the importance of always keeping at a consistent level of granularity within a CLD to not make the diagram too complex by presenting too much detail.

Sherwood (2011, pp. 131-132) also recommended using nouns and noun phrases, rather than a verbs or verb phrases, when defining variables. Keeping to this recommendation, the variables selected, that could be expressed as action verbs (sharing or committing) were rather defined with the appropriate noun or noun phrase equivalent (shared or committed). Appendix D contains all the questions used in the interviews that refer to both the practices as well as the variables used in these practices.

Table 4.8: Overview of BITA CSFs

BITA CSF identified	BITA variable for CLD
Collaborative planning processes	Collaborative planning processes
Effective communication	Effective communication
IT credibility	IT credibility
Shared knowledge	IT knowledge shared
Executive commitment	Executive commitment
User involvement	Constructive user involvement

The interdependency and feedback effect between the multiple CSFs identified in the systematic review are evident in this chapter and have also been confirmed by Hu and Huang (2006, p. 184) who observed that shared domain knowledge (Table 4.5) between IT and business executives and successful IT implementations (Table 4.4) lead to improved communication (Table 4.3) between business and IT executives. In conjunction with stronger connections between business and IT planning, short-term alignment is achieved. This is not unexpected and corroborates the selection of the method of analysis, CLDs, that deal with interdependencies and cause-and-effect relationships.

There are six broad categories of CSFs in the selected literature. Some of the factors can be described as background factors that are strongly influenced by other factors, including shared knowledge and prior success, while some are in the foreground, such as planning processes and communication, which influence the other factors.

Collaborative planning processes was selected as a variable that best represents the *Collaborative planning processes* CSF as well as sub-factors or codes (see Table 4.2). A trade-off on the codes (sub-factors) of *Business and IT partnering to prioritise IT systems* and *Planning sophistication* is again evident since these are not perfectly presented by the choice of variable, but it is sufficiently close. The other sub-factors all relate strongly to the chosen variable.

Effective communication was selected as a variable for the *Effective communication* CSF as well as sub-factors or codes (see Table 4.3). This is a small (only four), yet rather diverse group of codes, and the variable of Business IT social capital is not well represented by this choice. Multiple other options where investigated and all remain a trade-off between the different factors. Finally, it was decided that the concept of social capital is also to an extent represented by the variables of *Executive commitment, IT credibility (strongly)* as well as *Shared knowledge* and the importance of social capital will thus not be lost in the process.

IT credibility was selected as a variable that best encapsulates the *IT credibility* CSF as well as sub-factors or codes (see Table 4.4). This code family (CSF) represents the largest number of codes, yet it is highly descriptive of the results of the successful execution of the actions associated with each of the codes. Although at first glance practices that include concepts like IT governance, IT flexibility and IT's creativity seem disparate, they really all contribute towards the credibility. Virtually all authors dealt with prior success but most failed to recognise that it is not prior success that is important for BITA but rather the results of prior success, being IT credibility.

IT knowledge shared was selected as a variable that best encapsulates the *Shared knowledge* CSF as well as sub-factors or codes (see Table 4.5). This CSF deals with both formal and tacit means of knowledge sharing between business and IT. However, not having a descriptor of IT in the variable would make it extremely broad and lead to complexity in the diagram. It is thus acknowledged that the codes (sub-practices*) IT Management knowledge of business* and well as *Clear and stable business objectives known to IT management* may not be that well represented by the variable, but it is a necessary trade-off to limit complexity.

Executive commitment was selected as a variable for the *Executive commitment* CSF as well as sub-factors or codes (see Table 4.6). Although the variable represents a group of codes (sub-factors) that vary from the positioning of the CEO role in business and selecting practices of IT architecture and portfolios, the variable is an excellent indicator of the results of these actions.

Constructive user involvement was selected as a variable that represents the *User involvement* CSF as well as sub-factors or codes (see Table 4.7). Although user involvement represents the first two codes fairly well, it was decided to add ‘constructive’ to include the *Realistic expectations and sophistication of user managers*.

The variables listed were all used in the interviews (see Appendix H) as well as in the causal loop diagrams presented in Chapter 6.

CHAPTER 5
PROJECT PORTFOLIO MANAGEMENT PRACTICES

5.1 INTRODUCTION

Whilst some authors have presented BTA CSFs (as presented in Tables 2.3 to 2.10), it was still deemed necessary to define research question 1 and perform a structured review as presented in Chapter 4. The research question and answer were important given the more comprehensive set of BITA CSFs that were found than in any of the previous studies.

The interviews in Stage II (see Figure 3.1) required probing for the presence of PPM practices that was not be to be identified from the literature. Research question 2 was thus formulated to ensure that a comprehensive set of PPM practices was identified to be used in the interviews. This chapter documents the systematic review of the articles selected to define project portfolio management (PPM) practices to answer research question 2.

Section 5.2 describes the different practices identified through the systematic review and indicates the prevalence of these practices in the articles selected. Appendix E contains the details of the codes (sub-practices) and the code families (practices) and Appendix F contains the detailed mapping of all the identified codes and the articles.

In Section 5.3 the terms 'sub-practice' and 'code' are used interchangeably. Although all the codes used are not sub-practices, and could rather been seen as attributes of the particular PPM practice, some of the codes are indeed sub-practices and the discussion treats them as such. The details of the coding process followed to create this chapter is contained in Section 3.4.3 and is also shown in Figure 5.1.

Section 5.3 provides a narrative description of each practice supported by the codes as well as details of the practice from the selected articles. Section 5.4 provides a final list of practices, as well as variables that define the measurable dimension of each practice to allow it to be included in a CLD.

5.2 PROJECT PORTFOLIO MANAGEMENT PRACTICES

The Oxford Dictionary (2019) defines 'practice' as the application or use of an idea, belief, or method, as opposed to the theory relating to the particular principle. In this research, a practice is defined as the executed actions or procedures that embody the particular principle, in this instance, project portfolio management.

Coding for the various practices presented some challenges due to the interrelatedness of certain codes or sub-practices. Examples are future preparedness that interestingly is strongly related to cannibalising or terminating under-performing projects (Rank, Unger & Gemünden, 2015, p. 1738), yet this one principle maps to *Strategic alignment* via the *future preparedness code* as well as *Portfolio optimisation*' via the *project selection / termination / delay* code.

Following the guidelines from Zhang and Wildemuth (2009, p. 312) and using the constant comparative method, each new code created was first compared with the codes belonging to the family. The challenge of multiple codes for the same text has been acknowledged as completely normal and scientifically acceptable in qualitative analysis (Tesch, 2013, p. 124; Zhang & Wildemuth, 2009, p. 312). However, care was taken to ensure the categories in the coding scheme are defined in a way that they are internally as homogeneous as possible, and externally as heterogeneous as possible, as recommended by Zhang and Wildemuth (2009, p. 312).

The practices identified in the selected articles (see Section 3.3.3 and Table 3.7) are indicated in Table 5.1. Appendix E contains the complete list of practices as well as sub-practices and Appendix F contains the mapping of the practices to the articles from which they were extracted.

Table 5.1: Project portfolio management practices

PPM practice identified	Prevalence	Practice as a primary focus in the article coded
Strategic alignment	94%	Pajares & López, 2014; Young & Conboy, 2013; Voss, 2012; Killen & Hunt, 2010; Daniel et al., 2014; Killen et al., 2012; Rank et al., 2015
Portfolio optimisation	90%	Pajares & López, 2014; Killen & Hunt, 2013; Brook & Pagnanelli, 2014; Costantino, Di Gravio & Nonino, 2015; Rank et al., 2015
Project portfolio governance	90%	Young & Conboy, 2013; Gutiérrez & Magnusson, 2014; Beringer et al., 2012; Beringer et al., 2013; Martinsuo, 2013; Frey & Buxmann, 2011; Hyväri, 2014
Resource management	87%	Pajares & López, 2014; Laslo, 2010
Portfolio performance review	77%	Meskendahl, 2010
Integration management	74%	Heising, 2012; Meskendahl, 2010; Rank et al., 2015
Project portfolio ownership	65%	Young & Conboy, 2013; Killen & Hunt, 2013; Beringer et al., 2012; Hyväri, 2014
Portfolio risk management	65%	Pajares & López, 2014; Teller, 2013; Teller & Kock, 2013
Portfolio communication	65%	-

In principle thus the execution of the set of practices listed in Table 5.1 would embody project portfolio management within an organisation. Whether the organisation formally implements project portfolio management in a business unit, often called the project portfolio management office, is not important. However, the presence of the practices is important as the interviews (see Appendix E) tested for the presence of the practice, not the formalisation thereof.

In the code families that define PPM practices the *Strategic alignment* family of codes, *Portfolio optimisation*, *Project portfolio governance* and *Resource management* made continued appearances in the literature with an appearance of 87 percent or higher for all four these code families.

For *Strategic alignment* and *Resource management* this is not surprising given every definition presented in the literature (Section 2.5.3) includes the concept of aligning projects and portfolios with organisation strategy and allocating and managing the resources on the different projects. The practices of strategic alignment and resource management are thus central to project portfolio management.

Portfolio optimisation is not that explicitly dealt with in literature by name, but in principle most of the actions commonly associated with PPM are actually about optimising the portfolio, be that through aligning, resourcing, selecting or terminating projects, or ensuring an environment in which PPM flourishes. However, the typical environmental factors are coded in the *Project portfolio governance* that deals with the formalisation of all the different techniques used for alignment, selection, allocation and management of the portfolio. It is thus not unexpected to see the high level of prevalence of these four code families.

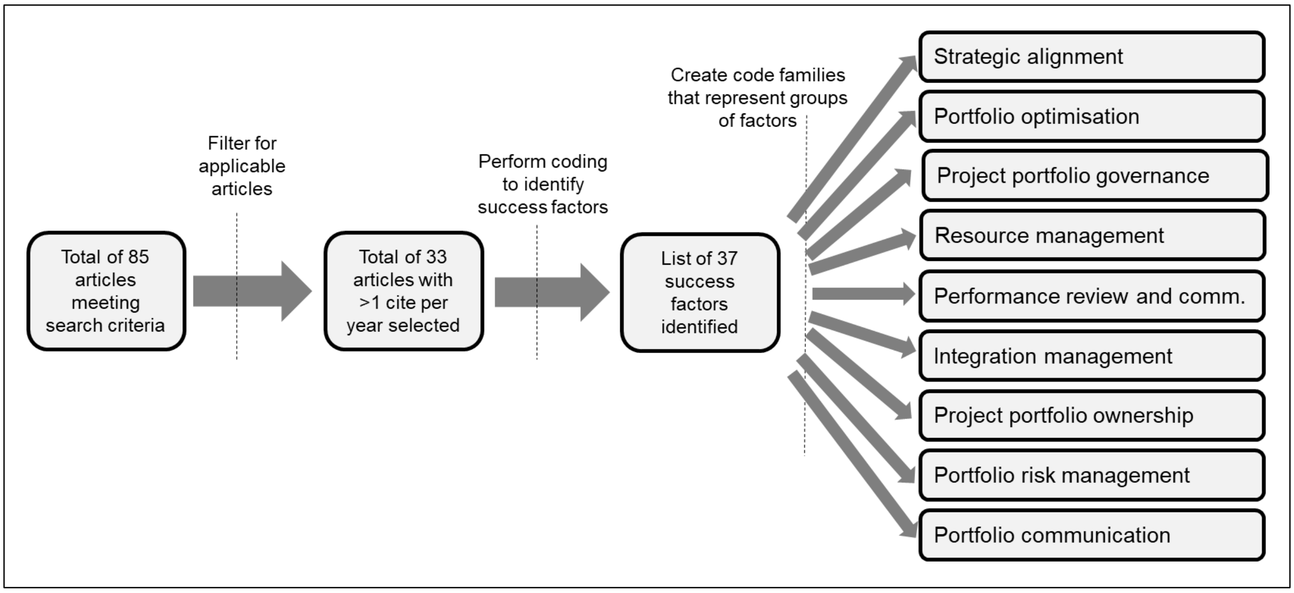

Figure 5.1: Search and SR process for PPM practices

At the lower end of the appearance are *Project portfolio ownership*, *Portfolio risk management* and *Portfolio communication* that are only present in 20 (65%) of the articles. The concepts of ownership and communication are not that well documented in the literature and often not seen by authors as central to PPM practices. However, the relative low presence of risk management-related practices is rather surprising given the origin of PPM in portfolio theory with its strong risk emphasis.

None of the 31 articles selected intended to provide a comprehensive set of practices for PPM, with the probable exception of Young and Conboy (2013). It was thus to be expected that not all articles would contain all practices. Given the relative high presence (65%) of the least covered practice, it is highly unlikely that a practice was completely missed in the analysis of the 25 most-cited academic articles about project portfolio management and six additional highly-cited articles with a focus on project portfolio management practices.

Not any one of the articles contained all the codes used to define the practices. This validates the decision to rather create the PPM practices through a systematic literature review and to not use an existing list of practices. As indicated in Appendix E the family codes (high-level practices) are actually present in six of the 31 articles with Teller et al. (2012) containing the highest number of the coded sub-practices (32 out of 37; 86%). The lowest number of practices was found in Laslo (2010) which is not surprising as it is a focussed article dealing with a specific quantitative resource allocation method.

In terms of saturation, no new code families emerged after the third article and no new codes (sub-practices) emerged after the tenth article. It can thus be stated with a fair amount of certainty that the set of practices that follow are comprehensive and, in all likelihood, accurately represent the execution of project portfolio management.

5.3 PPM PRACTICE DESCRIPTIONS

5.3.1 Strategic alignment

The PPM practice of *Strategic alignment* enjoys significant presence in the literature considered in this research. Research on fit, or alignment, has been examined by different research areas in management literature. The concept of strategic fit stems from organisational research with the central proposition that performance of an organisation is the result of fit between two or more factors, such as strategy, structure, technology or environment (Meskendahl, 2010, p. 808). In this instance, alignment refers to the contribution of the portfolio, or collective projects, towards the organisation’s strategic intent.

A coordinated project portfolio represents an organisation's investment strategy and delivers increased benefits to the organisation beyond the results of projects managed independently by leveraging synergies. Although evaluation, prioritisation and selection of projects are important in aligning the portfolio with the company's strategy (Voss, 2012), these principles are covered in the next practice of portfolio optimisation through categorisation and prioritisation. However, the practices have significant commonalities as is evident from the similarities in the codes and mapping of the codes to the articles.

Table 5.2: Strategic alignment practice and sub-practices

Practice	Sub-practices	Prevalence
Strategic alignment	Portfolio objectives	71%
	Strategic alignment	87%
	Portfolio dynamic re-assessment	55%
	Future preparedness	45%
	Value capturing	32%

Table 5.2 contains the codes identified in the coding of the *Strategic alignment* practice as well as the prevalence of these codes in the articles analysed. Appendix F contains the details of the analysis and shows how the codes manifested across the 31 articles analysed. In the articles by Daniel et al. (2014), Killen and Hunt (2010), Killen et al. (2012), Pajares and López (2014), Rank et al. (2015), as well as Young and Conboy (2013), strategic alignment was the primary focus area of the article, confirming the importance of this practice in the PPM academic literature.

The strategic fit of the project portfolio describes the degree to which the sum of all projects reflects the business strategy. Beringer et al. (2012, p. 18) contended that the "strategic fit of a portfolio reflects the internal strategic fit perspective that refers to the alignment of project objectives and resource allocation according to a project's strategic relevance". PPM is thus essential to realising business strategy and strongly influences the future competitive position of organisations (Gutiérrez & Magnusson, 2014, p. 30). The *strategic objectives* code feature strongly in the literature and is an important sub-practice embedded within the PPM practice of *strategic fit*.

Intertwined with the clear portfolio objectives is the concept of strategic fit. Gutiérrez and Magnusson (2014, p. 31) described PPM as a "decision-making process … assuring that the selected group of projects contributes to realizing the firm's business strategy in terms of product lines, markets, technological platforms". The strategic fit is supported by the vast majority of the authors and is central to the value embedded within PPM and unlocked through appropriate PPM practices. Daniel et al. (2014, p. 96) defined the attainment of strategic fit as the prioritisation of an organisation's projects and programmes in line with business objectives and matching these to the capacity to deliver them. Both the prioritisation and capacity to deliver them feature in the practices of *Portfolio optimisation* (Section 5.3.2) and *Resource management* (Section 5.3.4), again confirming the overlapping of this practice with others.

Although the sub-practice of *portfolio dynamic re-assessment* appeared in just over half of the articles, it was the primary focus of four of the articles (Daniel et al., 2014; Killen & Hunt, 2010; Killen, Jugdev, Drouin & Petit, 2012; Pajares & López, 2014). The continuous re-assessment of the project portfolio is not only strongly supported in the literature, but also important in the context of this research. PPM is not a static process but a dynamic one (Pajares & López, 2014, p. 648). "Unlike projects or programs, a portfolio does not have a finite life; instead it is a continuous process and requires regular tending to ensure that the portfolio remains in balance and remains consistent with the organisation's strategic objectives" (Young & Conboy, 2013, p. 1092). Gutiérrez and Magnusson (2014, p. 31) summarised the argument about dynamic capabilities in project portfolio management by arguing that PPM can be described as a dynamic decision-making process in which the portfolio of active projects is continuously reviewed and updated.

Killen and Hunt (2010, p. 157) believe that PPM should be seen through the dynamic capability view and, more importantly, that PPM provides a theoretical foundation that may influence future research and practice. This view is strongly supported by Meskendahl (2010, p. 814) who argued that a firm's project portfolio structuring capability “is a dynamic capability that, when matched with the strategic orientation, leads to better project portfolio results”. He is of the opinion that firms with a strong and distinct risk-taking perspective, called an aggressive strategic posture, could realise higher project portfolio success levels through the implementation of a more formalised and diligent structuring process (Meskendahl, 2010, p. 814).

The concepts that were coded as *future preparedness* and *value capturing* were only present in fourteen and ten of the articles evaluated, thus not showing significantly high levels of repetition. Although these codes may not appear as often as others in the selected literature, they present important aspects of PPM and substantiate the importance of the strategic alignment with both a current value capturing and future-orientated (strategic posturing) stance. Voss (2012, p. 571) stated that future preparedness reflects the preparedness of the organisation and its technological infrastructure for future needs. It evaluates long-term benefits and opportunities offered by the projects, which are mostly indirect and can eventually be realised after the projects have been completed. In fact, Voss (2012, p. 571) contended that future value represents the fourth dimension of PPM success together with average project success, the strategic fit, and portfolio balance.

This future-orientated value is often long-term benefits like the creation of new markets, development of new or improved technologies or processes, acquisition of new skills and competencies and brand value or employer reputation. Moreover, additional benefits include enhanced adaptiveness to react quickly to technology or market changes. This adaptiveness is an important concept as it relates to an important concept in the BITA literature. Liang, Wang, Xue and Ge (2017, p. 863) did research on the contradictory views about the impact of BITA on organisational agility. They looked at the intellectual and social dimensions of IT alignment and presented empirical evidence that intellectual alignment impedes agility by increasing organisational inertia, while social alignment facilitates agility by enhancing emergent business-IT coordination. Being future orientated in a dynamic environment is complex. Merely increasing alignment to ensure short-term gain from IT projects could negatively impact medium-term agility (see Section 2.4.3).

A contentious sub-practice coded is that of *value capturing*. The initial code was *value capturing and creation*. The value creation argument was mostly based on that of Voss (2012) who believes that the PPM value creation process transforms results of strategy development into propositions to create value, both for the customer and for the organisation. Voss continued by identifying key value creation elements, namely: (i) determining the value the company can create for the customer; (ii) determining the value the company can extract from the customer relationship; and (iii) maximising the lifetime value of the focus segments. The research context of Voss was deeply customer centric and cannot be generalised for PPM. On deeper inspection, and especially when compared to other articles, it was decided that PPM is not a value creation process and the code was updated to indicate value capturing only which was supported by multiple other articles.

5.3.2 Portfolio optimisation

The principle of *Portfolio optimisation* enjoys significant presence in the literature that was considered in this research. *Portfolio optimisation* was present in 27 of the 31 articles evaluated (87%), as one of the most-common practices identified in the literature.

An effective process to determine which projects to include in a project portfolio is essential to any organisation implementing project portfolio management. The most prominent code in the articles considered is related to project selection, termination and delay. Three sub-codes of selection, termination and delay were initially used in the coding process, but these were merged into a single selection / termination / delay code that presents this interdependent practice that often deals with all three decisions at the same instance. The codes included in this code family are indicated in Table 5.3 below.

Table 5.3: Portfolio optimisation practice and sub-practices

Practice	Sub-practices	Prevalence
Portfolio optimisation	Portfolio prioritisation	55%
	Project selection / termination / delay	68%
	Portfolio categorisation	29%
	Portfolio balance	58%

Table 5.3 contains the codes identified in the coding of the portfolio optimisation practices as well as the prevalence of these attributes in the articles analysed. Although the selection, delay and termination of projects are now in a single code, it warrants a brief explanation. Rank et al. (2015, p. 1738) made an important argument about the link between management quality and the willingness to cannibalise the current project portfolio. Where most authors focus extensively on the selection of projects and adding new projects to portfolios, Rank et al. made a very important observation about the willingness to sacrifice existing projects and reduce the value of current profit-generating assets, so that an organisation may proceed with the implementation of new projects.

It could be argued that knowing which projects to terminate, to release the organisational resources required for new projects, are more important than the often-covered selection of new projects. Campbell and Park (2004, pp. 28-29) argued the exact same principle and indicated that it is an organisational culture issue where the escalation of commitment often sees organisations clinging to poorly-performing assets.

Appendix F contains the details of the analysis and shows how the attributes manifested across the 31 articles analysed. In the articles by Killen and Hunt (2013), Meskendahl (2010) as well as Rank et al. (2015) *Portfolio optimisation* was the primary focus area of the article.

Petit (2012, p. 540) believes that for PPM to deliver value, individual projects must be added, reprioritised, or excluded based on their individual performance, as well as the entire portfolio's ongoing alignment with the defined strategy. In the often-dogmatic early PPM literature, the processes, methods and tools suggested, were mainly based on rational decision-making (Gutiérrez & Magnusson, 2014, p. 31). That is, formal and hierarchical decision-making processes in which decision-makers are assumed to make consistent choices that maximise the value of the firm, through systematic assessments of alternatives compared to predetermined criteria (Gutiérrez & Magnusson, 2014, p. 32).

To date a significant amount of literature, of which Laslo (2010) is a perfect example, focussed on highly-quantitative selection algorithms. In the absence of acknowledging the complex and dynamic environments in which project selection is done, as well as the multiples of qualitative criteria, this research has very limited value for practitioners. Although Frey and Buxmann (2011, p. 2) argued for an increased need for structure and professionalisation in the management of IT projects and project portfolios due to the increasing use of information technology, this does not necessarily refer to the mechanistic and quantitative techniques often found in academic literature.

Selecting projects in complex and dynamic environments is not a rational decision-making process. Pajares and López (2014, p. 648) argued that newly-initiated projects become candidates to be included in the portfolio on a continuous basis, "as new market, technical or strategic opportunities emerge". Conversely, the continuous monitoring and rebalancing of the project portfolio means a project can decrease in priority for consuming resources, or be terminated altogether if it does not deliver sufficient value or if it is aligned to an outdated strategy (LaBrosse, 2010, p. 76). The selection is thus a continuous process that affects portfolio balance, a critical concept enabled through individual project selection, termination and delay.

The distinctive nature of individual projects makes estimates about their progress, and ability to contribute value, difficult and therefore imprecise. The dynamic nature of individual projects that could change during their life cycle poses an additional challenge. The project's value contribution, embedded in the selection business case, could change significantly at any stage during the project life cycle. If an organisation aims to keep a balanced project portfolio, it is not sufficient to only consider the initiation stage business case; instead continuous operational and business value measures based on current project statuses, business requirements and strategic intent are required (Kaiser et al., 2015, p. 129). It is also possible for a project's risk profile to change after its initiation, hence the portfolio profile and therefore the selection of future projects need to reflect this change (Kaiser et al., 2015, p. 129). However, the details are coded and discussed in the risk management code family (Section 5.3.8).

Killen and Hunt (2013, p. 142) presented evidence that PPM not only improved the selection processes at case organisations, but also improved the ability to terminate poorly-performing projects. They presented multiple factors that inhibit organisation's ability to terminate poorly-performing projects and reallocate resources in a truly agile manner. These factors are often the escalation of commitment or lack of updates to business cases for individual projects as argued in the literature review (see Section 2.5.8). However, Rank et al. (2015, p. 1738) argued that even though the willingness to cannibalise is “quite easy to deploy, managers often try to protect their current investments in resources and try to exploit them to the maximum extent possible; thus they are reluctant to cannibalize the existing resources for some seemingly uncertain future gains”. In creating balanced project portfolios, organisations need to overcome this reluctance to terminate poorly-performing projects that are tying up existing resources. This reluctance to officially stop poorly performing projects is not uncommon in the IT literature where the escalation of commitment is documented to stop organisations from killing poorly-performing projects (Daniel et al., 2014, p. 96).

When multiple projects consume a single pool of limited resources, prioritisation of individual projects is critical. Brook and Pagnanelli (2014, p. 51) advocated that project selection is “aimed at maximizing the value of the project portfolio within the range of resource constraints. It involves simultaneous comparison of a number of projects in order to arrive at an optimal ranking of the projects”. This ranking, or prioritisation of projects using appropriate ranking criteria, ensures that the project with the most significant value contribution is added to the portfolio. Along with the prioritisation, the project also inherits the right to consume organisational resources (Brook & Pagnanelli, 2014, p. 51). PPM is thus about accepting projects into the portfolio, monitoring the progress of a single project and at regular intervals re-prioritising all of the projects in the portfolio to achieve balance, synergy and success while enforcing the firm's strategy via the project portfolio (Unger, Kock et al., 2012, p. 612).

Categorisation of projects is inherently different from prioritisation and could be done for various reasons, including prioritisation or often communication and reporting. Killen and Hunt (2013, p. 140), for example, categorised projects as short-term ‘exploitation’ projects and long-term ‘exploration’ projects. They are of the opinion that PPM capability should be tailored to cater for any organisation’s specific context as well as the project categories. Tailoring PPM for different project categories will improve the ability of the PPM capability to address the balance between the short-term ‘exploitation’ projects and long-term ‘exploration’ projects (Killen & Hunt, 2013, p. 140). They also raised the importance of monitoring and managing the balance between firmness and flexibility and the impact thereof on resource agility, defined as the ability to effectively reallocate resources (see Section 5.3.4) when the go/stop/kill decisions are made (Killen & Hunt, 2013, p. 146). Voss (2012, p. 568) supported the concept of a well-balanced portfolio to ensure optimised value capturing based on a balance of the size of projects, as well as short-term and long-term goals.

Achieving balance in the project portfolio is the ultimate aim of PPM, although extremely complex. Voss and Kock (2013, pp. 847-861) are of the opinion that the relationship value gained from this balance is more important for a large portfolio, than for a relatively small portfolio, due to the increased complexity. Petit (2012, p. 540) maintained that PPM literature does not adequately address the potential disturbances to the portfolio typically found in dynamic environments, that could disturb the balance of a portfolio. These disturbances could, for example, be changes in strategic intent or availability of resources to be distributed to a portfolio. Petit (2012) stressed the importance of periodical reviews of the portfolio performance (see Section 5.3.5) to ensure that the project portfolio contains only components that contribute towards achievement of the strategic goals, which is a complex measure in itself.

To achieve a balance in the portfolio, projects must be added, reprioritised, or excluded based on their performance and ongoing alignment with the defined strategy in order to ensure effective management of the portfolio. Any significant changes in the business environment resulting in a new strategic direction would also impact the criteria determining the composition and balance of the portfolio adding to the dynamic complexity (Petit, 2012, p. 540). It is thus required to also review the selection and termination criteria based on current criteria in the strategic plans. This is rather akin to hitting a moving target, a concept also prevalent in BITA literature acknowledging dynamic complexity. Essentially setting new criteria will lead to changes to the portfolio; yet, if strategic change is not occurring, the PPM efforts should focus on portfolio balancing. It can be argued, that a portfolio is always in transition, either to align to changing strategy, or in the absence of changes in strategy, due to the changes as projects move through their different life cycles and impact on each other (see Section 5.3.6 on *Integration management*).

Risk also plays a significant role in portfolio balance (Voss, 2012, p. 568). Although risk management is coded under a separate practice (see Section 5.3.8), risk is inherent in the project, the different projects, the alignment of the different projects and the interdependency between the different projects and is part of an optimisation process. Ultimately a "balanced portfolio in project management is a desired combination of projects that enables a company to achieve its objectives with the least amount of risk associated with the portfolio" (Voss, 2012, p. 568). This is to be expected due to the risk mind-set that was encapsulated in modern portfolio theory. In essence, the idea of a balanced portfolio is based on modern portfolio theory adapted by strategic management literature (Meskendahl, 2010, p. 809) as covered in Section 2.5.2.

Meskendahl (2010, p. 809) agreed with authors on the balance and risk argument and contended that "the desired combination of projects is a balanced portfolio that enables a firm to achieve its objectives without being exposed to unreasonable risk". Although *Portfolio risk management* is coded separately (see Section 5.3.8), balancing risk is part of the selection, termination and delay argument and also plays a role in balancing the portfolio. It is thus clear that the codes used are not mutually exclusive and neither are they required to be. This overlapping and interdependencies in the PPM practices are also evident in the CLDs in Chapter 6.

5.3.3 Project portfolio governance

The principle of *Project portfolio governance* enjoys significant presence in the literature considered in this research. *Project portfolio governance* was present in 28 of the 31 articles evaluated (90%), as one of the more prevalent practices. Coding for this practice presented a significant challenge as the codes used overlapped considerably with many codes used for other PPM practices. It was decided to keep this as a separate practice that focusses on stakeholders, leading, controlling and decision-making that are not sufficiently explicit in any of the other practices. The formalisation of PPM in organisations is the final code embedded in this practice.

Decision-making is the code most often found in the selected literature for *Project portfolio governance*. Table 5.4 shows that *Project portfolio governance* includes the concepts of stakeholder management, decision-making as well as control that are important governance processes in any environment.

The codes *portfolio leadership* and *portfolio steering* warrant an explanation, since they do not fit perfectly under the governance code family at first glance. However, 'leadership' in this context is very broad and akin to the steering activities within the management of a portfolio. Although some of the leadership statements coded could be seen as more about ownership (Section 5.3.7), invariably these sections were in fact coded with ownership codes as well, again showing the highly-integrated nature of the PPM practices. Steering activities, although closely related to decision-making, were coded as the actions that follow upon the making of certain decisions, in order to secure a particular outcome. Even the code family name was a challenge, but ultimately it was decided that *Project portfolio governance* was the most accurate description of the set of codes mapped to this practice.

Table 5.4: Project portfolio governance practice and sub-practices

Practice	Sub-practices	Prevalence
Project portfolio governance	Stakeholder interest	52%
	Stakeholder management	29%
	Portfolio leadership	52%
	Decision-making	77%
	Facilitating control	52%
	Portfolio steering	42%
	Formalisation of project portfolio management	48%

Table 5.4 contains the codes identified in the coding of the *Project portfolio governance* attributes as well as the prevalence of these attributes in the articles analysed. Appendix F contains the details of the analysis and shows how the attributes manifested across the 31 articles analysed. In the articles

by Beringer et al. (2012), Gutiérrez and Magnusson (2014), Martinsuo (2013) as well as Rank et al. (2015) *project portfolio leadership* was the primary focus area of the article.

It has already been argued in this chapter that strategic portfolio planning, evaluation of project proposals, and the selection of projects should be conducted in recurrent intervals synchronised with the organisation’s strategic planning cycles. Because of the highly-interdependent nature of these activities, and the importance of the portfolio structuring phase for the company's strategy implementation, it should be conducted with a significant involvement from the top management team members and representatives from functional units. More generally, portfolio governance describes the firm's ability to integrate the PPM into its existing strategic and management processes. That means PPM has a close influence on the firm's market, technology, human resource, and investment strategies, as well as these strategies, in turn, having an influence on the portfolio composition and management thereof.

In a mature PPM system, the concept of governance would mean that “all stakeholders focus on the tasks that they are supposed to perform and fulfil their responsibilities” (Beringer et al., 2012, p. 27). In such an environment, senior management do not need to engage in firefighting but rather focus on strategic tasks. Project portfolio managers focus more on the operational tasks of portfolio steering and engage in portfolio structuring only to gain insight into strategic issues to prepare for subsequent operational tasks.

Different organisational roles contribute towards the leadership requirements for portfolio success. Pajares and López (2014, p. 646) suggested that the CEO and executive management team are responsible for defining and managing the firm portfolio, as they are responsible for the strategy to be defined and implemented. However, according to Pajares and López (2014, p. 646), more operational aspects, that require tactical and operational decisions about project management and coordination of multiple projects, are carried out by programme, project and resource managers. Beringer et al. (2012, p. 27) broadly categorised the entire set of PPM tasks as follows:

- *Portfolio structuring* aims for balance and strategic alignment and is conducted at recurrent intervals in alignment with a firm’s strategic planning cycles. This includes all the managerial activities initially undertaken to establish a target portfolio from a given business strategy (see Sections 5.3.1 and 5.3.2).
- *Resource management* aims for the efficient allocation of project resources across an entire portfolio through managerial activities, such as cross-project resource planning, allocations and approvals (see Section 5.3.4).
- *Portfolio steering activities* include gathering information for the continuous monitoring of strategic alignment (see Section 5.3.5), the development of corrective measures in case of deviations from the target portfolio (see Section 5.3.5), the coordination of projects across organisational units to identify project synergies (see Section 5.3.6), and the detection and termination of obsolete projects (see Section 5.3.2).

Although this broad classification is useful, it excludes three important code families that emerged in the inductive coding process. The first is the concept of *Portfolio ownership* (see Section 5.3.7) that could also be argued as the PPM culture. *Portfolio ownership* indicates that entrenching practices in organisations is more than governance and formalising; it is also embedding them in the hearts and minds of those that need to execute these practices. In the BITA literature this is often called the social dimension of alignment. Although embedding the ownership and culture dimension is probably the most important oversight in Beringer et al.'s (2012) broad classification, *Portfolio risk management*, which is very well covered in the literature, is probably the most glaring oversight. Section 5.3.8 deals with this set of management tasks associated with managing portfolio risk in detail. The final code family is that of *Portfolio Communication* (see Section 5.3.9) deals with the intra and inter portfolio communication activities that support the successful execution of many of the other sub-practices.

Beringer et al. (2013) provided another classification of PPM based on a process-oriented understanding of portfolio management. According to them, the set of managerial activities can be structured along three generic and recursive main phases: (i) portfolio structuring; (ii) resource management; and (iii) portfolio steering. The first two groups of managerial activities have already been dealt with in previous practices; it is the latter (steering) that was coded for in this practice in particular. This steering of the portfolio was found to be different from mere decision-making; it is more about ensuring that decisions are executed that are important in the directly project and portfolio activities, intra-portfolio or even intra-project activities. This can be thought of as a lower level of alignment at the operational and tactical level.

Martinsuo (2013) suggested that the decision-making on project and portfolio selection is less planned and rational and, instead, more political and path-dependent than the normative models would suggest, i.e. it requires the steering activities. She referred to research which revealed the existence of pet projects and 'under the table' projects and their success outside of the formal portfolio management regime. According to Martinsuo (2013), studies about project portfolio management in practice have shown that managers' actions and managerial decision-making involve intuition, negotiation and even bargaining, not accounted for in the PPM frameworks built upon rational project portfolio decision-making. These steering activities are important for portfolio success, despite a lack of formalisation to the same extent as decision-making.

Decision-making remains an important PPM activity. An important part of managing a portfolio of projects is to remain aligned to the objectives that were set for the portfolio. This requires exceptional decision-making skills as well as strategic insight. Gutiérrez and Magnusson (2014) stated that PPM is considered to be a decision-making process with three main objectives: (i) maximising the return on the investments; (ii) managing risk by diversification; and (iii) assuring that the selected group of projects contribute to realising the firm's business strategy.

According to Korhonen et al. (2014, p. 23), "not much is known about controls for managing uncertainties, especially at the portfolio level, although, hints about management controls in project portfolios exist", despite the knowledge of management control systems in general. Authors have often referred to the same set of activities under 'control' and 'steering' making it rather difficult to segregate the codes at a more granular level. Beringer et al. (2012, p. 18), for example, believes portfolio steering aims to enhance a company's adaptive capacity and flexibility with respect to a portfolio's internal and external changes that appear on short notice during a planning period. This is not significantly different from what other authors have presented as control or decision-making.

However, some authors see steering as somewhat distinct from control and decision-making. Heising (2012), for example, argued that an important objective in PPM is portfolio steering, which includes all the recurring tasks that must be undertaken to keep the portfolio on track and to permanently coordinate the portfolio. The PPM process proposed by Jonas (2010) incorporates these aspects. Jonas suggested a chronological sequence of four interdependent phases: (i) portfolio structuring; (ii) resource management; (iii) portfolio steering; and (iv) organisational learning and portfolio exploitation. Voss (2012, p. 567) argued essentially the same phases, but put the emphasis on the decision-making embedded in the "set of business practices that integrates projects with other business operations and that includes key activities such as **decision-making** [emphasis added] on which projects are to be given priority, which projects are to be added to or taken out of the portfolio, and how to allocate resources".

It is evident that the practice of project portfolio management in real-life is somewhat messier and less rational than what some decision-process-centred frameworks would suggest. This was acknowledged in some recent empirical studies that drew attention towards the day-to-day practice of portfolio management, i.e. what project and portfolio managers actually do besides what they should do (Martinsuo, 2013, p. 796). Importantly project portfolio leadership is mostly context specific. Martinsuo (2013, p. 796) argued that "projects' dependence on their specific parent-organizational and stakeholder context as well as history highlight the need to examine project portfolios in their actual dynamic context, instead of assuming a stable context". Although some important research has revealed various aspects of the applied practices in project-based management, they have not yet taken a holistic view to the actuality of project portfolio management, according to Martinsuo (2013, p. 796).

The portfolio manager continues to play an important role even when practices are well established. Research confirms the essential role of the competences and activities of the project and portfolio manager, as well as top managers to define how PPM manifests in the day-to-day practice. The role of single-project management practices to project portfolio management performance and thereby the skills of project managers in taking the portfolio level into account in their work remain important (Martinsuo, 2013, pp. 797-798).

The core responsibilities of project portfolio managers in the PPM process are more operational in nature, and they should not serve as visionaries focussing on strategy. However, they must not be pure administrators who solely focus on data and operations. Project portfolio managers need both a strategic vision (understanding and buying into portfolio strategy) and operational oversight (collecting and analysing information) to be able to make context relevant decisions and steer project portfolios successfully (Beringer et al., 2013, p. 842).

A strategic orientation, if not direct strategic responsibility, is a necessary requirement to enable project portfolio managers to steer a portfolio successfully. Beringer et al. (2013, p. 843) showed that "involving project portfolio managers in portfolio structuring can be beneficial to generate the necessary strategic understanding and buy-in and thus enable them to successfully perform their major task of portfolio steering". An important part of the project portfolio leadership is thus developing the strategic competencies of portfolio managers, a concept embedded in the next practice under the code *Portfolio manager ownership*.

Terminology specifically relating to project stakeholders was not evident across all articles. However, Beringer et al. (2013) made an important contribution in terms of stakeholders identifying two different groups who have a stake in a portfolio as strategic (affecting) stakeholders, and moral (being affected) stakeholders. Stakeholders are further differentiated with respect to organisational aspects between firm internal and external stakeholders.

Beringer et al. (2012, p. 19) are of the opinion that certain stakeholders are able to influence other stakeholders, and thereby indirectly wield significant influence. They thus argued that the position of stakeholders in a network, can explain their behaviour and influence. The active management of stakeholder interests are important, as well as the ability to use certain stakeholders to manage others. Beringer et al. (2012, p. 19) believe that strategic stakeholders are internal with respect to portfolios "because they constitute the core of PPM; as such, we believe them to be a major source of influence with respect to project portfolio success".

Beringer et al. (2012, pp. 19-20) defined four strategic internal stakeholders for PPM:

i) *Senior management* decide on processes and standards for the overall project organisation in general and the prioritisation, selection and evaluation mechanisms in particular. They approve the target portfolio from a strategic perspective and deliver timely decisions about the reallocation of resources, or the reprioritisation of projects in conflict situations.

ii) *Mid-level management* comprises those stakeholders who are located below senior management but not necessarily above (and increasingly alongside) project leaders. Beringer et al. (2012) did not explicitly define their role in the PPM context.

iii) *Project portfolio managers* have a new role and have evolved alongside traditional line management. This role is supposed to be critical in planning and controlling complex project landscapes and implementing project portfolio management practices.

iv) *Project managers* are the most obvious stakeholders, who are decidedly important to a project portfolio since they are accountable for the success of their individual projects.

Although the existing research suggests that the level of engagement of one stakeholder influences project portfolio success, project portfolios and their management remain dynamic in nature (Beringer et al., 2013, p. 835). The importance of stakeholders varies at different stages in a project's life cycle. Once again PPM practices must deal with dynamic complexity, in this instance managing ever-changing stakeholder perceptions in a fluid context of a changing portfolio aligning to a strategic intent that may change as well. Central to this management of stakeholders is appropriate communication that is coded under the practice of *Portfolio communication* (see Section 5.3.9).

Multiple studies support the notion that the formalisation of portfolio processes significantly affects the portfolio performance (Korhonen et al., 2014, p. 32; Teller et al., 2012, p. 599; Teller, 2013, p. 46). Helsing (2012, p. 583) warned that senior management "cannot and should not get involved in too many single projects as it has a limited management capacity. Moreover, there is a danger in senior management supporting 'pet projects' that may potentially prevent or delay termination of problematic projects." There is thus a very clear requirement for senior managers to support the PPM processes and ensure that well-recognised PPM processes are established to manage portfolios appropriately. These processes will allow top management to achieve more transparency about the project concepts and proposals, as well as to assess the potential value of the project pipeline (Heising, 2012, p. 583).

Korhonen et al. (2014, p. 32) agreed and proposed that practitioners should assess their organisational capabilities to identify and manage uncertainties in PPM to meet strategic objectives. Assessing abilities should be done across the board level with all portfolio management processes benefiting from higher maturity levels. One such process, for example, is the portfolio risk management process (see Section 5.3.8).

Teller and Kock (2013, p. 818) posited that mature portfolio risk management processes are substantially different from single project risk management. The categories of portfolio risks are, for example, completely different and consist of structure, component and overall risks. "Structural risks are risks associated with the composition of the group of projects, and the potential interdependencies among components. Component risks are project risks that the project manager needs to escalate to the portfolio level for information or action. The overall risk considers the interdependencies between projects and is, therefore, more than just the sum of individual project risks" (Teller & Kock, 2013, p. 818).

It is thus clear that new capacities are required at the organisational level to deal with portfolio-induced complexities. These capacities include formalisation of PPM practices, as embedded in this code family, but also ensuring ownership of the principles of PPM in an organisation (see Section 5.3.7).

5.3.4 Resource management

A portfolio is different from a programme or large-scale projects with sub-projects since its projects need not have a shared goal, but simply compete for the same resources. Unsurprisingly then resource allocation is one the basic principles of PPM. Resource allocation according to the firm's objectives and gap analyses between actual and intended state to take corrective actions, has been identified as a fundamental aspect within strategy implementation.

Kaiser et al. (2015, pp. 126-139) stated that, while in its inception PPM primarily meant the selection of projects using the original portfolio theory factors of risk and return, PPM now refers to a broader set of activities (e.g., continuous risk management, controlling, and reporting), and considers a wider range of factors. According to Heising (2012), a significant part of PPM is resource allocation to achieve the company's objectives. This view has been shared by other authors who consider resource allocation among simultaneous ongoing projects to be one of the primary themes in PPM (Laslo, 2010, p. 609; Pajares & López, 2014, p. 648).

Table 5.5: Resource management practice and sub-practices

Practice	Sub-practices	Prevalence
Resource management	Resource management	87%
	Conflict management	35%
	Resource planning and scheduling	81%

Table 5.5 contains the codes identified in the coding of the *Resource management* attributes as well as the prevalence of these attributes in the articles analysed. Appendix F contains the details of the analysis and shows how the attributes manifested across the 31 articles analysed. In the articles by Beringer et al. (2012; 2013) and Laslo (2010), resource management was the primary focus area of the article.

The timely implementation of projects executed concurrently not only depends on the availability of financial resources, but also on the availability of the necessary project staff to execute the numerous tasks associated with a project. In order to avoid resource bottlenecks and to provide for the efficient use of resources at the same time, the effective assignment of the organisation’s resources to the projects is crucial (Frey & Buxmann, 2011, p. 10). However, Laslo (2010, p. 609) argued that efforts to optimise resource allocations are made complex by differences in project activities, due-dates and even the nature of penalties for projects that fail to meet their objectives, that may lead to a change in priorities towards the end of projects with deadline challenges.

In practice, projects compete for a pool of limited shared resources, so the academic literature has been focussed on the resource constraint multi-project approach (Pajares & López, 2014, p. 648). This is often quantitative in nature and uses mathematical models to optimally allocate resources. Pajares and López (2014, p. 648) indicated that “multi-project scheduling and resource allocation problems are difficult to model, and the rigorous solutions from Operational Research have limited utility in real portfolios" since it is difficult to mathematically formalise both objective functions and constraints. Pajares and López argued for a more complex set of criteria containing both quantitative and qualitative criteria.

Cross-project resource planning and resource approval are, no doubt, some of the most conflict-ridden aspects in portfolio management. The handling of resource conflicts between competing projects and between resource-demanding and resource-supplying management roles is a significant practical challenge for organisations. Jonas (2010, p. 821) contended that PPM is able to reduce the potential resource conflicts between line management and projects significantly and finds support across the board from most authors from the selected articles.

Competition among projects for the allocation of individual experts leads to disagreements and an intensification of internal lobbying activities. Gutiérrez and Magnusson (2014, p. 37) are of the opinion that a primary organisational need that PPM addresses, is how to "to solve the chaos in resource allocation among projects". Jonas (2010) believes that encouragement of the line management, through senior management, might be central to reducing conflict potential. It significantly influences the line management's involvement in a positive way and makes a strong contribution to reduce possible role conflicts between the line management and the project portfolio manager. This is done by increasing the empowerment, and decreasing the intervention, caused by poorly-integrated line managers who lack role clarity but have high role significance.

Laslo (2010, p. 609) contended that, where the vast majority of projects share resources with other projects in a resource-limited multiple-project situation, the major challenge is to find a way of handling resource scarcity according to the overall strategic direction of the corporation. This may not be sufficient, since there is an important influence from resource management on the project selection processes often ignored by authors. However, Rank et al. (2015, p. 1738) made a strong case for the 'cannibalisation' of the existing portfolio and framed the challenge as not being about allocation only, but also releasing resources from poorly-performing projects. Permitting this cannibalisation will in turn free up resources for allocation to other higher-priority, or newly-introduced projects. Lerch and Spieth (2013, p. 18) defined an important supporting contribution of PPM as ensuring the right number of projects in the portfolio in proportion to the resources available.

Daniel et al. (2014, p. 102) found that PPM gave organisations greater visibility of all major IT project activities across the firm, "which enabled them to anticipate and resolve resource issues before they arose and to reduce expenditures on external resources without affecting project plans".

Although portfolio communication is dealt with in Section 5.3.9, there is an important interdependency to ensure visibility across the portfolio about performance to release resources, as well as priorities and resource requirements to allocate resources. LaBrosse (2010, p. 76) made an important argument that PPM is a 'zero-sum game', i.e. not value adding, but value capturing. PPM thus determines which resources will be taken from some projects and given to others, while other projects are put on hold. This re-allocation of resources in the firm requires portfolio managers with well-developed interpersonal skills to manage the process. When it comes to resource allocation, more often than not it is not about algorithmic allocation of resources in a highly-structured way. Negotiation skills, statesmanship, and tact in dealing with competing demands among stakeholders are just as important as technical skills (LaBrosse, 2010, p. 76), covered under *Portfolio communication* (Section 5.3.9).

5.3.5 Portfolio performance review

The principle of *Portfolio performance review* enjoys an average presence in the literature considered in this research as it existed in 24 of the 31 articles evaluated (77%). The *portfolio performance review* code is a very prominent principle in the academic literature that forms part of this study and was coded in 20 (65%) of the articles. However, the concept of performance of portfolios varies significantly in the literature and multiple views exist of what defines superior portfolio performance.

Table 5.6: Portfolio performance review practice and sub-practices

Practice	Sub-practices	Prevalence
Portfolio performance review	Portfolio ROI	45%
	Portfolio efficiency	45%
	Portfolio performance	65%

Table 5.6 contains the codes identified in the coding of the *Portfolio performance review* attributes as well as the prevalence of these attributes in the articles analysed. Appendix F contains the details of the analysis and shows how the attributes manifested across the 31 articles analysed. In the article from Meskendahl (2010), portfolio performance management was within the primary focus area of the article.

Beringer et al. (2013, p. 832) emphasised that there is a significant difference between single project success and average project success across the entire portfolio. The portfolio performance criterion is determined both by individual project characteristics, and by the interdependence between projects in the portfolio.

PPM can be considered as a managerial approach to assist organisations in achieving corporate objectives more efficiently. The foundation of this approach underlies the concept of the firm as a set of projects implementing corporate strategy that emphasises the ability to improve efficiency through the effective allocation of resources (Pajares & López, 2014, p. 646). A fundamental argument supporting PPM is the higher degree of efficiency that is obtained when the projects are managed as a portfolio rather than separately, achieving a higher level of portfolio performance.

Project management research often focuses on the single project level and limits its attention on project success to the success criteria of budget, schedule, and quality compliance (see Section 1.2.6). However, recent research takes on a wider project perspective going beyond this 'iron triangle' in assessing the project success with a broader set of success criteria which has a strong and significant effect on project portfolio efficiency. (Martinsuo & Lehtonen, 2007; Meskendahl, 2010, p. 809). De Reyk et al. (2005) were some of the first authors to argue for the importance of a project team with relevant finance and strategy skills. They described the value of a project team able to make sense of the assumptions behind project time and cost calculations, with the ability to analyse the sensitivity of these results, and evaluate the risks that might impact project returns.

This concept is not strongly supported in project management literature, but it is certainly present in project portfolio management. Although PPM literature does not explicitly deal with the project team members' ability to gauge measure beyond the traditional measures, it does emphasise the importance of these measures at the project portfolio level. Conventional wisdom in project management research is that project teams execute technical tasks and that project managers control these tasks and take ownership of the project's performance. However, at PPM-level, performance is clearly complex and the responsibility of the project managers and the portfolio manager to ensure effectiveness, i.e. strategic alignment as presented in Section 5.3.1 as well as efficiency in resource consumption (Section 5.3.4).

Gutiérrez and Magnusson (2014, p. 31) described PPM as a decision-making process to maximise the return on the investment made, clearly requiring insight on both the investment and astute management of the return associated with all projects in the portfolio. According to Heising (2012, p. 587) a portfolio's economic success can be divided into market success, and commercial success. Market success is defined measures, like operational efficiency, sales volume or market share, while commercial success embodies traditional financial measures, such as break-even, profit and ROI (Heising, 2012, p. 587).

Meskendahl's (2010, p. 810) commercial performance is based on the traditional financial management criteria, like breakeven, profit or ROI and is typically compared to the initial objectives for these criteria. Meskendahl (2010, p. 810) contended that the economic success of the project portfolio considers the "share of revenue generated by new products compared to competitors and the overall revenue share of new products with and without predecessor products. All kinds of projects and portfolios that deal with the performing organization by affecting cycle time, yield, quality and so forth can be measured and evaluated."

An important enabler of project and portfolio success in dynamic environments is flexible processes, the so-called organisational agility (see Section 5.3.7 as well). According to Heising (2012, p. 591), this flexibility entails implementing not only selection mechanisms when projects enter the portfolio, but also the subsequent PPM processes that deals with the ongoing management of the portfolio, to ensure flexibility. He also suggested processes around ideation that are mostly seen by other authors as part of the ideation and innovation process, prior to project identification and initiation.

According to Pajares and López (2014, p. 646) the decision to include, or exclude, a project from a portfolio not only depends on the financial and strategic value of this particular project. This decision should also account for how the new project could fit into the structure of schedules and allocation of resources of previous projects. Portfolio efficiency is an extremely complex measure and requires a complete portfolio overview and more importantly, an insight into how each changing element will impact the balance from strategic alignment to resource allocation. Adding to the complexity is also how the individual project's cash flow profile and capital cost requirements interact with the cash flow and capital cost of the existing portfolio (Pajares & López, 2014, p. 646).

Young and Conboy (2013, p. 1092) maintained that PPM is "focussed on creating and continually reviewing and updating the selection of projects and programs under management within the organisation at any one time, as a continuous process, akin to line management of an operational area of the business". They believe that the collective management of these unrelated projects could occur in a manner that optimises the organisation's desired business outcome; their definition of portfolio success. This is rather important, since IT value literature is also at pains to point out that the value from IT initiatives should be measured from a business perspective.

Researchers have developed multi-dimensional project-, portfolio-, and company-level concepts that consider project performance during execution, future preparedness, alignment of the portfolio to the business strategy, portfolio balance according to the company's resources and capabilities and the use of synergies. According to Voss and Kock (2013), overall business success incorporates market performance, reflecting the fulfilment of sales objectives and the commercial performance of project results derived from standard financial performance measures. Average project success reflects the fulfilment of project performance criteria, such as budget, schedule and quality, as well as customer satisfaction. Future preparedness reflects the preparedness of the organisation and its technological infrastructure for future needs and evaluates the long-term benefits and opportunities offered by the projects.

Although authors agree that financial criteria alone are insufficient for a long-term view of success, and developed multi-dimensional concepts of both the performance during execution and the success of the outcome, financial results and performance criteria still constitute the first dimension of project portfolio success (Voss, 2012, p. 571). One succinct yet comprehensive view on portfolio performance was provided by Teller and Kock (2013, p. 819), who defined six different dimensions for PPM success: (i) average project success; (ii) average product success; (iii) strategic fit; (iv) portfolio balance; (v) preparing for the future; and (vi) economic success. Their second dimension of product success is really the business value from the project. Although commendable, most of the criteria represent complex constructs that would again require further scrutiny to define the highly-complex concept of portfolio success.

Portfolio performance is probably the practice with the least amount of synergy in the literature. It is also highly dependent on intra-portfolio communication and creates the measures that should be communicated to stakeholders outside the portfolio to form an opinion on the contribution towards strategic intent, two principles well covered in Section 5.3.6 *Integration management* and Section 5.3.9 on *Portfolio communication*.

5.3.6 Integration management

The principle of *Integration management* enjoyed moderate level of presence in the literature considered in this research and was present in 23 of the 31 articles evaluated (74%), thus one of the less predominant practices identified.

Although the codes of this practice initially belonged to other code families (practices) it became evident that they all refer to the practice of integration, even if they have strong interdependencies with other practices. Voss (2012, p. 569), for example, described integration as a collaborative process with a clear emphasis on communication activities. Other studies have kept the emphasis within the success and evaluation practices pointing to the positive relationship between interaction and success (Voss, 2012, p. 569). However, it became evident that the codes represent a set of processes specifically related to portfolio integration and do not belong to any of the other practices to meet the requirement of internally being as homogeneous as possible (as recommended by Zhang & Wildemuth, 2009, p. 312).

Table 5.7: Integration management practice and sub-practices

Practice	Sub-practices	Prevalence
Integration management	Cross-functional integration	55%
	Project interdependence	55%
	Portfolio collaboration	39%
	Single project influence	39%
	Organisational complexity	35%

Table 5.7 contains the codes identified in the coding of the integration management attributes as well as the prevalence of these attributes in the articles analysed. Appendix F contains the details of the analysis and shows how the attributes manifested across the 31 articles analysed. In the articles by Heising (2012), Meskendahl (2010) as well as Rank et al. (2015), integration management was the primary focus area of the article.

Integration management is often mentioned in principle, but often absent in name and focus within the PPM academic literature. For example, sufficient effort is spent on explaining project prioritisation for each project added, but not necessarily the reprioritisation of all remaining projects. Another example, dealt with slightly better in the literature, is the concept of portfolio risk and return that changes with each addition to or removal from the portfolio. Lerch and Spieth (2013, p. 24) for example, recognised that project outcome interactions might increase the risk in a portfolio as certain projects depend on other projects' success. They argued that complementary projects might increase, and competitive projects might decrease, the value of a project portfolio. The most significant oversight by many authors is probably the integration required at strategic, tactical and operational levels of the portfolio within its contextual environment, to enable a well-performing project portfolio.

Although authors are at pains to explain the inter-project collaboration and the attainment of organisational efficiencies when projects are prioritised correctly, and resources are optimally allocated, this is only possible if the same functional level integration exists at strategic level (across all strategic imperatives) and at operational level (across all line management functions). Laslo (2010, p. 609) argued that, in a multiple-project situation the vast majority of projects share resources with other projects and defined the major issue as finding a way of handling resource scarcity according to the overall strategic direction of the corporation. This, however, is not sufficient to deal with the complexity where multiple operational activities also consume the same resources. In most environments, organisational resources 'do not belong to projects' but report into line functions and therefore, resource constraints exist between line and project functions.

Pajares and López (2014, p. 648) emphasised that the decision to add projects to an existing portfolio not only depends on the project's features such as strategic alignment, financial value, ROI or risk; it also depends on how the new project interacts with the existing portfolio and affects some properties of the existing portfolio. Although this principle is respected across the literature, practices that deal with the integration is not often explicitly defined. Furthermore, according to Frey and Buxmann (2012, p. 7), academia "suffers from an overweight of contributions covering mathematical models". They are of the option that many of these models are rather theoretical and not derived from real-world demands and thus have limited use in practice.

Virtually all authors have dealt with the issue of selection and complexity of selection, but stop short of dealing with the operational issues and integration requirements as part of the selection criteria. Teller (2013) moved towards acknowledging the complexity and integration practices by arguing that PPM can be considered the management of constraints, the coordination of the portfolio of projects, and importantly, the management of interfaces between different projects. These interfaces are complex and could ultimately derail the entire portfolio's performance.

This is not completely different from the arguments about the difficulty to attain and define IT value in the information systems literature. This value is often not embedded within the particular initiative, but rather in how an IT initiative's outputs are embedded within the organisation. The value argument is ultimately about the utilisation of the project's deliverables, strongly dependent on the integration of the initiative with the business operations (see Section 1.2.6). This is not unique to portfolio management and has been part of project management research that is moving further away from defining success in terms of the time, cost and quality, but rather views success as the organisational

ROI and contribution to strategic intent. From a portfolio perspective, it is also possible to simply contribute towards lowering the portfolios' risk as a value contribution.

Killen and Hunt (2013, pp. 137) argued that "in a complex world, what is best will depend upon the situation, and people need tools to help them link appropriate practices with their context". These tools to manage the complexity have been shown to strengthen the influence that PPM formalisation has on portfolio success (Killen & Hunt, 2013, p. 137). Tools to deal with interdependence, be that on risk, resources, alignment or another dimension of project portfolio management, are important in PPM.

The synergy and value are not just about the consumption of resources. It is also possible that projects' outcomes may be supportive of each other, or, have a negative effect on each other (Brook & Pagnanelli, 2014, p. 49). Project synergies describe the cooperation between the individual projects of a specific portfolio; for example, dependencies or heightened value can result from projects using the same technology, or acting upon the same clients or market (Teller, 2013, p. 39). The management of interdependencies allows for the realisation of synergies that may increase efficiency or shared opportunities, or for the acknowledgement of the negative impact of projects that may reduce the positive outcomes of another due to its impact on the market.

Jonas et al. (2013, p. 219) believe that "a perspective that combines the strategic contributions of each single project is necessary to appropriately address the overall business strategy. This creates a coordination problem that requires cross-project coordination beyond the management of each single project." They introduced a relatively new concept by arguing that the objectives of PPM must include the "optimal alignment of projects **to each** [emphasis added] other" (Jonas et al., 2013, pp. 219). This implies the pursuit of projects that are in alignment with business strategy given their inter-project alignment as well as resource commitments aligned with strategic objectives.

Dealing with the interdependence and integration requirements whilst still keeping the emphasis on individual project performance is complex. For example, when organisations provide "more influence to their projects, more autonomy to their teams, better qualifications, information, and top management attention, and an integration of customers and suppliers to the project, then each single project within the portfolio gets a more vigorous effect regarding its objectives" (Jonas, 2010, p. 824). Although this sounds desirable, there is a risk that rivalry between multiple powerful projects negates advantages for a single project by drawbacks through poor PPM performance (Jonas, 2010, p. 824).

Teller et al. (2012, p. 600) contended that project portfolio complexity also increases the opportunity to leverage synergies in knowledge, technological platforms, or customers, beyond the risk and resources argument prevalent in the literature. In order for an organisation to strengthen core competencies and reduce redundant work, it is important to actively consider complexity within the portfolio, but also the portfolio in the context of the organisation.

5.3.7 Project portfolio ownership

The principle of *Project portfolio ownership* sees a lower level of presence in the literature considered in this research and was present in 20 of the 31 articles evaluated (65%). It was thus one of the less prevalent practices identified and none of the sub-practices reached a level of 50 percent coverage in the academic literature. In addition, the code family initially contained both the terms of ownership and maturity since there is a number of articles that refer to the importance of achieving a certain level of maturity in PPM. Eventually it was decided to use the code family ownership since it represents the level of maturity, how well PPM is practiced, but also the actions to improve and grow the maturity levels that is really an indicator or organisational ownership of the principle of project portfolio management, hence the term ownership.

Table 5.8: Project portfolio ownership practice and sub-practices

Practice	Sub-practices	Prevalence
Project portfolio ownership	Management support	48%
	Organisational learning	45%
	Portfolio manager empowerment	35%

Table 5.8 contains the codes identified in the coding of the *Project portfolio ownership* attributes as well as the pervasiveness of these attributes in the articles analysed. Appendix F contains the details of the analysis and shows how the attributes manifested across the 31 articles analysed. In the articles by Beringer et al. (2012), Hyväri (2014), Killen and Hunt (2013), as well as Young and Conboy (2013), project portfolio ownership was the primary focus area of the article.

According to Teller et al. (2012, p. 599) in "contrast to single project management, project portfolio management is conducted at a higher hierarchical level. With an eye on the entire project portfolio, a more holistic view is required to reflect previous experience, simultaneous projects, the organizational environment, and future organizational intentions." This higher-level management interaction and accountability has important repercussions for organisations, for example the exchange of information, management of resources, and coordination of the collection of projects become more important for project portfolios (Teller et al., 2012, p. 599).

Organisational learning plays an important role at the end of any single project life cycle. Learning as part of portfolio management focuses on the time when projects exit the portfolio process, and beyond. Organisational learning is realised through re-evaluation of project results and by utilising post-project reviews, within the portfolio context. Organisational learning is aimed at securing and maintaining relevant knowledge for the organisation after project closure, while portfolio exploitation means the utilisation and dissemination of project results and lessons learned from earlier projects, which is often seen as a particular task of the project manager (Jonas, 2010).

Heising (2012, p. 583) argued that a systematic portfolio management approach is required for the ideation and concept definition stage, which ensures that appropriate ideas and concepts are selected and supported (see Section 5.3.1). Importantly, he believes that if "performed properly, support should be much higher, leading to better funding of valuable ideas, concepts, and project proposals … if the ideation portfolio is well integrated with the project portfolio management, projects can, thus, be implemented much faster" (Heising, 2012, p. 583). There is thus an appropriate level of maturity required for portfolio-specific processes. Portfolio ownership, rather like project ownership, thus starts earlier than the traditional initiation processes and being intimately involved with the project from before formal initiation could heighten ownership and ultimately performance.

Killen and Hunt (2013, p. 136) presented another potential benefit of PPM ownership with evidence from a meta-study that showed how PPM can provide organisational agility and contribute to create value in dynamic environments. However, and important in the context of this research, PPM practices and capabilities must be tailored for the context and during implementation they should be adjusted over time (Killen & Hunt, 2013, p. 136). This higher level of maturity should be done in a coordinated and consistent manner since the "unintentional evolution of PPM capabilities can result in undesirable changes to the PPM capability such as the 'success trap', where organizational decision-making evolves to favor short-term, incremental, or low-risk 'exploitation' projects, at the expense of the more radical, breakthrough, longer-term 'exploration' projects that organizations believe are essential for long-term success" (Killen & Hunt, 2013, p. 140).

This introduces an important counter-balance argument embedded in the PPM ownership practices with recent project management literature arguing the value of agility (see Section 2.5.5). The BITA literature also stressed the importance of agility even referring to the 'agile paradox' (see Section 2.4.3). PPM literature acknowledges the importance of agility, as well as the challenge to formalise agility. It seems that central to the agility challenge is taking ownership of the portfolio and ensuring that appropriate decisions are made on an ongoing basis, using the tools and techniques available to the project portfolio managers. When individual projects are held captive by rigorous processes and techniques that may not deal well with dynamic complexity, the portfolio agility is significantly reduced.

Despite the risk of decreased agility, the formalisation is important and even more so when portfolio complexity is high. Formalisation increases the availability and richness of information, ensures clear responsibilities and commitment reliability, and facilitates resource prioritisation and allocation, according to Teller (2013, p. 46), all critical aspects in portfolio performance (see Section 5.3.5). It is clear that PPM practices need to be formalised to ensure their efficient execution, balanced with the required agility to allow adaption as mandated by different contexts to not be seen as overly rigorous.

Teller et al. (2012, p. 604) posited that practitioners will benefit most from formalisation of PPM processes in an integrated fashion to achieve the highest process quality. However, formalisation of PPM should never be done at the expense of empowering portfolio managers, especially in more complex environments. Agility is normally the result of pragmatic human decision-making. As more PPM processes are established and embedded in the organisation, the ability of project portfolio managers to make empowered decisions is critical to maintain the required portfolio agility.

5.3.8 Portfolio risk management

The principle of *Portfolio risk management* was one of the less common practices in the literature considered in this research and was present in 20 of the 31 articles evaluated (65%). *Portfolio uncertainty*, a complex concept mostly ignored by highly- quantitative selection methods (Frey & Buxmann, 2012, p. 7) had the lowest prevalence in the articles, featuring in only ten of the articles.

Table 5.9: Portfolio risk management practice and sub-practices

Practice	Sub-practices	Prevalence
Portfolio risk management	Managing uncertainty	42%
	Portfolio risk	61%
	Portfolio uncertainty	35%
	Risk management	61%

Table 5.9 contains the codes identified in the coding of the *Portfolio risk management* attributes as well as the prevalence of these attributes in the articles analysed. Appendix F contains the details of the analysis and shows how the attributes manifested across the 31 articles analysed. In the articles by Pajares and López (2014), Teller (2013) as well as Teller and Kock (2013), *Portfolio risk management* was the primary focus area of the article.

Daniel et al. (2014, p. 104) found that organisations studied considered risk only at the level of individual projects with virtually no attention to the overall portfolio risk, prior to the formalisation of PPM. However, since the introduction or formalisation of PPM, practitioners increasingly attempted to consider the risks across projects, such as project interdependencies and overall portfolio risk with varying degrees of success since only some firms studied exhibited clear evidence of balancing risk across the entire portfolio. Their research clearly indicated a difference between the desire to manage risk at the portfolio level, and the ability to actually do that effectively.

Kaiser et al. (2015, p. 136) explained that “project portfolio management, particularly the selection of the right projects in terms of strategy, financials, and risk, is a complex task involving a high level of uncertainty”. Dealing with uncertainly is challenging in its own right; when this is done in a dynamic environment with projects entering and exiting the portfolio on a continuous basis in the wake of changing strategic imperatives, it requires exceptional management ability. This uncertainty definitely plays out in the IT domain as well. Three decades of research has focussed on IT value (see Section 2.2.1) and the uncertainly faced by project portfolio managers are not different from the challenges for modern managers wishing to gain value from their IT investments.

Teller and Kock (2013, pp. 827-829) defined portfolio risk management as the management of *uncertain events* and conditions as well as their interdependencies at the portfolio level that cause significant positive or negative effects on at least one strategic business objective of the project portfolio. They further emphasised a distinction between risk management at the project level and risk management at the portfolio level, highlighting that risk management at the portfolio level implies a wider perspective with a focus on strategic issues. Teller and Kock stopped short of defining risk management processes unique to portfolio-level challenges, as do many other authors. Most authors have acknowledged the complexity and dynamic challenges, yet did not provide clear evidence of project portfolio management processes.

According to Martinsuo et al. (2014, p. 733), project portfolio uncertainties have been covered in academic literature in three main areas. Firstly, multiple authors have argued that organisational context, (particularly its complexity and project interdependencies) causes uncertainties and requires different management practices, in order to make the portfolio successful. Secondly, a few studies have directed attention to the environmental uncertainties, such as market and technology turbulence or customer requirements, that should be taken into account. Thirdly, changes at the individual project level have been considered as relevant in generating uncertainty at the portfolio level. It is evident that uncertainty has important implications on project portfolio management, and for those managing portfolios and portfolio risk, on multiple levels.

“Portfolio risk management is concerned with the analysis of events that could affect the objectives of the portfolio as a whole”, according to Pajares and López (2014, p. 649). Pajares and López further argued that, since PPM is related to the implementation of corporate strategy, portfolio risk management should be concerned with the risks directly affecting variables like ROI, profits, value, and market share, compared to project risk management that is about the issues affecting the success of individual projects.

It is important to note that every new project added to, or removed from, a portfolio affects the overall portfolio risk. This ‘new’ portfolio risk not only depends on the risk of the added or removed project, but on how this project interacts with the sources of risk of the existing portfolio. Lerch and Spieth (2013, p. 24) called these ‘complementary projects’ that might increase or decrease the value or risk of a portfolio depending on how well they complement, or not, the portfolio to which they are added to or removed from.

By way of explanation, a project with a particular level of risk, could significantly increase the risk of a *portfolio A*, without affecting too much the risk of a *portfolio B*; in fact, it is even possible that the new project could reduce the portfolio risk (Pajares & López, 2014, p. 649). Pajares and López (2014, pp. 649) referred to these kind of projects as ‘hedging projects’, compared to Lerch and Spieth’s (2013) ‘complementary projects’, since they can decrease the risk of a portfolio and, potentially at the same time, increase the portfolio’s economic and financial value. What the desirable projects are called (there is a lack of consistency in the literature) is not important. The development of management control systems that, when used properly, could overcome the challenges and risks of uncertainties and also exploit the value added by individual projects, from a portfolio perspective, is very important and a potential significant contribution of project portfolio risk management (Korhonen et al., 2014, p. 23).

Although the practice of *Portfolio risk management* is not the most prominent of the principles identified in this research, the articles that cover it, make a strong case for risk management to be a standalone principle of PPM. Teller and Kock (2013) analysed the six components of portfolio risk management of which two, *Portfolio risk identification* and *Integration of risk management into project portfolio management,* are rather unique to portfolio management, as argued by preceding authors in this section. Teller (2013, p. 37) again emphasised that “portfolio risk management, contrary to project risk management, is characterized by a focus on the entire project portfolio with regard to strategic issues and the ability to achieve strategic objectives rather than identifying and managing risks solely at the project level”.

However, Teller (2013) also made another very important contribution towards portfolio risk management from a cultural and maturity perspective. He contended that a strong risk management culture, championed by the organisations’ directors, is a vital component in increasing the effectiveness of risk management processes. According to Teller (2013, p. 44), a risk management culture incorporates risk awareness, commitment, acceptance, communication, openness, risk tolerance and trust. This is substantially beyond the typical processes identified by most authors and advocates for management support and organisational maturity, from a risk management perspective, supporting the practices listed in Section 5.3.7 on Project portfolio ownership.

Risk management invariably forms part of the established management controls as organisations are forced to deal with the negative implications of risks that manifest in multiple ways. In dynamic environments where strategy changes and portfolios are continuously updated with projects added and removed, significant uncertainly could lead to many events consuming management time. Teller and Kock (2013, p. 820) strongly believe that controlled risk-taking eventually reduces fire-fighting and will see an increased probability of achieving strategic objectives.

5.3.9 Portfolio communication

The principle of *Portfolio communication* had a lower level of prevalence in the literature considered in this research and was present in only 20 of the 31 articles evaluated (65%). This is surprising given the acknowledgement of the complexity of the typical portfolio and management decisions about the portfolio. Ultimately decisions are made based on the accuracy of the information presented and communicated to those in decision-making positions.

Once decisions have been made, they need to be communicated together with their expected or intended impact and measurement criteria. In dynamic environments where both the strategic context and the portfolio content are subject to continuous change, this communication is even more important. It is thus to be expected that gathering of information to make decisions and distributing information about decisions should be an important practice.

Table 5.10 contains the codes identified in the coding of the portfolio performance management attributes as well as the prevalence of these attributes in the articles analysed. Appendix F contains the details of the analysis and shows how the attributes manifested across the 31 articles analysed.

Table 5.10: Portfolio communication practice and sub-practices

Practice	Sub-practices	Prevalence
Communication management	Information needs	55%
	Information sharing	42%
	Communication	52%

Lerch and Spieth (2013, p. 18) referred to PPM as a dynamic decision process, whereby innovation projects are evaluated, selected, and prioritised, and existing projects may be accelerated, terminated, or deprioritised. Frey and Buxmann (2012, p. 10) believe that the IT domain is even more complex since it is characterised by frequent changes caused by the arrival of new projects, changing input and output parameters, the necessity to re-assess projects and the need to re-allocate resources as technology continues to change. Whether managing innovation projects or IT projects, the change seems inevitable.

Decision-making at portfolio level in a dynamic environment is complex and highly reliant upon quality information meeting the requirements of decision-makers. It is the level at alignment between the decision-maker's ability and quality of information that ultimately leads to appropriate decisions, as so clearly articulated by Kaiser et al. (2015, p. 136): "[I]nformation processing theorists argue that good organizational structure is achieved when a task's information requirements are matched with the information processing capacity of those charged with completing this task". Dynamic environments with high degrees of uncertainty, increase the requirement for rich information of high quality to facilitate astute decision-making. Within PPM this places an important emphasis on understanding information needs and the ability to collect and prepare information for decision-making (Kaiser et al., 2015, p. 136).

Voss (2012, p. 569) agreed that all-inclusive information about the risks and associated value of each project, as well as the interdependencies between the projects and available resources, is important. Jonas et al. (2013, p. 223) believe that this will enable organisations to address the major challenges in PPM that include achieving operational transparency on all projects, providing strategic direction for the projects and establishing cross-project coordination. Brook and Pagnanelli (2014, p. 61) concurred and put the emphasis on those in decision-making positions who should develop and integrate reporting tools that link all strategy, business case, selection, prioritisation and execution information; something that is easier said than done. This requires information gathering and processing beyond the typical project management requirements. It could be argued that PPM information is complex due to the strategic (alignment), tactical (prioritisation), operational (resource allocation) and project (individual performance) dimensions that meet in one organisational role (Jonas, 2010, p. 822).

Effective communication is often described in the literature as establishing complete visibility across the entire scope of projects within a project portfolio. However, the requirement is significantly more than creating visibility of traditional project intrinsic measures. Information requirements in the project portfolio environment are multi-dimensional and context specific but, in general, consist of using multiple criteria, such as “relevance, accuracy, conciseness, completeness, understandability, currency, timeliness, and usability of information” (Jonas, 2010, p. 820). Given the complexity in terms of strategic alignment (Section 5.3.1), portfolio optimisation and balance (Section 5.3.2), portfolio governance (Section 5.3.3), resource allocation (Section 5.3.4), the complexity of portfolio performance (Section 5.3.5) and portfolio risk management (Section 5.3.8), the information requirements for portfolio communication is highly complex and dependent on the task and role that requires the information, i.e. context specific.

Daniel et al. (2014, p. 102) presented evidence that PPM gave some organisation’s greater visibility of all major project activities across the firm, which enabled them to anticipate and resolve resource issues before they arose and to reduce expenditures on external resources without affecting project plans. There is thus also a requirement to review common activities from different projects, a concept covered under integration management (Section 5.3.6).

It is rather difficult to generate information about activities and processes that are not monitored on an ongoing basis as part of organisational control or governance. The extent to which activities are traditionally monitored thus determine the quality of information on which decisions regarding prioritisation and selection of projects are made. However, line management’s monitoring of activities to provide real-time access to resource information, which is not just used on projects, is thus crucial as well. Jonas (2010, pp. 822) indicated that portfolio steering comprises the coordination of projects across organisational units to identify synergies between comparable projects or to identify and abort obsolete projects. This is a complex task to ensure that attributes of information quality, and in particular the dimensions of ‘completeness’ and ‘timeliness’, are met.

Significant value is evident from appropriate portfolio communication within the PPM literature. For example, stakeholders’ cognisance of the risks within projects that need to be managed, was deemed to diminish the degree of risk according to Teller (2013, p. 44). Teller et al. (2012, p. 600) believe that “high information quality and transparency over the project landscape form the basis for good decision-making and facilitate the prioritization of the right projects”. Cross-project optimisation and mutual collaboration across project borders are only possible with continuous delivery of timely and reliable project status information (Beringer et al., 2013, p. 834).

Conversely, a lack of quality information has been identified as a critical barrier for project portfolio success. This could, for example, impede the efficient application of optimisation algorithms for resource allocations. Jonas (2010, p. 820) confirmed that a lack of portfolio oversight inhibits resource allocation and the opportunities for collaboration in the absence of accurate information. The efficiency of resource allocation also depends on the quality of information available and the company's capability to process information. In general, improved PPM communication quality enables better management decisions, thereby improving portfolio success (Jonas, 2010, p. 820; Teller et al., 2012, p. 600).

Communication within a portfolio is also a critical enabler of integration and collaboration between projects within a portfolio, a concept covered in *Integration management* (Section 5.3.6).

5.4 SYNTHESIS, PRACTICES AND VARIABLES

The disparate nature of academic literature in terms of project portfolio management was corroborated in this systematic review. The extraction of PPM practices was required based on the absence of a set of generally-accepted PPM practices to be used for the interviews as well as the modelling of the influence between PPM practices and BITA. It was indeed evident that the academic view on PPM are not well-formulated and the practices are distributed across multiple articles. Not a single source contained all the practices listed in Table 5.1. Appendix F shows the distribution of the codes as well as code families among the different articles coded from the 31 carefully-selected articles curated from the 241 articles considered (see Section 3.4.2.2).

The individually suggested practices share common themes, although the constituent concepts are given various codes in the considered literature. The golden thread that aligns them into a specific principle has been identified in this research and used as the guiding principle to group them accordingly following an inductive approach.

The main finding in terms of project portfolio management practices is that, although disparate on a concept level, common focus groups can be identified throughout academic articles when grouped into logical practice-oriented code bundles. This is evident as shown in Appendix F, where PPM practices that have been identified are mapped against the articles used in this literature review to illustrate that, although the literature seems disparate on a superficial level, it does reveal comparable themes when the concept codes are grouped into parent codes.

However, in order to create CLDs, it was necessary to define variables that represent the changing conditions based on the execution of PPM practices (see Section 2.6). Although the central argument is the contribution of the practices, these practices can only be presented as variables on the diagrams. Wardman (1994, pp. 1-2) argued that a significant part of the clarity of a CLD is based on the careful selection of variables. Following her guidance, an iterative process was followed to define the most appropriate variables as indicated in Table 5.11 and detailed in Section 3.4.13.

A key challenge with CLDs is always to remain at a consistent level of granularity and not make the diagram too complex by presenting too much detail (Sherwood, 2000, p. 127), or confusing though different levels of granularity. The variables and selection process for these variables are presented in Table 5.11.

Table 5.11: PPM practices and variables used for system dynamics diagrams

PPM practice	PPM variable for CLD
Strategic alignment	Degree of alignment
Portfolio optimisation	Portfolio balance
Project portfolio governance	Portfolio governance
Resource management	Optimal resource allocation
Portfolio performance review	Portfolio performance
Integration management	Intra-portfolio collaboration
Project portfolio ownership	Portfolio ownership
Portfolio risk management	Portfolio risk management
Portfolio communication	Effective intra-portfolio communication

Sherwood (2011, pp. 131-132) recommended using nouns and noun phrases, rather than verbs or verb phrases. Although there is at times a tendency to express the appropriate action as a verb (align or communicate) rather than as a noun equivalent (alignment or communication), Sherwood is of the opinion that using nouns leads to diagrams that are easier to interpret, hence the nouns selected for each practice as indicated Table 5.11. Sherwood (2011) also suggested that diagrams not include phrases such as 'increase in' or 'decrease in', since that is what the arrows represent. Possible noun phrases, such as 'increase in alignment', or 'decrease in ownership', are thus not used.

The ***Degree of alignment*** was selected as a variable that best encapsulates the alignment practice, as well as sub-practices (see Table 5.2). Although the sub-practices of *value capturing* and *future preparedness* are not explicitly covered in the selected variable, it does represent the most prevalent code of 'strategic alignment' as well as *portfolio objectives* and *dynamic re-assessment* extremely well, and also sufficiently covers the related concepts of *value capturing* and *future preparedness*.

Portfolio balance was identified as the most appropriate variable to present *portfolio optimisation* and the sub-practices (see Table 5.3). Although it is possible to use a phrase like 'optimal portfolio', this is not a variable. All terms tested with the initial pilot study other than *portfolio balance* required significant explanation and also became contentious during discussions (see Section 3.3.4). The concept of a balanced portfolio is then also acknowledged in the literature as presenting the optimal value (Pajares & López, 2014, p. 646). However, Voss (2012, p. 567) argued that the optimisation of individual portfolios, does not necessarily optimise the overall business performance. He argued that alignment between the different portfolios is required as well, which is a potential limitation of the variable that deals with portfolio balance and not the interaction between portfolios.

Table 5.4 contains the sub-practices associates with the practice of ***Portfolio governance***. Although the sub-practices deal with the more structured concepts such as *decision-making* and *control*, it also encompasses the concepts of *leadership* and *steering*. The literature about the control and decision-making indeed includes very complex and robust quantitative techniques (Frey & Buxmann, 2012, p. 7) but acknowledges the complexity of portfolio governance (Young & Conboy, 2013, p. 1098). Selecting a variable *project portfolio governance* is thus inclusive of all the sub-practices. However, care should be taken in how this is used in the modelling to ensure that it includes the 'softer' sub-practices of leading and steering that also form part of governance.

Resource management as a high-level practice contains an interesting combination of sub-practices that includes the softer skills of dealing with conflict (for resources) as well as complex quantitative methods for resource allocation in complex situations (see Table 5.5). However, the ultimate goal for all these methods and techniques is the optimal allocation of resources for the entire portfolio, if not organisation. Where a variable of resource allocation would indicate an increase or decrease in resources allocation, that is essentially meaningless, the variable ***Optimal resource allocation*** signifies the success of the allocation sub-practices.

The performance of a portfolio is a complex measure as was argued in this chapter. The practice of *portfolio performance review* encapsulates both the efficiency (that leads to improved performance) and the return on investment (ROI) that is a measure of performance. The review of the portfolio performance is not explicitly evident at first glance, but the purpose of a review is to improve performance. It is thus argued that the selected variable, ***Portfolio performance*** includes the intended end-state of the review sub-practices sufficiently, if not the particular practice *per se.* Performance is a decent choice as variable since it is easy for readers of diagrams to relate to increased or decreased performance.

Intra-portfolio collaboration is the final variable that represents all sub-practices referring to the conflict and cooperation within the portfolio, as well as the single project's influence and organisational complexity. Although the same argument could be made about the quality versus quantity of the collaboration (as for communication), collaboration was not seen as problematic during pilot testing. Where interviewees were sensitive to communication overload leading to the effective moniker for communication, this was not the case for collaboration. Although the variable is prone to different interpretations but the essence of the arguments about integration management is indeed presented as an increase in intra-portfolio collaboration, or decrease in the degree of conflict between projects. Although inter-portfolio conflict could also be used as a variable in line with the recommendations of Kim (2011, p. 1), the positive sense of the variable makes it easier to interpret the diagram correctly.

The variable ***Portfolio ownership*** signifies the extent to which an organisation is taking ownership of the management of the portfolio, versus the management of individual projects. Where the previous variable, portfolio governance, signifies the formal processes in place to grow the measure of portfolio management maturity, this variable with the sub-practices indicated in Table 5.8, indicates the more tacit dimension of portfolio management. The sub-practices of *management support*, *organisational learning* and *portfolio manager empowerment* signify the extent to which an organisation has successfully entrenched the practices as part of the organisational culture, i.e. moving from the governance to the culture dimension.

The variable ***Portfolio risk management*** is rather evident from the preceding argument about variable choices. Although the practice includes dealing with uncertainly, this uncertainty mostly manifests as risks, or at least is managed as potential risks once identified. The variable then indicates the extent to which portfolio risk management is formalised and executed, and is easy to interpret as a value that can increase or decrease as required for a CLD. However, portfolio risk is different from project risk (see Section 5.3.8) and it is important to recognise this on the CLDs as well.

Portfolio communication was initially selected as the variable to represent the sub-practices that relate to the information gathering, processing and distribution activities within the portfolio and about the portfolio. This is not an optimal selection as it is subject to different interpretations. For example, an increase in portfolio communication could indicate to some observers communication ‘about the portfolio’ to stakeholders outside the portfolio. This could for example be the perspective of, executive management concerned with performance, balance and alignment, or of line management concerned with resource requirements or risk. Conversely, for other observers it may indicate heightened within portfolio communication to increase collaboration and minimise intra-portfolio risk and conflict and maximise learning and mutual value. It was decided that a variable of ***Effective intra-portfolio communication*** is very clear about both of the key uncertainties, if somewhat unwieldy. Care should thus be taken to ensure that the variable represents both these perspectives in the diagrams, as well as communication quality.

Appendix G contains all the questions used in the interviews that refer to both the practices as well as the variables used in these practices.

CHAPTER 6
INTERVIEW RESEARCH RESULTS

6.1 INTRODUCTION

This chapter contains the results of the interviews and the diagrams constructed from the interviews (see Section 3.4.10). The detailed process followed to create the diagrams is captured in Chapter 3 (see Section 3.3.6 and Section 3.4.11 as well as Figure 3.5). For each diagram created (Section 6.2 to Section 6.7) it also provides an analysis of all the feedback through balancing and reinforcing loops and presents arguments about the impact of the feedback on the variables modelled. Insights on the dynamic nature of BITA are presented as well as the impact of PPM practices on BITA CSFs.

The aim of system dynamics modelling is to explain behaviour by providing a causal theory. This theory is then used as the basis for designing interventions into the system structure, which then change the resulting behaviour and improve performance (Lane, 2008, p. 3). Consequently, a plausible explanation for the particular system and insight on variables that could be manipulated to improve the system are provided in narrative terms immediately following each diagram.

Where present, a systems archetype is described, as well as the influence and the insights gained from looking at the systems archetype. The six different diagrams are combined into a single diagram, presented in Appendix L. Section 6.8 deals with an attempted synthesis of the diagram, as well as insights gained from this exercise.

Section 6.9 summarises the feedback received from academics who were asked for input about the scientific rigour of the research process, the value of the research, as well as how it should be presented to practitioners. Section 6.10 concludes this chapter with the feedback received from the practitioners with whom the diagrams were shared as well as the key insights from the research.

In order to be able to construct causal loop diagrams from the data, it was required to select a variable for each of the six BITA CSFs and the nine PPM practices. Section 3.3.6, Section 3.4.13, Section 4.4 and Section 5.4 explain the selection of the variables presenting the practices in the diagrams that follow.

6.2 SHARED KNOWLEDGE

6.2.1 Description

The first diagram (Figure 6.1) contains the CLD for *Shared knowledge* using the variable *IT knowledge shared* (see Section 4.4). Although the diagram was done for the set of practices representing the sharing of knowledge (see Table 4.5), the BITA CSF of *IT credibility* also manifested strongly in the conversations without being triggered directly. It thus provides evidence of the tacit link between sharing IT knowledge in organisations and the positive impact on the credibility of the IT organisation in general.

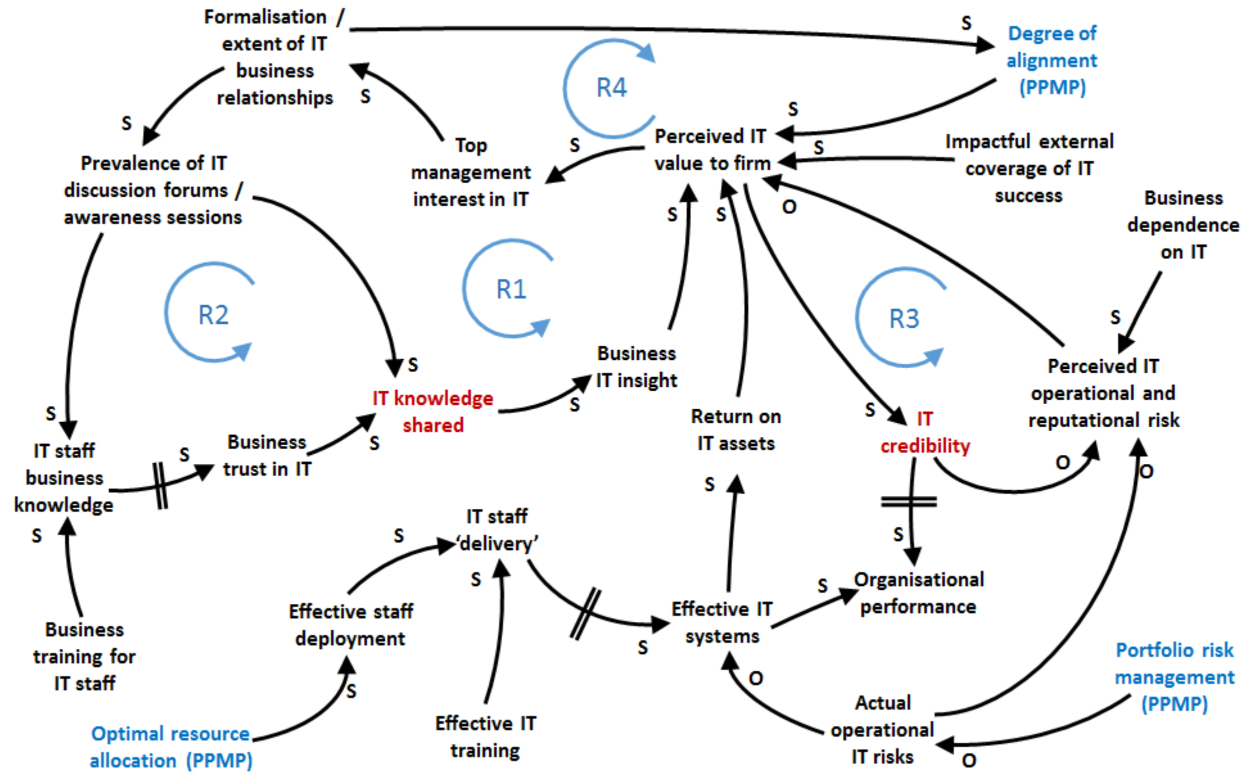

Figure 6.1: Shared knowledge CLD

Some links of particular interest, both due to their prominence as well as their presence in feedback loops, are discussed below. The *Formalisation of IT business relationships* was interestingly enough a result of *Top management interest in IT* that is in turn influenced by the *Perceived IT value to the firm*. Interviewee 2 verbalised this link with the following statement: “The executive’s interest in IT will drive the extent of the IT and business interactions, not only how often we meet but also the depth and substance of the discussion”.

This was corroborated by Interviewee 17 who stated: “[i]t is only when senior managers show a sincere appreciation for the value from our tech dollar and sweat that they buy into the value of a relationship and ensure that our forums are actually used and supported. If the line managers are not committed, the importance of any ‘forum’ [air quotes] just fade away”. Reinforcing loops R1 and R2 both elaborate further on the insights and the impact of the feedback loops on the relationships and discussion forums.

A second insightful contribution came when coverage of technology and the *Perceived IT value to firm* was explored. Although some participants hinted at the role of external coverage to increase perceived IT value, Interviewee 11 best summarised the strongest consensus in stating that, “If there is a very sexy IT success story in the media it will impact the perception about value from IT – but it has to be sexy”. This is an interesting perspective since the effect of external IT success only impacts general management when it penetrates the vastness of communication. For example, Interviewee 13 stated that “… when an interesting story is told and retold in the 3 minutes before meetings start, you know that it will remain in the minds of those making decisions and you will probably be asked about this in future".

Four different feedback loops were identified and are depicted in Figure 6.1. Loop R1 (Figure 6.2) indicates the impact of growth in the perceived value of IT based on the formalisation and prevalence of IT discussion forums and their effect on increasing IT knowledge. As with any reinforcing feedback loop, it should not just be read in the positive sense, i.e. growth potential. Any absence of discussion opportunities could lead to an absence of perceived gain from IT and a further reduction in the extent and value from such forums, having a negative impact on knowledge sharing.

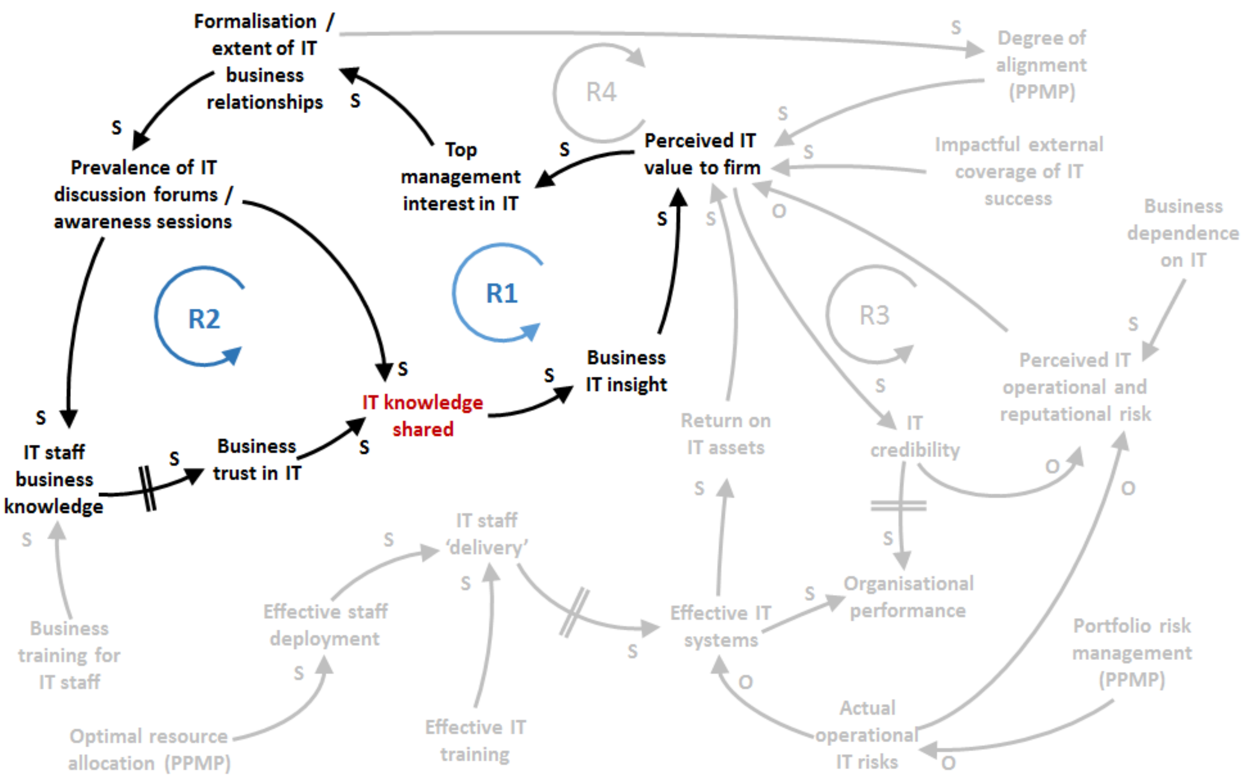

Figure 6.2: Shared knowledge reinforcing loops R1 and R2

Loop R2 (Figure 6.2) shows the impact of the *Perceived IT value to firm* and prevalence and formalisation of interaction between IT and business on the IT staff's knowledge about business issues and ultimately, after a period of time, the growing trust of the business in IT. Interviewee 6 explained the delay by remarking that, "… an IT person may have increased business know-how, but not always the opportunity to display this know-how. The business opinion about IT staff is influenced by what they know and also when they use the know-how at the right time for the right system. Don't try to impress us with your information; use it when required and business will value you".

The opposite of growth can again be argued for this reinforcing loop, where a lack of business trust in IT will lead to a lower value perception and ultimately limited opportunities to gain the value and build the required social capital within business. When the feedback loop starts reinforcing itself in the negative direction it can easily become a snowball of mistrust, lack of communication and very limited opportunities to share knowledge between business and IT, according to the CLD, based on the interview data.

Reinforcing loop R3 (Figure 6.3) shows the link between *Perceived IT value to the firm,* the impact of that on *IT credibility* and ultimately, the perceptions about risk in the operational and reputational environments. The reputational risk was a strong theme in the interviews, with Interviewee 15 explaining that, "…in [organisation name] we are just one small slip or cyber exploitation away from being splattered all over the 8 o'clock news or twitter. Business executives do not have the ability to govern all elements of security. We have to trust the techies and IT execs know what they are doing, and they mostly do". The relationships around the credibility of IT systems and the IT organisation are further explored in Section 6.5.

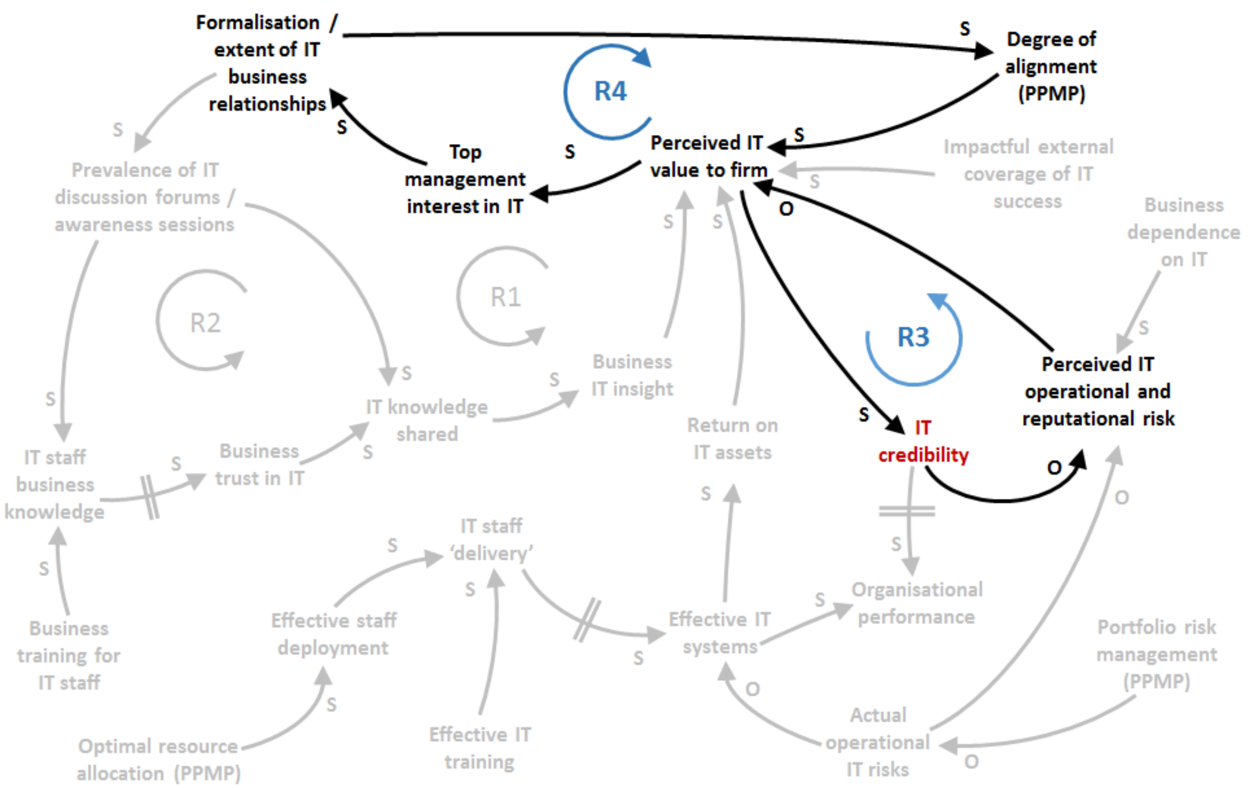

Figure 6.3: Shared knowledge reinforcing loops R3 and R4

Figure 6.3 shows the reinforcing loop R4 that contains the PPM practice of the *Degree of alignment* that is impacted by the *Formalisation / extent of IT business relationships*. In principle, when relationships are formalised, it will lead to business assisting in prioritising IT projects (see Collaborative Planning CLD in Figure 6.6) and this action will increase the degree of alignment between the portfolio of projects and the organisation's strategic intent. Important to note, is the higher degree of alignment impacting on perceived *IT value to the firm,* according to the data. This variable, *Perceived IT value to the firm* is present in all of the loops R1, R2, R3 and R4. *Perceived*

IT value to the firm is thus a very important leverage point for organisations since it could influence the reinforcing direction of all of the loops.

However, forming part of four loops makes it extremely difficult to manipulate this variable directly and it is important to seek for indirect ways to manipulate it. Two possibilities are presented in the diagram. The first is the *Return on IT assets* that is strongly linked to *IT credibility* and discussed in Section 6.6. This variable is a result of multiple interdependencies and cannot be directly manipulated. The second variable is *Impactful external coverage of IT success*. According to the diagram, this variable presents an opportunity to grow perceptions about IT value in general for the organisation, not just for the institution where success was achieved. Sharing this knowledge proactively in an efficient manner can have a positive impact on IT knowledge shared and ultimately on BITA.

Although the PPM practice of *Degree of alignment* is rather peripheral to the diagram at first glance, the ability to influence the *Perceived IT value to the firm*, that in turn is fundamental to the system of knowledge sharing, makes it an important practice to contribute towards BITA. The variable *Degree of alignment* is the result of the PPM practice of Strategic alignment (see Table 5.11) and consists of multiple sub-practices that contribute to alignment (see Table 5.2). It is not unexpected that practices that align projects with strategic intent will contribute to BITA, but it is interesting to note that it manifests in the CSF that depicts how knowledge is shared, which is more an indirect effect, as well as result of, the alignment PPM sub-practices.

6.2.2 Analysis and interpretations

The variable *Perceived IT value to the firm* is central to all four reinforcing loops, two of which have a direct impact on the variable *IT knowledge shared* that is modelled in this section. Two archetypes also seem to be present on the CLD, which warrant further analysis. Banson et al. (2016, p. 80) contended that archetype analysis can help in the identification of leverage points, in other words, where an intervention can lead to greater influence on the system behaviour.

Figure 6.4 shows the typical structure for a ‘Fixes that fail’ archetype, as illustrated in Figure 2.21a, with the two reinforcing loops, one of which has a delay. However, upon further inspection an important observation is that the loop with the delay in fixes that fails has unintended consequences on the loop with the delay, that is not present. In addition, the loop without the delay is a balancing loop and in this instance, R1 is a reinforcing loop. The structure shown in Figure 6.6 is thus not a common CLD archetype.

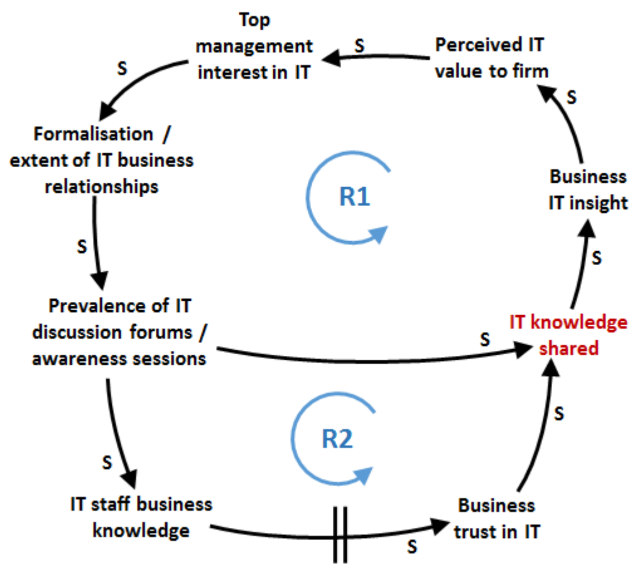

Figure 6.4: Potential ‘Fixes that fail’ archetype for IT knowledge shared

However, Vermaak (2011) argued that apart from the common archetypes, further analysis about other structures and their behaviour and influence on the system should also be done. In the case of Figure 6.4, in which the two reinforcing loops share multiple common variables, it is evident that two of the key drivers of the sharing of IT knowledge, *Business trust in IT* and *Prevalence of IT discussion forums / awareness sessions,* will be influenced strongly by business insights and value perceptions. There is potential leverage in influencing these variables. To determine how this can be influenced, it is necessary to look at Figure 6.5.

Figure 6.5 shows a common variable between two reinforcing loops that is typical of the ‘Escalation’ archetype, presented in Figure 2.20b. However, as explained in the ‘Escalation’ archetype, a shared variable that embeds a relative position variable is evident. That is, the variable shared between the two loops should indicate a desirable, or not, position for the two different loops (referred to as the quality of A’s position relative to B in Figure 2.20b). As this is not evident in this instance, it thus does not represent an ‘Escalation’ archetype.

There is nonetheless an interesting observation to be made from the two systems’ structures and that is the common variable of *Perceived IT value to firm’s* presence in both diagrams. Several individuals referred to this variable using different terminology, from “Bang for IT buck” (Interviewee 14), “Value for tech[nology] blood, sweat and tears” (Interviewee 12), to “Return on IT investment” (Interviewee 8), who acknowledged in follow-up questions that it is in essence not a hard quantitative measurement but really more the “good news IT stories” (Interviewee 8) that are told by IT.

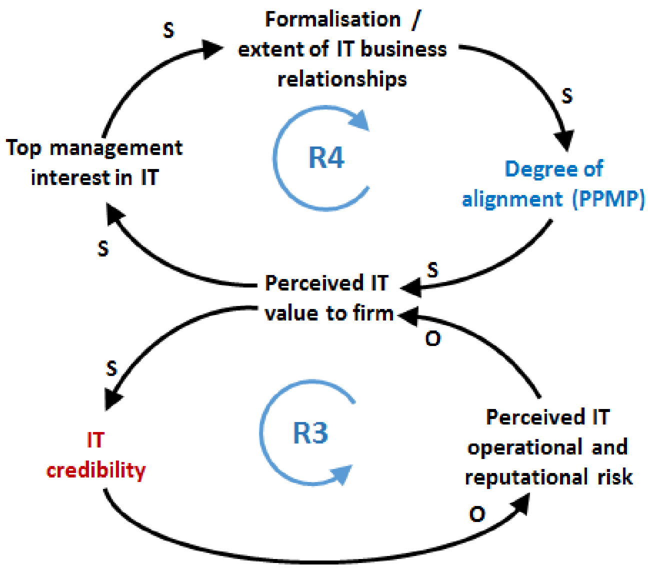

Figure 6.5: The potential 'Escalation' archetype for IT knowledge sharing

The most important observation from the entire diagram is probably that leverage is obtained by making a positive or constructive influence on *Perceived IT value to firm* and that there are multiple variables that could be influenced. The collection of the sub-practices (see Table 5.2) that leads to the PPM practice of *Strategic alignment* influencing the variable *Degree of alignment* provides the first evidence from the research that there is a potential link between PPM practices and BITA.

An interesting insight is the lack of balancing loops in the diagram that does not show how an upper limit of the variables in the multiple reinforcing loops will be obtained. In theory, the variables do not represent physical items with natural limits and not having a balancing effect in knowledge and credibility does not necessarily indicate a poorly-constructed diagram as it would for physical items, should there not be a limit defined.

Authors Wagner et al (2014) and Huang and Hu (2007) strongly support the arguments made in this section (see Section 4.3.4). In fact, Reich and Benbasat (2000, p. 100) already argued that shared domain knowledge is key for both short, medium and long-term alignment.

6.3 COLLABORATIVE PLANNING PROCESSES

6.3.1 Description

Figure 6.6 contains the CLD for *Collaborative planning processes*. Although the diagram was done collectively for the mutual involvement of business within IT planning, and IT within business planning (see Table 4.2), the concept of knowledge sharing indicated by the *Shared knowledge* BITA CSF manifested strongly in the diagram as well. It is to be expected that joint planning actions should have an influence on knowledge sharing and in turn knowledge sharing would influence, if not the extent of planning, at least the value that emerges from these joint planning sessions.

Interesting observations that provide support for some of the more strongly-established links are indicated below. Interviewee 2 remarked that, "[t]here is a significant and important difference between forced planning with IT and mutually beneficial planning, where role players want to be at the same table. In the first instance, people look for excuses and their interests are self-protection and empire building. In the latter, the mind-set is for shared value". This is an important observation, since both the data and literature are clear on the formal systems, but also the tacit systems of planning and indeed knowledge sharing. In the opinion of Interviewee 2, you could actually have formal planning sessions that are of little value due to a lack of buy-in from the employees.

Interviewee 5 used terminology close to that which is associated with PPM to describe the actions at the collaborative planning sessions by stating that, "[w]e aim at establishing an optimal portfolio of IT initiatives for [organisation name]. Our goal is to guarantee that tech investments provide the best return possible".

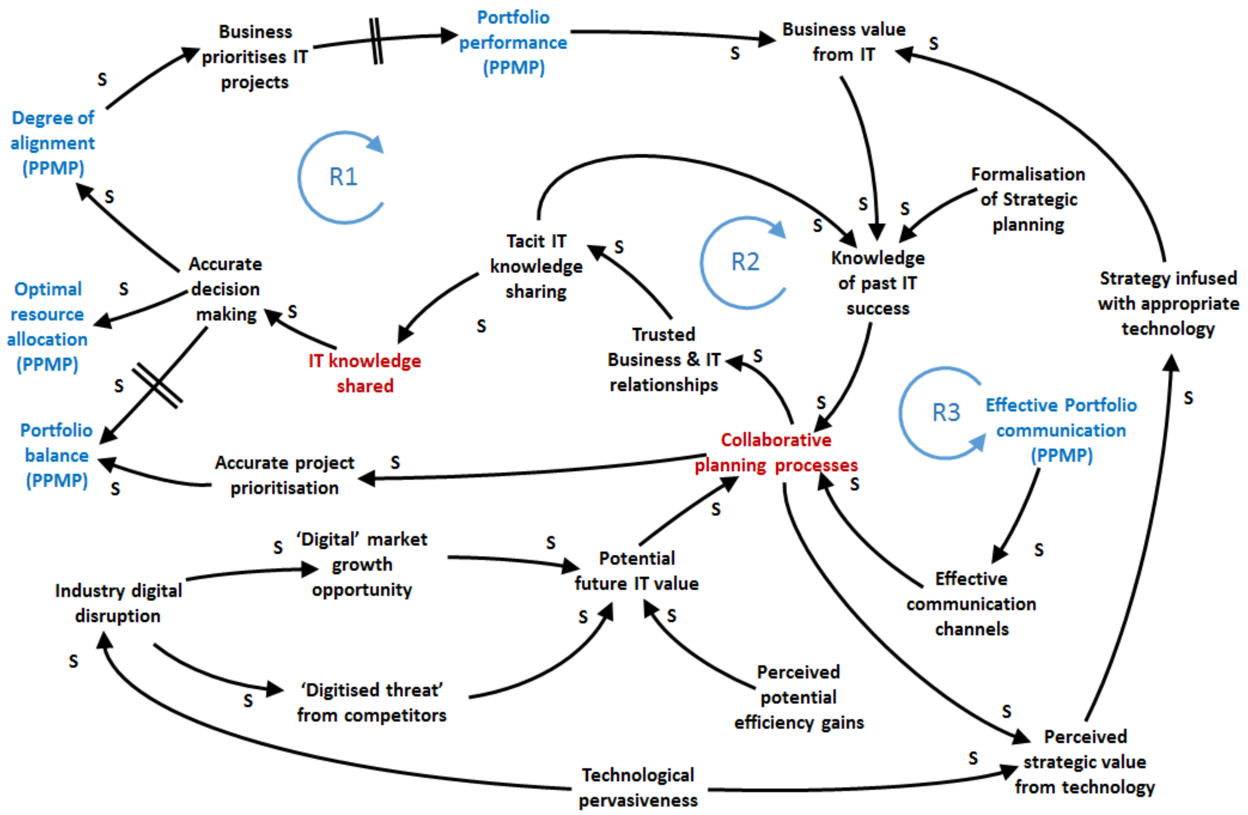

Figure 6.6: Collaborative planning processes CLD

The external success (see Section 6.2) again featured in the description of relationships with Interviewee 15 remarking that, "people only know about IT successes outside the organisation if it is newsworthy. The successful implementation of a core banking system for [company name] that took three years to plan and execute flawlessly, is not really newsworthy outside the bank".

An interesting branch of the CLD, although it does not form a feedback loop, is the *Technological pervasiveness* and its impact on *Industry digital disruption*. Interviewee 5 describes this as being

"… a little bit like hitting a moving target with a moving gun. The target, our strategy and planning are in permanent flux, but the technologies as well". The disruption is seen by the interviewees as drivers of opportunities for market growth, but also leading to potential threats from competitors. Interesting to note is that efficiency gains from technology is not linked to *Technological pervasiveness* according to the data; it is acknowledged as a driver of *Potential future value,* but not as a direct effect of technological pervasiveness. These views are also supporting the more modern emphasis on dynamics capabilities and the dynamic nature of strategy as presented in Section 2.4.

This presents opportunities for further research since both efficiency gains and the pervasiveness of technology were mentioned by the vast majority of interviewees, yet the efficiency gains were not directly linked to technological pervasiveness. Section 6.6 and Section 6.7 explore this further since the presence of technology, or existence of information systems, does not lead to gains in efficiencies; it is the actual use thereof that creates value.

6.3.2 Analysis and interpretations

Three different reinforcing loops were identified for *Collaborative planning processes*. Figure 6.7 shows the first reinforcing loop (R1) that contains both the variable being modelled, *Collaborative planning processes*, as well as the previous variable, *IT knowledge shared*. It is intuitive that these two variables are part of the same cause-and-effect relationship for reasons argued in the previous section.

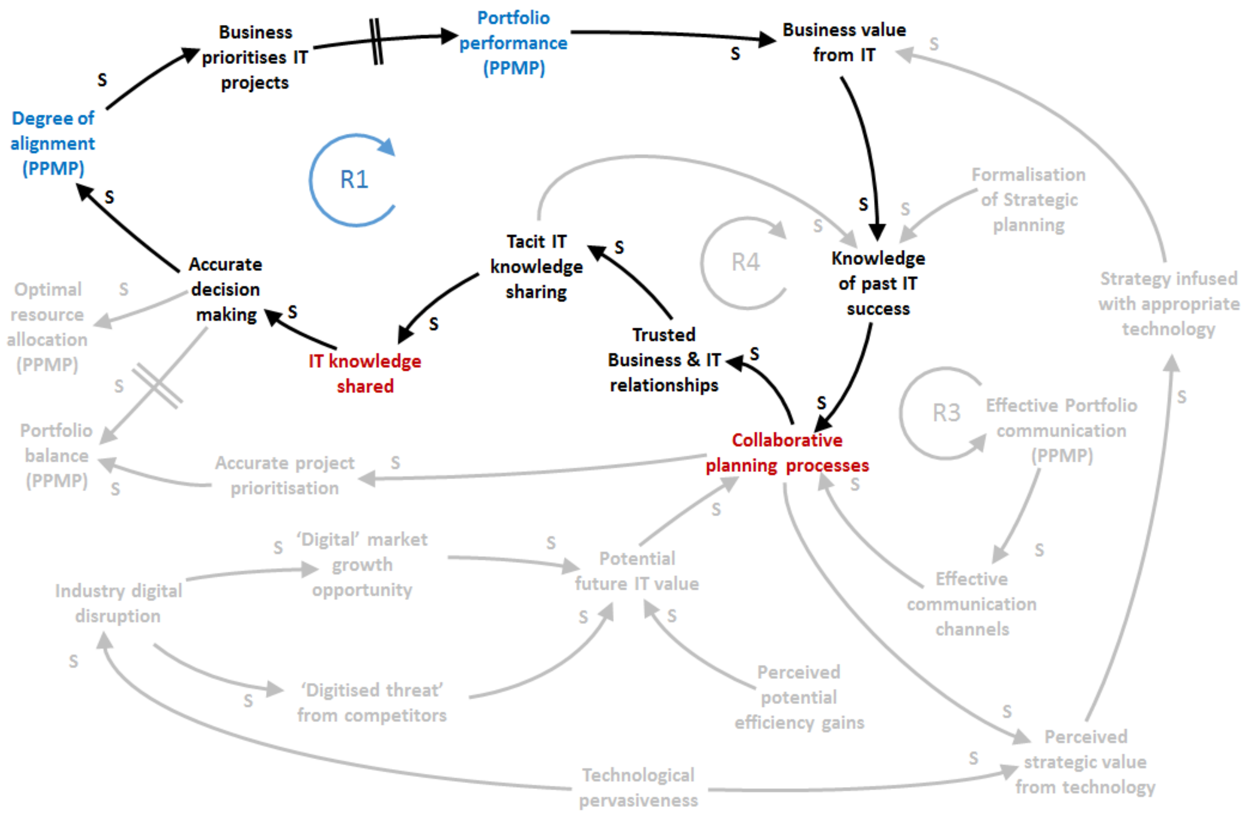

Figure 6.7: Collaborative planning processes reinforcing loop R1

The more interesting observation from loop R1 is the presence of two PPM practices, *Degree of alignment* as well as *Portfolio performance*. The loop confirms a very important relationship between two key BITA CSFs as well as two of the PPM practices. The variables (or principles) linking this together are again the concepts of trust, IT knowledge, knowledge about the success of IT and business value gained from the IT investments, already identified from the previous diagrams.

A new variable that plays an important role is *Accurate decision making*. Interviewee 2 explained this by saying that, "[i]t is only possible to make the best decisions when you have deep insight on both the business requirements and technology capabilities. You cannot make good decisions in the absence of knowing what is required and what is possible". Zhang, Chen, Lyytinen and Li (2019, p. 6229) referred to this as the Business and IT Co-evolution (BITC) and argued that this forms a "co-evolutionary process that reconciles top-down rational designs and bottom-up emergent processes coherently interrelating the Business / IS relationships in order to contribute to an organization's performance over time". The data and CLD thus strongly support this theoretical perspective.

Reinforcing loop R2 (see Figure 6.8) is in effect a special case of the same loop as R1. It just acknowledges that trust and knowledge sharing increases knowledge about past success, with a positive impact on planning. From a modelling perspective, the important question is whether this loop is not the same as R1 but at a lower level of granularity. Upon inspection it was decided to leave the relationship between *Tacit IT knowledge sharing* and *Knowledge of past IT success* since it is fundamentally different from the more formal improvement in decision-making and the internal impact on priorities and alignment. Effectively loop R1 deals with the 'within organisation' gains and loop R2 deals with the 'external' knowledge, that will also have an impact on the sharing of knowledge and ultimately on BITA. These are two different principles, evident from the diagram.

The final loop for this BITA CSF is loop R3, also shown in Figure 6.8. This loop has a more strategic dimension and where R1 and R2 focussed on knowledge and trust, this deals explicitly with perceived strategic value. The use of the word 'perceived', although it was not explicitly used by many interviewees, is important. The nature of strategy is forward looking and as such, it drives value perceptions. Interviewee 11 stated that "… the participation in planning sessions with the digital team certainly increases your appetite for all things digital and certainly shows what is possible".

Important in loop R3 is the variable *Strategy infused with appropriate technology* that leads the *Business value from IT* variable. The value from IT principle is not just common in the two loops (R1 and R3) but also evident in other diagrams (see Figures 6.1 and 6.14 for *Return on IT assets* and Figure 6.17 for *Business value from IT*) and thus plays an important role in BITA across the different CSFs.

A significant observation that leads to the link from technological pervasiveness is that many of the digital conversations are actually triggered by the business executives as well. Interviewee 11 believes that "IT at times 'hold back' in the digital conversations as they seem to fear having to deliver all the things we dream about. Sometimes they seem to share our excitement, but would rather not display that in open discussions, fearing that they are not able to contain where the conversation is going". In Section 6.7, the user involvement is discussed and the concept of having realistic expectations, addressing this particular issue, is addressed.

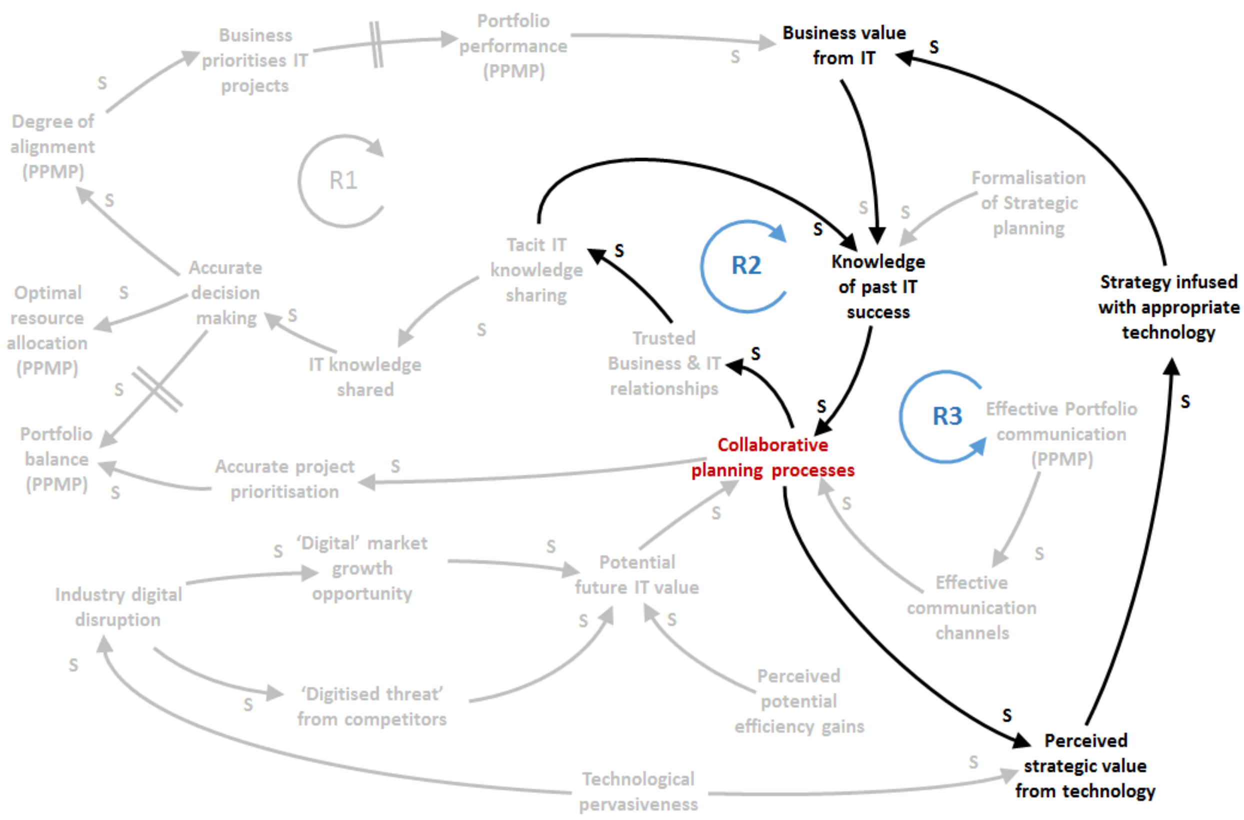

Figure 6.8: Collaborative planning processes reinforcing loops R2 and R3

The most significant insight from the *Collaborative planning processes* diagram for the stated research proposition (Section 1.4) is no doubt the strongly-implied link represented in loop R1. Two PPM practices, *Strategic alignment* (presented by the *Degree of alignment*) and *Portfolio performance* are clearly fundamental in the more formal and tactical of the three planning loops. It thus provides clear evidence of the relationship between PPM practices and BITA CSFs.

The second important observation is to an extent in conflict with the research proposition that deals with PPM practices contributing towards BITA CSFs. In this instance the opposite cause-and-effect relationships seem to be evident. The PPM practices of *Portfolio optimisation*, represented by the variable *Portfolio balance*, as well *as Resources management*, represented by the variable *Optional resource allocation*, are more a result of the alignment activities and less a contributor to the alignment activities, based on this diagram. The cause-and-effect relationships are evident, but they seem to be in the opposite direction of the proposed. In fact, it could be argued, based on this CLD that the attainment of higher degrees of alignment could contribute towards certain PPM practices and ultimately, the maturity of PPM in organisations.

The leverage for this diagram is once again rather evident since the *Formalisation of strategic planning* influences *Knowledge of past IT success* that is shared by all three the reinforcing loops. It is important to note that this does not refer to the formalisation of IT strategic planning as argued by some authors (Chan et al., 2006; Wong et al., 2012) but of strategic planning that encapsulates the impact of IT on strategic intent. As stated very clearly by Interviewee 19, "…unless you include the impact of technology on the context, operations and our customers, you cannot call it strategic planning. The presence and discussion of the impact of IT is implied in the words 'strategic planning'".

A final interesting observation, which was not evident during the interviews, but is made explicit by the three loops R1, R2 and R3, is the three different forces at play to increase collaborative planning. Loop R1 deals with the explicit and tactical level of planning, loop R2 deals with the more tacit part and loop R3 deals with the strategic part of planning. This balance, or rather required presence of strategic planning (R3), tacit sharing (R2) and tactical measurement and making IT and IT contributions explicit (R1), are all complementary, and probably all critical to joint planning processes being successful.

With no archetypes present in the *Collaborative planning* diagram, the emphasis moves to the next BITA CSF, namely *Executive commitment*.

6.4 EXECUTIVE COMMITMENT

6.4.1 Description

The CLD for *Executive commitment* (see Figure 6.9) contains five different feedback loops as well as four of the variables that represent PPM practices. It is evident from the strengths of the relationships as well as the multiple feedback cycles that *Executive commitment* plays a key role in BITA, as indeed identified by BITA authors (Gomolski, 2005; Kurniawan & Suhardi, 2013).

Interviewee 17 verbalised a very strong common theme that, "[t]he commitment of the executive team is largely formed by personal IT experience. This is in turn shaped by previous experiences, good and bad, and current realities in digital [team's] delivery". The role and contribution of IT leaders in fact play out very strongly across most of the diagrams. Interviewee 14 defined this as "value sharing relationships" stating that "we need to create value in each other's lives". However, it was evident from the data that this desire for mutual value is not always present, and neither experienced, from both the business and IT leaders' perspectives.

Another view on the mutual value was expressed by Interviewee 9, who stated: "…you scratch my back, I scratch your back, not beneath the table, but in open view. Management is horse trading and the IT organisation has some very good horses to trade … you just need to be able to distinguish between a race horse and a donkey". This comment was made to highlight the interdependency and was not intended to define anything untoward in the commitment or relationship, as confirmed by

Interviewee 10 who stated: "[i]t is all about value sharing relationships, for the benefit of the [organisation name] and our customers, that remains the end goal".

A principle that is not present in a feedback loop but that manifested strongly is the innovativeness of the IT leadership and the impact it has on system agility. Interviewee 11 provided an excellent example where he "…negotiated with the business that all money saved in approved projects goes back into our skunk works fund, from where we can then fund fringe projects. An example of this was a Whatsapp chatbot, never approved, but developed and commercialised from saved money".

The innovativeness thus leads to an element of agility where funds could be reallocated due to the trusted relationship between business and IT. The dynamics of a reinforcing loop is clear here as Interviewee 11 continued to describe how this in turn built more credibility when the value was noticed, that in turn built the trust relationship.

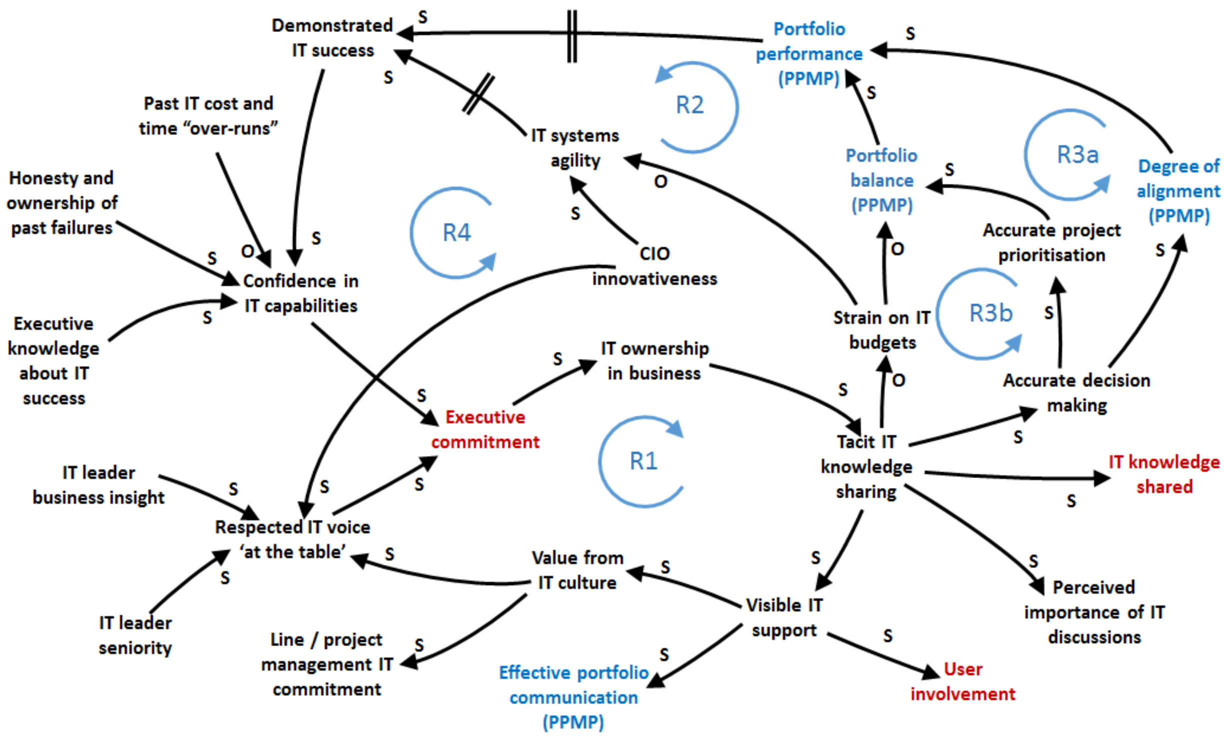

Figure 6.9: Executive commitment CLD

However, this was not evident in most instances since strong governance structures are mostly present (see Figure 6.18). The inverse was also argued about the CIO, or at least IT leadership's role in systems agility. Interviewee 4 stated that, "[a]ny CIO will have enough reasons to hide behind poor systems performance. The CIO who is worth his/her salt will go beyond those reasons and deliver". The arguments about IT rigidity is important given the arguments about potential rigidity presented by Tallon and Pinsonneault (2011) in Section 2.4.3.

Huang and Hu (2007) presented an supporting argument about the CIO's obligation make use of IT assets in an innovative manner, but most other IT authors argue the importance of governance and operational and project management as critical CIO tasks. They fail to elevate the importance of innovation from the CIO, not the IT department, as an important contributor to business and IT alignment.

6.4.2 Analysis and interpretations

Although there are five different reinforcing feedback loops, on further analysis it was determined that the insight and value from the third and fourth loops identified (loops 3a and 3b in Figure 6.11) are very similar and as a result the diagram and discussion are presented as one. There is also a balancing loop B1 evident that is discussed after Figure 6.13.

Figure 6.10 contains the first reinforcing loop R1 and shows the relationship between *Executive commitment* that drives the level of IT ownership and an important variable absent from the BITA literature in name, if not in principle, *Value from IT culture*. There are two complementary, yet somewhat different, views on this variable.

The one view, best expressed by Interviewee 14 is that it is just accepted that IT will 'deliver'. She stated that the "IT department is supposed to deliver fully-functional operational systems every day, like a doctor should keep a patient healthy. If your doctor keeps you healthy, you don't phone to thank him, it is his job. It is the job of the IT department to keep healthy systems, period". However, Interviewee 3 verbalised the same principle in a more positive sense: "[t]he technology function has become critical to deliver large-scale [digital] transformation programmes that create new levels of customer experience, new ways of working in [company name] and business-wide cost reductions. We know we can count on them to bring value to the table."

The net result of the culture that accepts or expects value from IT, is a *Respected IT voice at the table* and very importantly, the contribution that this voice is making towards the commitment of all the executives, IT and non-IT. This relationship was one of the strongest that arose from the interviews, with multiple interviewees commenting on this very clearly: "If your IT guy is not on the Exco, you're dead" (Interviewee 3); "Your CIO should have an equal voice at the highest level of decision-making in the organisation" (Interviewee 7); and "The role of the CIO at executive level is critical" (Interviewee 8).

It is also interesting to note that the BITA CSFs are once again highly interdependent, as acknowledged by multiple BITA authors (Luftman et al., 1999; Preston & Karahanna, 2009; Teo & Ang, 1999). Chen et al. (2010, pp. 231) is one of many authors that argued the importance of the CIO to have a senior role on the executive team supporting the data from this research.

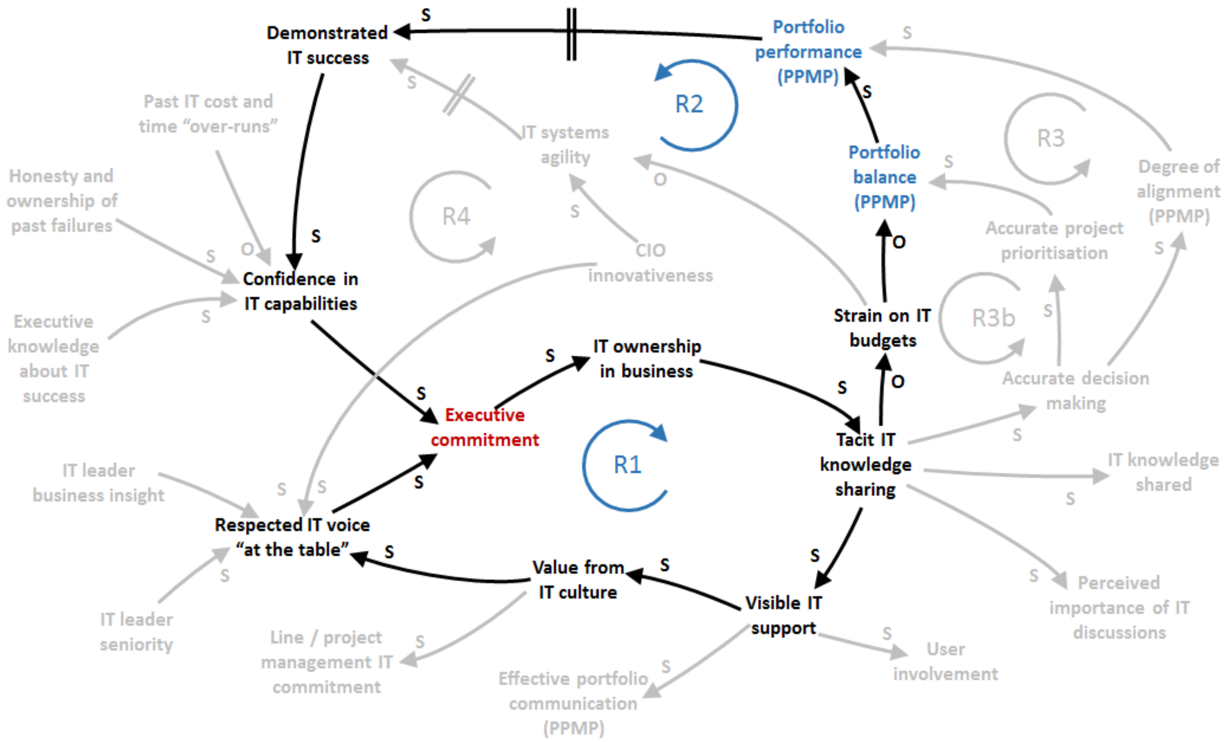

Figure 6.10: Executive commitment CLD reinforcing loops R1 and R2

Figure 6.10 also contains the second reinforcing loop of the *Executive commitment* CLD and shares multiple variables with loop R1. Interesting in this loop is the first inclusion of a cost variable, *Strain on IT budgets*, as well as the delay between the performance of the portfolio and the *Demonstrated IT success*. It is argued that, although operational and tactical measures may indicate a portfolio that is performing well, according to defined measures for success, it takes time for this measured performance to be seen as demonstrated success and increased confidence in IT's capabilities. Where loop R1 dealt with the culture and respect for the IT leadership, loop R2 is more about measured and demonstrated success that will eventually lead to confidence in IT and higher levels of executive commitment. Clearly these are both necessary and complementary contributors towards BITA based on the analysis of the CLD.

Care must be taken to not read reinforcing loops only in the positive dimension (Haraldsson, 2004). When looking at loops R1 and R2 and even loops R3a and R3b (see Figure 6.11) they all share the variables *Executive commitment* (BITA CSF for this section), *IT ownership in business* and *Tacit IT knowledge sharing*. In principle, should any of the favourable conditions that will lead to an increase in *Executive commitment* be absent, or exert downward pressure on any variable in the loop, the reinforcing loop will effectively have the opposite impact. In this instance, the cause-and-effect relationships will potentially create an even lower level of commitment through the escalating nature of the loop.

Figure 6.11 contains effectively two reinforcing loops, R3a and R3b, but they share nearly all variables, with the exception of the two PPM practices of *Degree of alignment* and *Portfolio balance*.

Both these reinforcing loops indicate the strong relationships between knowledge sharing and decision-making and the PPM practices. However, different from the hypothesis for the research, the effect of BITA in this instance contributes to practices that sit within the PPM domain. However, both of these practices lead to an improvement in *Portfolio performance* that in turn effect the demonstrated IT success and result in increased confidence in IT capabilities, leading to *Executive commitment*. Thus, there is also a cause-and-effect relationship from PPM practices leading to a BITA CSF. The evidence thus seems to be stronger for interdependence between PPM practices and BITA CSFs as a direct cause and effect as suggested via Figure 3.7.

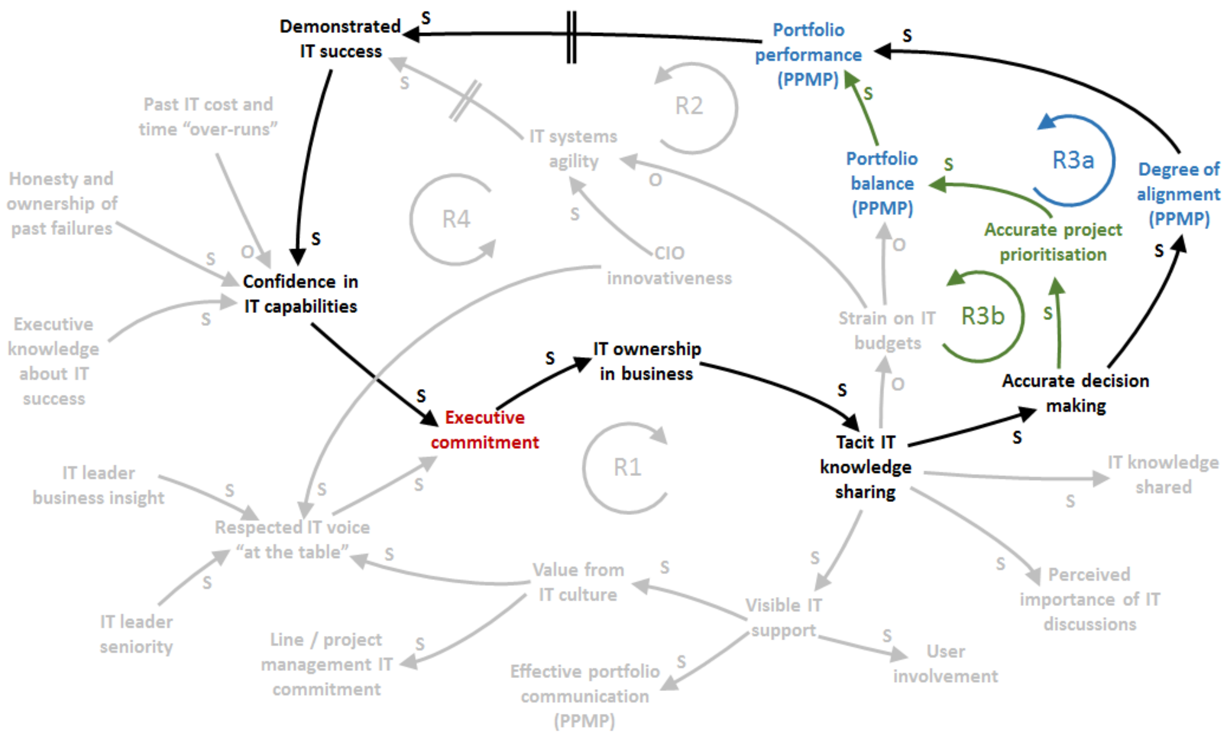

Figure 6.11: Executive commitment CLD reinforcing loop 3a and 3b

Figure 6.12 contains the reinforcing loop R4 that shows the impact of *Strain on IT budgets* on *Executive commitment*. It is well known that funding is required to build future-proof systems. Interviewee 22 stated this well by arguing that, "in [company name] we are already heavily invested in legacy systems and are mostly forced to design around this to create systems in double quick time … just increasing our future technical debt".

It is evident that 'technical debt' is seen by participants as the more common definition of the high cost associated with systems changes or maintenance due to practical shortcuts taken during development. The argument by Tom, Aurum and Vidgen (2013, p. 1498) that technical debt could also be "viewed as a tool similar to financial leverage, allowing the organization to incur debt to pursue options that it couldn't otherwise afford", is not evident in the mind-set of those who presented the relationships of financial strain, impeding system agility.

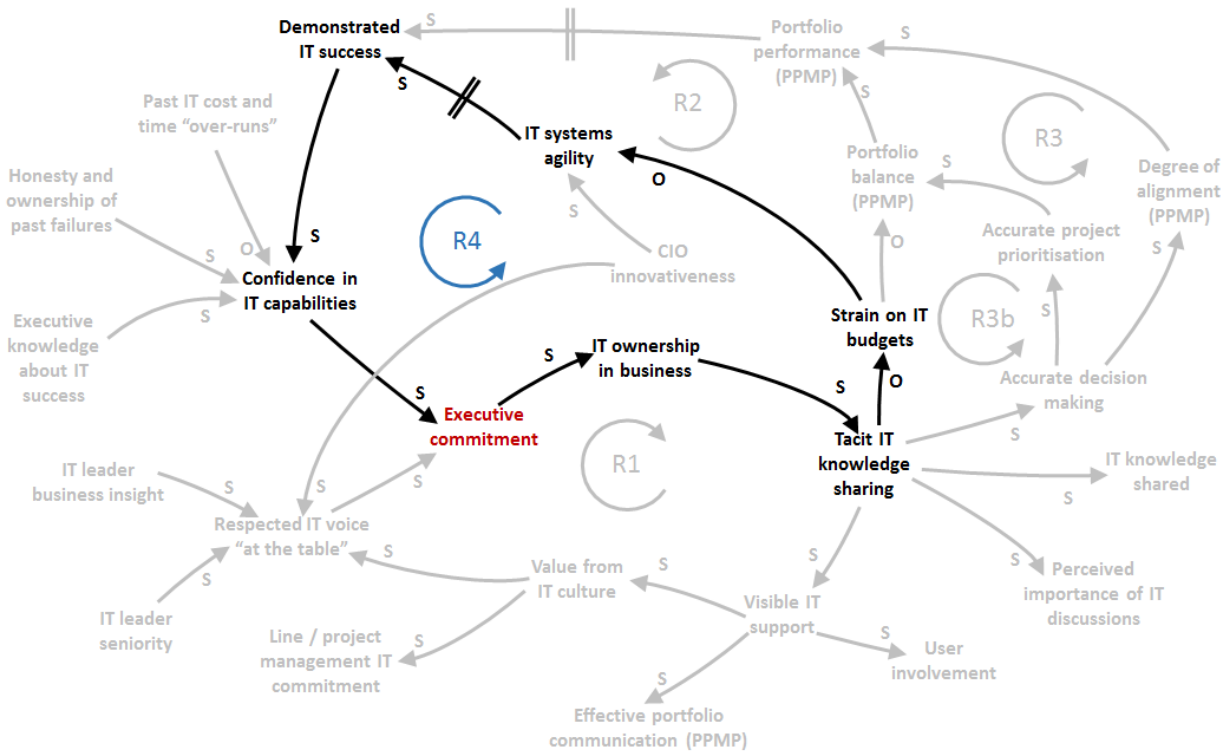

Figure 6.12: Executive commitment CLD reinforcing loop R4

Of importance in this reinforcing loop is the impact on *Demonstrated IT success*. The academic literature (Chan et al., 2006; Reich & Benbasat, 2000; Yayla & Hu, 2009) strongly argued for the value of past success in creating confidence in IT's capabilities and the net effect on *Executive commitment*. The data provides clear support for this cause-and-effect relationship of prior success building confidence and trust in the current capabilities.

One very important aspect, that is not strongly supported in the BITA literature, emerged from the data - the innovativeness of the CIO. In fact, it is evident from Figure 6.13 that *CIO innovativeness* is a very important leverage point in this system. The innovativeness of the CIO has a direct effect on the IT system's agility that leads to demonstrated success, a common variable in all the reinforcing loops. As argued previously, reinforcing loops could either increase or decrease *Executive commitment*. Having a variable outside all the loops under the control of the organisation, is a very important insight from this diagram.

Although system's rigidity, or rather a lack of flexibility, is dealt with in Section 6.6 (IT credibility), an important interdependency is articulated well by Interviewee 1, who stated that, "[w]hen you are sitting with rigid legacy systems … you have two choices: complain and blame, or fix it. It is the CIO's job to resolve this in innovative ways". This further emphasises the important role of the CIO and the potential positive snowball effect when innovative IT leaders gain credibility by working creatively within constraints.

In addition, it also has a direct effect on the *Respected IT voice at the table* variable that leads to *Executive commitment*. If the CIO's innovativeness is the leverage point, it should also be emphasised that this is dependent on the correct positioning of the CIO. Being innovative but struggling to be seen as influential or even getting access to the chief executive suite, will stifle any value from these creative endeavours.

The requirement to be innovative as CIO was described by Interviewee 21 as "the attitude of the CIO to work within regulations of the industry and necessary red tape of the bank and use it as excuse, or knuckle down and move beyond it to the see opportunity is the key to success". Interviewee 12 commented on the relationship that shows a *Strain on IT budget* that impedes IT systems agility. In his opinion, "[n]o CIO has unlimited budget; energy should be spent on getting more bang for buck and making less bang to get more buck".

Three PPM practices, *Portfolio balance, Portfolio performance* and *Degree of alignment*, are included in this diagram. All three variables are present in loops R3a or R3b and form part of the main reinforcing process to influence *Executive commitment*. However, it is evident that these practices are again embedded within the loops and are not necessarily the key activities that could influence *Executive commitment*. They present a necessary but not sufficient or critical dimension, other than the positioning and innovativeness of the CIO that plays a significantly more important role.

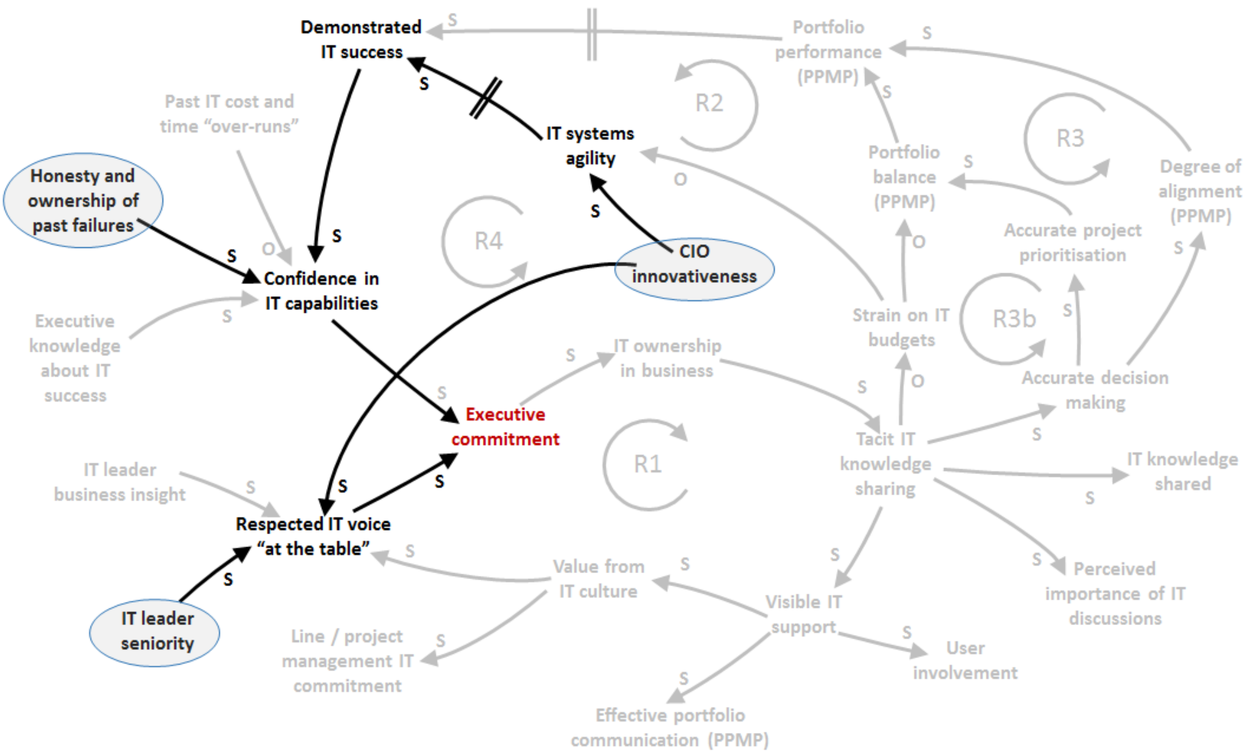

Figure 6.13: Executive commitment leverage points

Three important leverage points emerged from the diagram for *Executive commitment* in Figure 6.13. Two of the factors, *CIO innovativeness* and *Honesty and ownership of past failures,* are inherent to the selection and management capabilities of the IT leader in the organisation. Organisations need to ensure that they appoint IT leaders who are innovative and make this part of the selection criteria due to the significant value that this presents. The second important factor is the *Honesty and ownership of past failures*. This variable is present in both the *Executive commitment* CLD and the *IT credibility* CLD and is dealt with extensively in Section 6.6. Important is that these both impact on the selection and promotion of IT leaders and executives for organisations and within organisations.

The final important leverage is based on the seniority of IT leaders in the organisation. The data clearly supports the literature from authors like Scott (2005, p. 916), who argued that the CIO should be part of the senior management team. Burn and Szeto (2000, p. 206) even stated that the CIO needs to have a direct link to the CEO, a concept that will, according to the diagram, have a positive net effect on BITA.

6.5 EFFECTIVE COMMUNICATION

6.5.1 Description

Figure 6.14 contains the CLD for the effective communication BITA critical success factor practice. The diagram contains three different reinforcing loops and four different PPM practices. The interviews about IT intrinsic communication generated significant data and care was needed with the level of granularity provided in this diagram. Nonetheless, it does seem to contain slightly lower-level relationships, yet these were constructed using the same methods (see Figure 3.5).

Vermaak (2011) acknowledged the challenges of different levels of granularity when constructing diagrams, but this was within the context of a single diagram. In this instance details as well as the method used to construct Figure 6.15 were consistent with that of the other diagrams, although the nature of the question and principle of *Effective IT communication* probably lead to a deeper level of detail, since the CLD is not necessarily at the same conceptual level as the other five BITA CSFs.

First some general interesting comments about communication that were embedded in the diagrams as multiple relationships:

- “Most staff has no idea how to communicate to get action” (Interviewee 2).
- “Over-communication is a very real risk, being conservative in volume and crystal clear in intent is the name of the game in a very busy environment” (Interviewee 6).
- “Business people do not want IT training, they want awareness. They want to know what IT can do for them and then who they can ask to achieve that” (Interviewee 14).
- “IT jargon kills the desire to read any communication from them [IT department]” (Interviewee 16).
- “Communication from IT people can be overly technical or very vague” (Interviewee 16).

Although there was an almost uniformly-held belief that organisations where the interviewees were employed at made significant inroads to improve the communication between IT and business staff, it was evident that communication remains a challenge. Despite numerous comments on what drives effective communication as well as the terminology differences, the irony is not lost on the researcher.

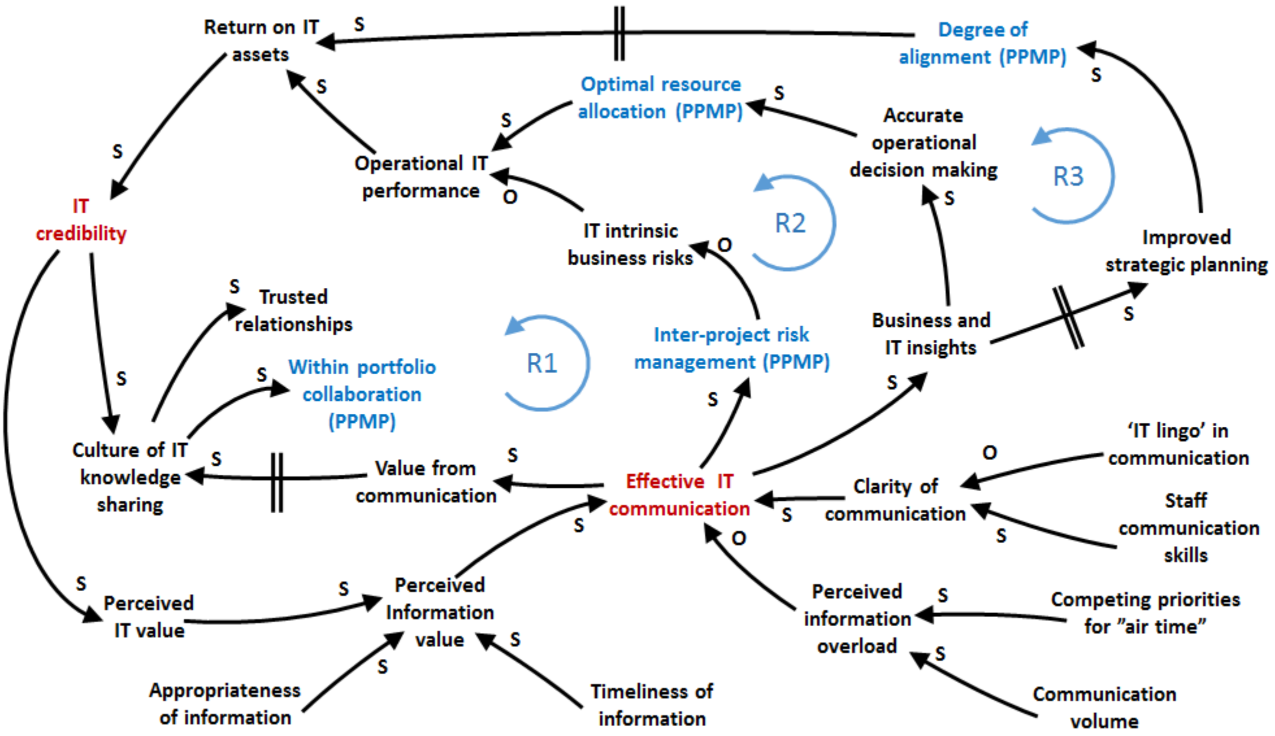

Figure 6.14: Effective IT communication CLD

After careful analyses, it seemed that there were really only three factors that lead to *Effective IT communication*, of which two are controllable. The third factor, *Perceived information overload*, mostly sits outside the control of the organisation and is a reflection on personal communication strategy for individuals, irrespective of the communication regarding IT. Although it is possible to deal with real and perceived information overload, it is a general management challenge, not specific to BITA or IT and is thus not dealt with further than being included in Figure 6.14.

An important relationship that can be controlled is the *Perceived information value* that leads to *Effective communication*. The interesting observation here is that the effectiveness of communication is partly pre-ordained prior to receiving the message, and not necessarily embedded in the message. Based on the perception of IT value among senior leaders, they will either prioritise the communication or not. This in turn is influenced by the *IT credibility* that indicates a slippery slope for the reinforcing loop, if negatively triggered. In this instance, all of the loops R1, R2 and R3 show that low levels of *IT credibility* could further lower the effectiveness of communication.

The *Clarity of communication* is embedded in the message and completely under the control of the organisation. However, it is evident that there is still some work to be done here. Interviewee 7 pointed out that, “sometimes, after reading an email from IT twice and still not knowing what they want me to do, I simply delete it”. Interviewee 16 agreed but pointed to the fact that she would first mark IT emails as ‘Read” to ensure IT “does not know that I delete their emails without reading it”. It is evident from the diagram that there is a close relationship between the level of credibility in the IT function and effective communication. The concept was further explained by Interviewee 2, who believes that “…language is a driver of trust – use overly-complex technical terminology and it [trust] is easily lost”, emphasising that there are factors under the control of the organisation that could be used to improve the effectiveness of communication.

6.5.2 Analysis and interpretations

Figure 6.15 contains the reinforcing feedback loops R1 and R2. Feedback loop R1 indicates a direct relationship between *Effective IT communication* and the PPM practice *Inter-project risk management*. Although the research is investigating the impact of PPM practices on BITA CSFs and not *vice versa*, these particular practices are embedded in a reinforcing loop that includes risk, performance, IT credibility and ultimately feeds back into *Effective IT communication*. The management of the risk between the multiple IT initiatives that is intrinsic to the nature of PPM (see Table 5.7) plays an integral part in the effectiveness of communication between IT and business.

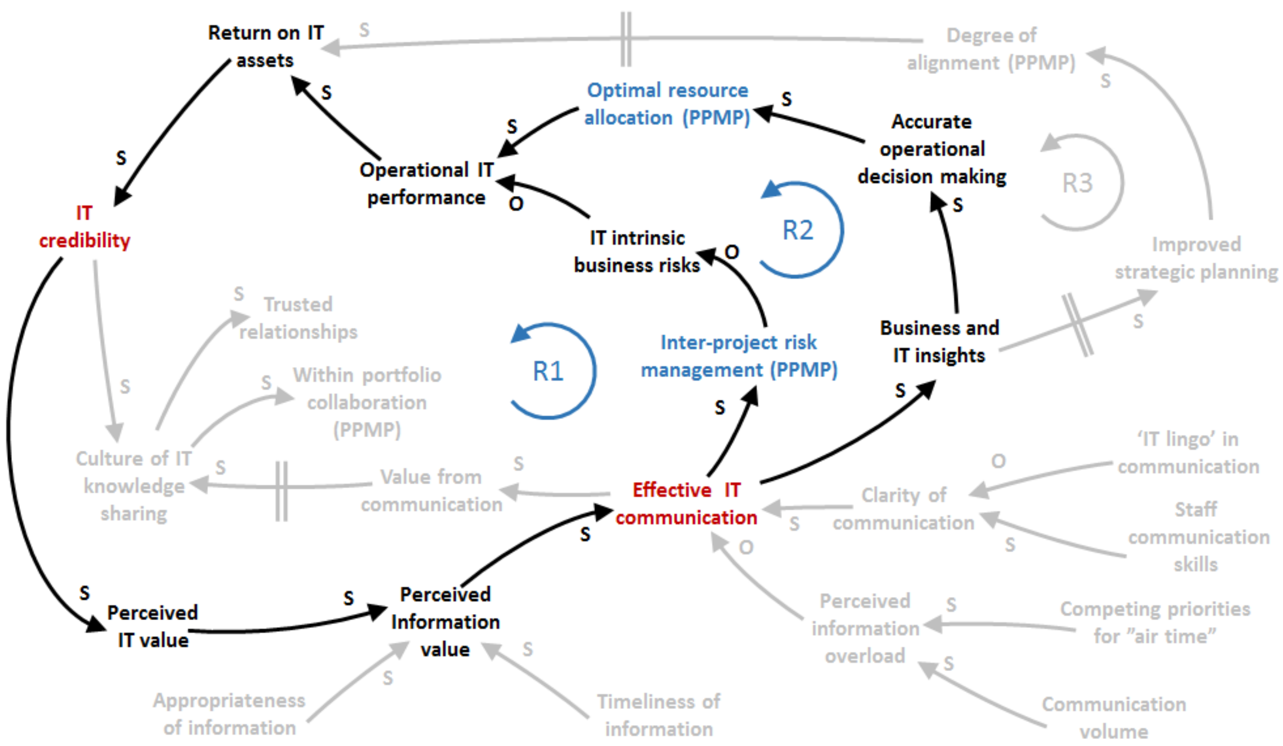

Figure 6.15: Effective IT communication reinforcing loop R1 and R2

The second reinforcing feedback loop (R2) focusses on operational decision-making and resource allocation. Where loop R1 dealt with the influence of risk on operational performance, loop R2 deals with the impact of higher levels of insight, leading to more accurate decision-making that includes resource allocation and *Operational IT performance*. Both feedback loops drive operational performance, but from two different but interconnected principles. The PPM practice of *Optimal resource allocation* is embedded in loop R2, providing evidence that this practice is important for building the credibility for IT, ultimately leading to the effectiveness of communication.

Where loops R1 and R2 dealt with the operational challenges of risk and resources, reinforcing feedback loop R3 contains the more strategic view on effectiveness in communication, as is evidenced by the *Improved strategic planning* and the *Degree of alignment* PPM practice (see to Figure 6.16). The variable shared with feedback loop R2, *Business and IT insights*, is effectively a multiple dimensional variable that encapsulates all of the operational, tactical and strategic insights. This variable consists of multiple factors mentioned during interviews, yet all these factors are testament to higher levels of insights, be it at different levels.

Analysing reinforcing feedback loop R3 shows a delay within the loop. The impact of risk management (R1) and operational decision-making and resource allocations (R2) will have a quicker effect on the return of IT assets. However, it could be argued that the sustainability of a return at the strategic level due to improved alignment is more important and could potentially have a stronger impact.

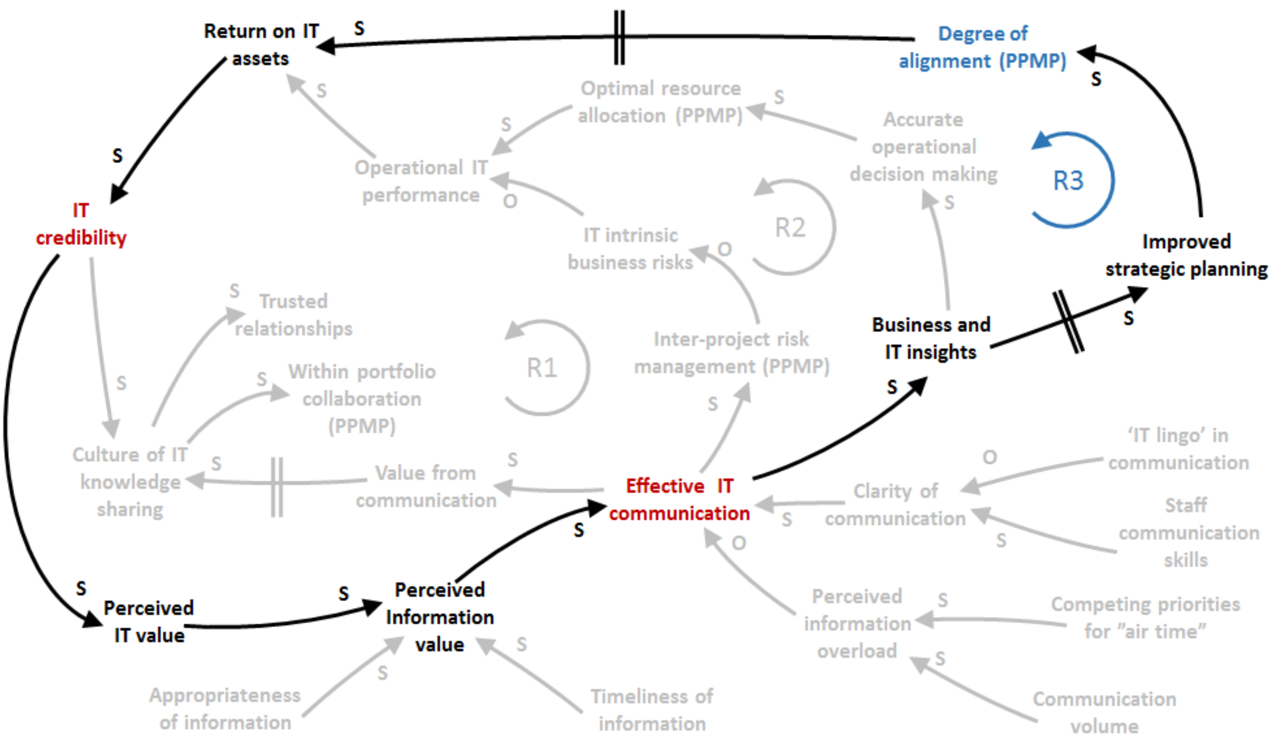

Figure 6.16: Effective IT communication reinforcing loop R3

Although this is not a predefined archetype, it is very typical in system dynamics diagrams to react on loops with delay in a manner different from loops without delays. When a variable within a loop without a delay is interacted upon, the desired result is normally evident. Conversely, when a loop contains a delay, this effect is not always noticeable, hence one of two behaviours manifest (Lane, 2008): Actors in the system either abandon the action in spite of it being correct and desirable, since the impact is not evident; or they tend to overreact and perform more and more of the desirable actions, due to a lack of timely evidence.

Interviewee 9 made an important observation about communication that is not necessarily embedded in any one relationship, but more descriptive of the entire system. He remarked that the "real question about communication is whether the organisation has a data-driven decision culture. If decisions are based on data and knowledge, people want communication to strengthen their positioning in negotiations. If the culture is making decisions on gut-feelings, then people don't really care that much; they will wing it and the loudest voice wins." This is an important observation since no obvious leverage point exists in the diagram.

The real insight based on the CLD is that it has the normal communication challenges (information overload / clarity of the information). Importantly the culture of data-driven decision-making build on *IT credibility*, which preordains the value that is mostly attached to communication around IT. The leverage for *Effective IT communication* is thus based on *IT credibility* and striving for higher levels of credibility of the IT organisation will have a positive impact on communication.

A final important comment from Interviewee 23 also highlighted both the challenge and systemic nature of effective communication in a time of rapidly-changing technology. This comment specifically deals with the agility side of IT. Interviewee 23 remarked that, "[r]ealignment of IT initiatives in a fast-changing environment is the uber value of effective communication. If you don't know what adds value and what does not add value, you cannot prioritise." Although most BITA CSFs and sub-factors seem to have a high degree of interdependency, in the case of *Effective IT communication,* it seems that there is also a high level of dependency on other factors as well.

6.6 IT CREDIBILITY

6.6.1 Description

Figure 6.17 contains the CLD for the *IT credibility* BITA CSF. The credibility of the IT organisation featured strongly as a precondition for effective communication in Section 6.5, yet it is a complex critical success factor in its own right. Figure 6.17 indicates the cause-and-effect relationships as well as the PPM practices and feedback loops.

The communication challenges again came to the forefront in this section, with comments such as: "[n]ever use terminology more complex than required to 'get the job done' " made by Interviewee 4, confirming the strong interdependency between effective communication and trust. Interviewee 7 corroborated this view when remarking that IT staff "… have to translate IT into their [business] vocabulary; they [business staff] have to understand what you [IT] bring to the table".

Interviewee 16 provided a good analogy by stating: "Don't expect business to understand IT. A good example is the power failure – everybody understands the requirement to have back-ups and servers running when there is no power. No-one 'gets it' when a server farm or storage area network takes 10 to 15 minutes to be operational after failing. They never will". The closing comment of "they never will" is important to note. It places the emphasis on IT to describe their challenges in business language. Unless IT staff are able to relate their complex technical world to non-IT staff in a manner that they understand, they will always struggle with credibility. All of this data confirms the *Trust in IT capabilities* perspective evident in Figure 6.17.

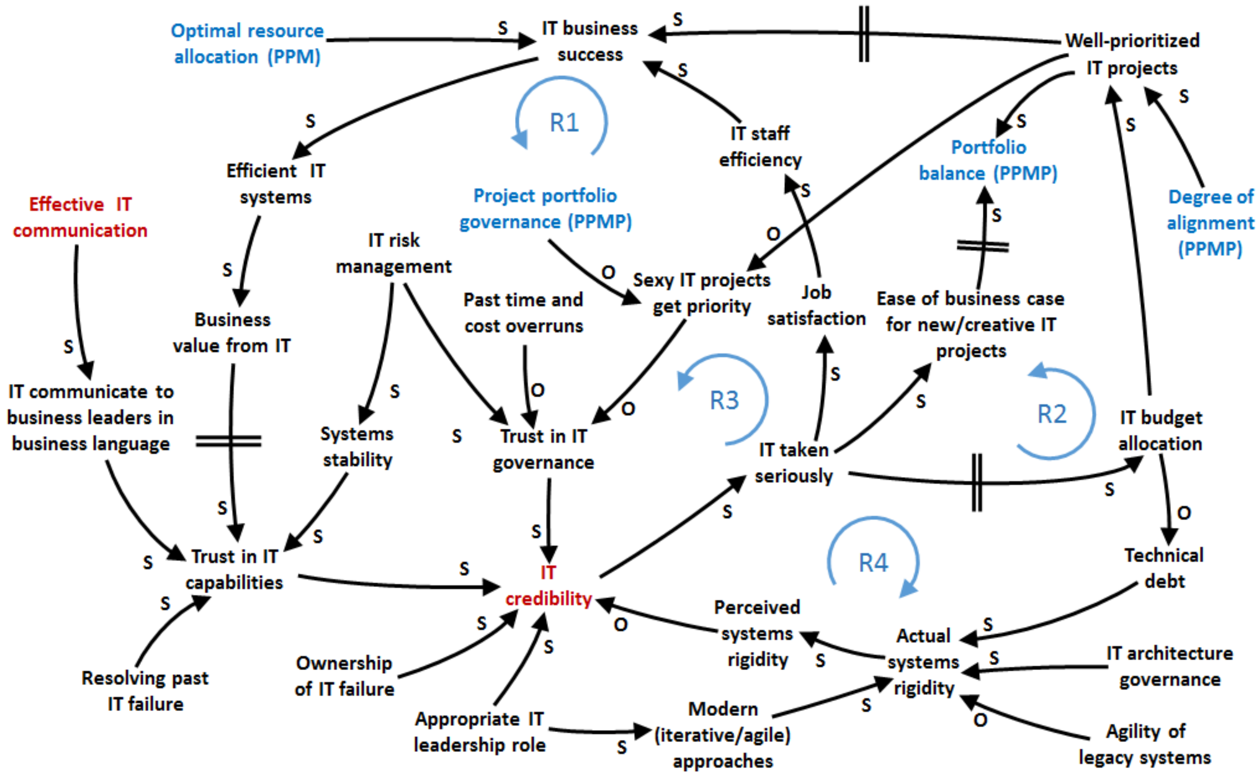

Figure 6.17: IT credibility BITA critical success factor diagram

A strong feature in the process to improve credibility seems to be focussed around systems agility. The desire to make systems react to a fast-changing business landscape is highly evident from the data. Interviewee 1 argued that the "… willingness of the CIO to break out of the rigidity trap is what gives credibility". Interviewee 7 concurred by using the concept of 'technical debt' known in systems development to describe the greater rigidity issues from infrastructure to development and systems deployment. He stated that the "… rigidity trap, or technical debt, is the cost of additional rework due to past short cuts, rather than doing things properly to save time and money. In systems development this is well known, hence we have software architects, but in infrastructure, it is not that well appreciated, but we have exactly the same challenges. Non-scalable infrastructure based on past rushed projects or compromised infrastructure roll-outs not well funded or designed, create tomorrow's legacy systems today." Loop R4, described below, deals with this challenge in detail.

One very evident insight from the data that is not dealt with in academic literature is that credibility is as dependent on resolving and owning past failure as it is on past success. In fact, dealing with past failure and taking ownership could even be more important than the evidence of past successes. One of the limitations of CLDs is that it does not differentiate between the strength of different moderating factors. There is potentially interesting future research to be done to determine if credibility is shaped by ownership and resolving of past failure, or evidence of success.

The academic literature (Chan et al., 2006; Yayla & Hu, 2009) elaborated on the importance of past success, yet failed to acknowledge that failure is more evident and easily shared than success. This actually provides an opportunity to build credibility that should not be underestimated. The following five comments provide a clear indication of this opportunity:

- "Credibility is not just about success; it is about how you dealt with challenges and stepped up to the plate when things got heated" (Interviewee 4).
- "Do you want to be credible? Sort out the &%$#*[problems]" (Interviewee 5).
- "Credibility is not about past success; it is about taking ownership of past failure, and oh [expletive], do we have many of them in [organisation name]" (Interviewee 10).
- "The perception of IT is more shaped around how we dealt with past challenges and failures than the previous successes" (Interviewee 16).
- "Don't tell people what you've done in the past; they really don't care. Rather show them what was not done well in the past and how you fixed that" (Interviewee 18).

The common theme of opportunity within failure is mostly absent in the literature and is an important finding of this research. It is no doubt a point of leverage to gain higher levels of credibility for the IT function that will contribute towards BITA on an ongoing basis.

6.6.2 Analysis and interpretations

Figure 6.18 shows the reinforcing feedback loops R1 and R2 for the *IT credibility* diagram. Loop R1 takes an operational and staff efficiency perspective that deals with the impact of credibility, leading to efficiency resulting in higher degrees of success and ultimately *Business value from IT* that over a period of time grows trust and credibility. An interesting observation from Interviewee 18 is that trust does not represent the highest order state that should exist between IT and business, as is often stated (Huang & Hu, 2007, p. 175). Interviewee 18 maintained that the first challenge is acceptance; trust cannot be created before acceptance of the role of IT. Following acceptance is trust and trust is important. However, Interviewee 18 argued that following trust is respect and that respect is what drives IT credibility. Once IT leaders are trusted by their peers, they should strive for respect that is built over long periods of time.

Interviewee 12 provided an interesting theoretical perspective on this by referring to social capital. "There is a social capital theory that explains when IT and business actively work together, they create shared social capital and shared knowledge that contribute to how we think about digital's contribution to [company name]". In Figure 6.18 the concept of social capital is best presented by the variable of *IT taken seriously*, a variable that is common to both feedback loops R1 and R2.

By being common in two reinforcing loops it can be argued that *IT taken seriously* presents a leverage point. However, unfortunately it is a direct cause of *IT credibility* and is common in all four the reinforcing feedback loops. This confirms that there are multiple other factors driving *IT taken seriously* which makes it very difficult to change this through direct action. Nonetheless, the opportunity is then to manipulate *IT credibility* that will in turn influence this variable as well as the four feedback loops.

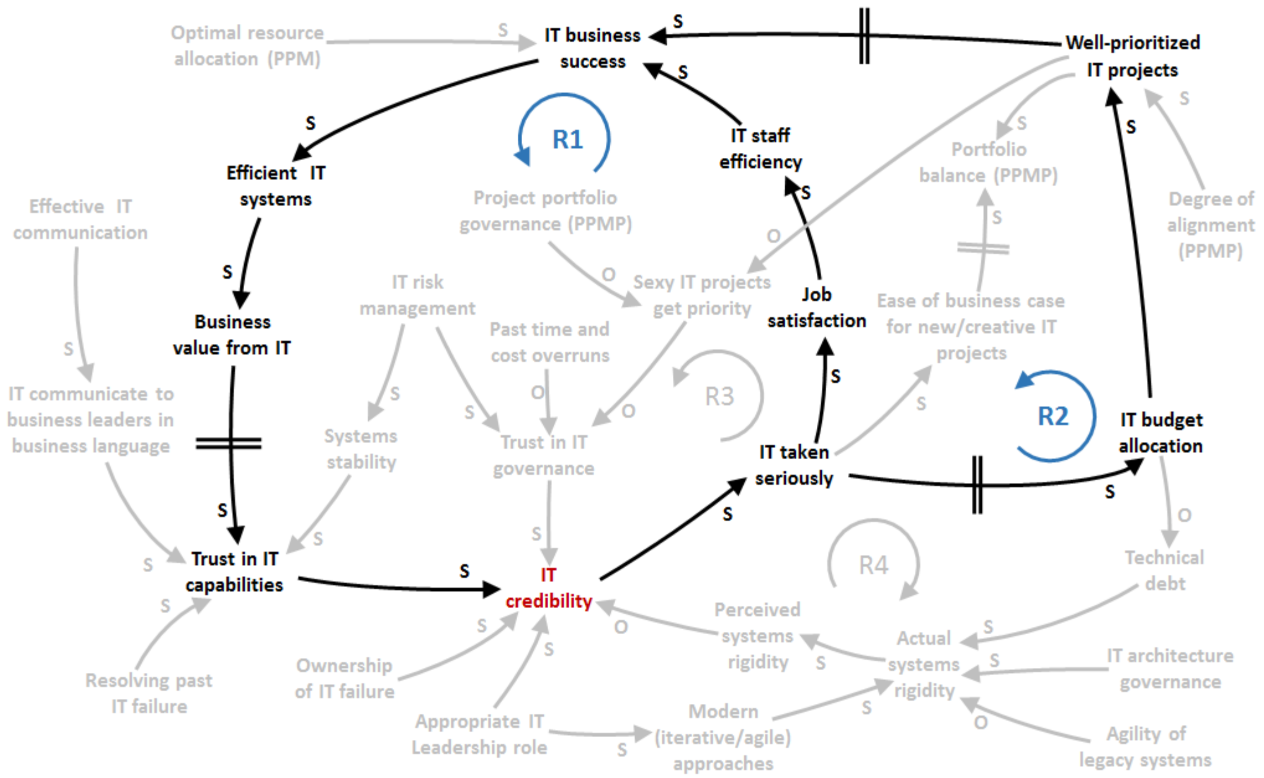

Figure 6.18: IT credibility BITA CSF reinforcing feedback loops R1 and R2

Reinforcing feedback loop R2 deals with the impact of IT respect or credibility and the associated budget allocations. Interestingly, the concept of appropriate budgets has an impact on technical debt (see Figure 6.19) that is to be expected, but also on the prioritised projects and not necessarily the number or magnitude of projects.

The concept of *Well prioritised IT projects* is rather important and different, but interdependent on business setting IT project priorities because business does not have full visibility of the multiple initiatives and neither sufficient insight to know about projects that address technical risk. Interviewee 13 explained this by stating: it is "…not just about IT priorities being set by business; it is also about business priorities, that business don't understand, correctly identified by IT. Cyber is a perfect example. Business has no idea about the potential threat or impact of cyber, but they expect us to be all over it and have systems operational 24/7 with no interruption. What the systems will do, that's business' baby, keeping them spinning over, now that is for us to prioritise."

Reinforcing feedback loops R3 and R4 deal explicitly with the impact of budget allocation and the associated prioritisation and systems flexibility. Although the two principles are clearly dependent on each other, probably more than indicated in the diagram, two very distinct processes with sets of interdependencies exist, according to the data.

Loop R3 deals with the prioritisation already discussed since it forms part of loops R2 and R3, but a new variable is introduced, namely *Sexy IT projects get priority*. Although this is not the most professional term to use, it was first used by Interviewee 12 and thereafter shared with other interviewees when they struggled to verbalise their concern about a lack of visibility on IT project prioritisation.

Trust in IT governance features strongly in this loop and has a direct impact on *IT credibility*. The variable of trust in the IT governance processes was first modelled as IT governance until it became evident that the level or degree of governance is not the important variable; it is the level of trust in the IT governance that leads to *IT credibility*. Importantly, the PPM practice of *Portfolio governance* has a direct impact on projects being successfully completed and will contribute towards the required trust in the IT governance processes.

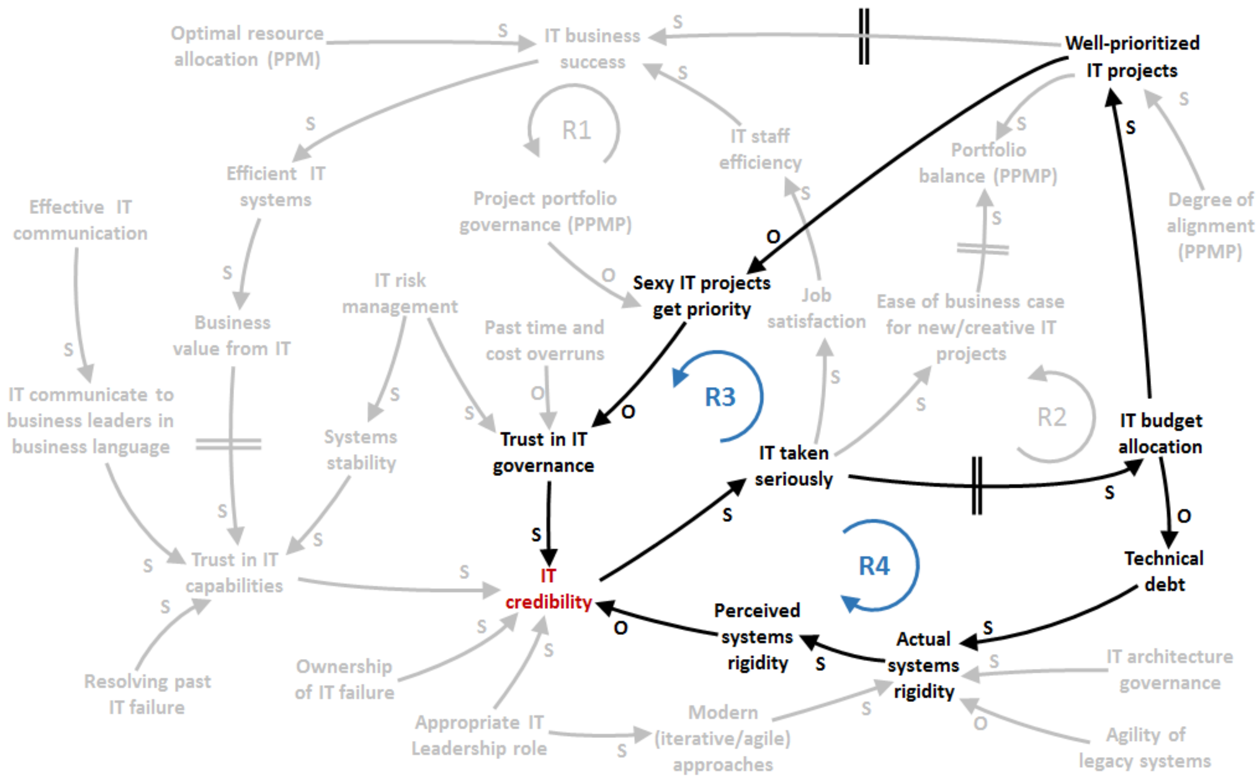

Figure 6.19: IT credibility BITA CSF reinforcing feedback loops R3 and R4

Reinforcing loop R4 deals explicitly with the concepts of rigidity and technical debt. Interviewee 23 displayed some of the best insight on the concept of technical debt and argued that most major financial institutions in South Africa are now stuck with some degree of technical debt due to previous investments. He argued that, "…legacy systems are sometimes used as a swearword in [organisation name] but we forget they probably represented the best possible trade-off of available technology, time and money when they were implemented decades ago. In fact, it is possible that whatever state-of-the-art core banking systems are being implemented today, will be called legacy systems in 20 years' time. That does not mean we are not making the best possible decisions right now." The argument is thus that a trade-off is always made when implementing new technology and that is certainly a principle supported in the project management literature (Dolci & Maçada, 2011, p. 199).

Traditionally IT systems were implemented to meet user and business requirements. The systems' success was measured as the extent to which the system met the requirements at project completion (Munns & Bjeirmi, 1996). This was a bit like defining the strategic intent based on the resource-based view (RBV) and market-based view (MBV) of the organisation (see Section 2.4.1). However, the world of strategy has moved on towards the transient advantage (see Table 2.13) and this is evident in the development and deployment of systems as well. Although systems still need to meet the requirements (think of it as meeting the RBV and MBV), they need to take cognisance of the transient nature of the business model and thus develop future proof systems for requirements not yet known, like a business designing processes and developing capabilities for products, channels and clients not yet clearly defined.

It is thus not surprising that *Actual systems rigidity* leads to reduced *IT credibility*. The rigidity of the systems is clearly influenced by multiple aspects including *Technical debt*, *IT architecture governance* and the use of *Modern (iterative/agile) approaches*. Interviewee 9 is of the opinion that IT leadership, or rather an *Appropriate IT leadership role* plays a very important part by influencing *IT credibility* directly, but also indirectly via modern approaches and the impact on addressing real and perceived systems rigidity. He stated that, "[i]t is possible to break out of the IT rigidity trap, but that is completely up to the IT leaders in the organisation. Can they do it? Can they motivate the importance and secure the funding to do it?" This links strongly back to the arguments about the appropriateness of IT leadership positions as well as the innovativeness of the CIO argued in Section 6.4.

The leverage for *IT credibility* is multi-dimensional, yet evident. Figure 6.20 shows the multiple leverage points argued in this section. However, it must first be argued why the multiple variables present in the reinforcing loops R1, R2, R3 or R4, that all impact the credibility of the IT deployment and organisation, are not leverage points. With the significant interdependencies as well as the delays present in all loops (see Figure 6.20) there are two important arguments. Firstly, any influence on a variable in R1, R2, R3 or R4 may take significant time to impact *IT credibility* due to delays in the process. Secondly, the negative impact of influencing a variable in the direction not intended could have a perpetuating effect on multiple reinforcing loops. It is thus desirable to get a manipulated variable that could, without delay, influence IT capability and kick-start the multiple reinforcing loops in the increasing (desirable) and not decreasing (undesirable) cumulative direction.

Figure 6.20 provides an indication of four potential leverage points. An increase in the PPM practice of *Project portfolio governance* could decrease the variable *Sexy IT projects get priority,* which in turn will increase *Trust in IT governance* and ultimately *IT credibility*. The next variable is *IT risk management* that will also impact *Trust in IT governance* and *Trust in IT capabilities* that both impact *IT credibility*. Although *Ownership of past failure* and *Resolving past failure* are related, they represent different aspects. One is about resolution, showing concrete improvement, and the other is about ownership by IT when things go wrong. Interviewee 12 described this as "… don't go back and hide in your IT cave when things go wrong; own up, be visible, communicate and above else, accept that you're no more perfect than anyone else. Your mistakes are just more visible and at times more painful. Show your [descriptor of guts]."

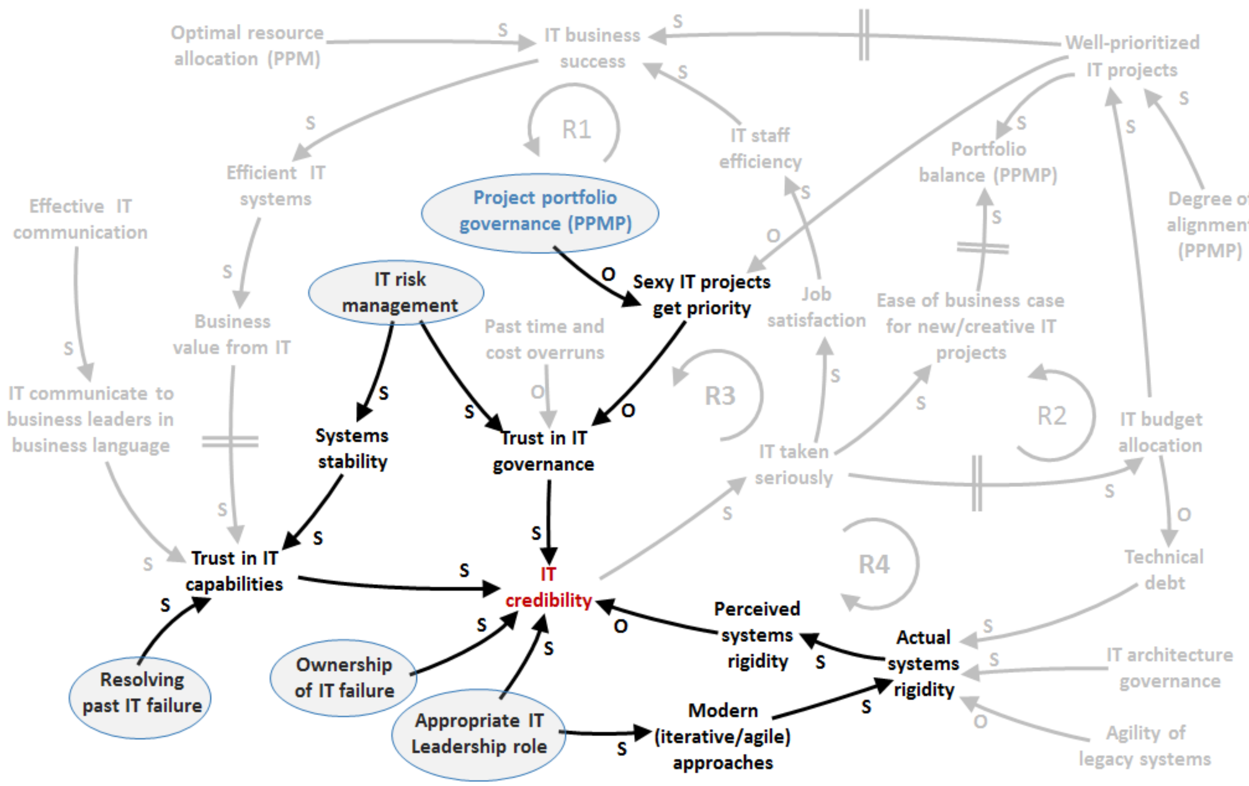

Figure 6.20: The multiple leverage points for IT credibility

The final leverage, *Appropriate IT leadership role*, is important since it manifested in the *Executive commitment* BITA CSF as well as representing a point of leverage and this could really have a concrete impact on BITA. The data indicates that *Appropriate IT leadership* has a direct impact on *IT credibility,* as is evidenced by Interviewee 18 who commented on the positive impact in their organisation after multiple IT leadership roles were elevated to the strategic level in the last ten to

15 years. In his opinion, this is one of the biggest, “if not the single biggest factor that grew credibility of digital and digital channels in [organisation name]”. Importantly, although not intuitive at first glance, it also impacts on the more modern approaches to IT systems and infrastructure development and deployments that have a direct impact on *IT credibility*.

It is clear from the systems methods diagram created for this BITA CSF that *IT credibility* is critically important to achieving sustainable BITA. There are multiple practical actions that could be taken to improve credibility and they could have long-term effects and as such, not contribute to the rigidity, but may very well contribute towards flexibility.

6.7 USER INVOLVEMENT

6.7.1 Description

The final diagram created from the interview data is for the BITA CSF of *User involvement*. It soon transpired during the interviews that *User involvement* as a generic term of BITA is problematic, since not all IT systems require user inputs. Interviewee 9 for example stated that “… infrastructure or security deployments are not dependent on user involvement at all.

User involvement very much refers to application development or at best roll-out. I struggle to see how user involvement in a network upgrade or establishing cloud-based capacity to ensure elasticity of demand has any benefit for the organisation?” The point is certainly well made, and care must be taken in the application of this CSF. Nonetheless, the factor was used and where appropriate, the conversation was steered in the direction of systems development and deployment projects, be that client facing or back office.

Figure 6.21 contains the CLD for the *User involvement* BITA CSF practice. It is evident from the figure that two other BITA CSFs are also contained in the diagram as well as in some of the feedback loops. *Shared knowledge* is part of reinforcing feedback loop R2 and *IT credibility* forms part of two reinforcing feedback loops (R3 and R4) as well as one balancing feedback loop (B1).

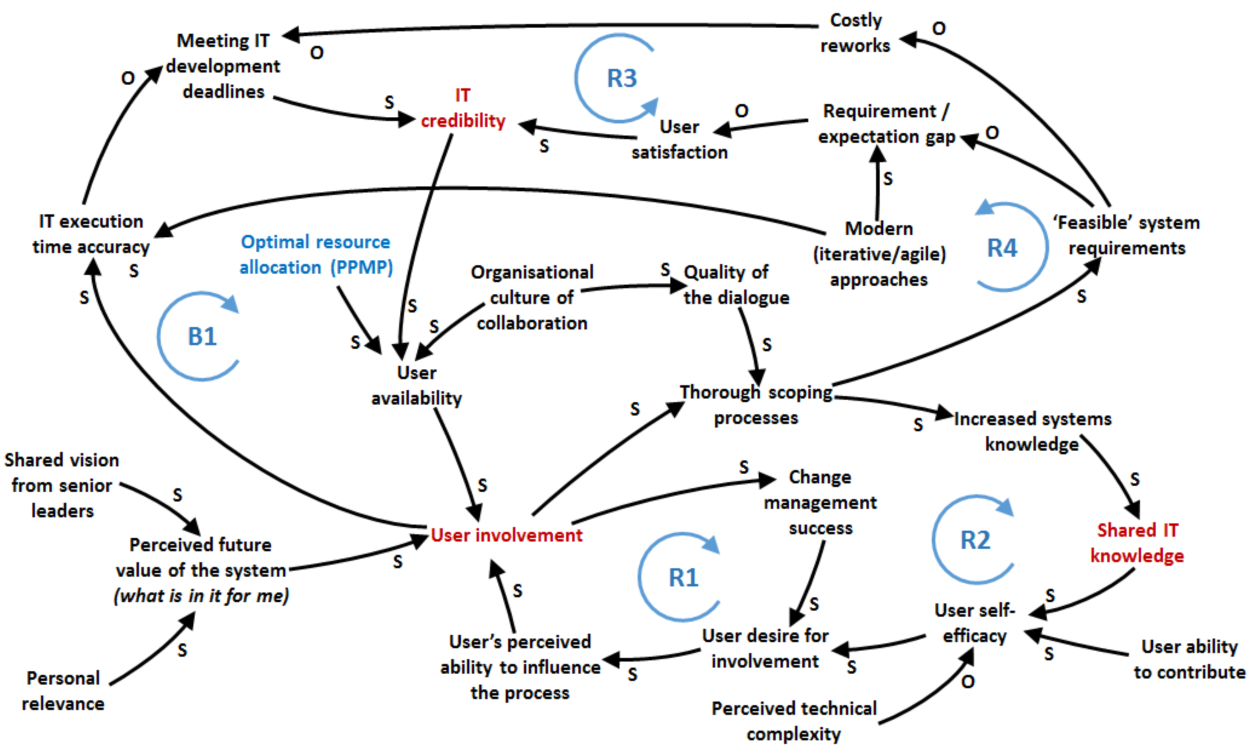

Figure 6.21: User involvement BITA critical success factor diagram

A very important insight, and again somewhat absent in the academic literature, was clearly articulated. Although it does not necessarily have a strong cause-and-effect relationship, a very strong argument was made by interviewees that not all users' involvement is beneficial for systems development or deployment, specifically from an IT perspective. Although broad-based user involvement is desirable from a change management perspective, from an effectiveness (getting quality requirements) and efficiency (getting the requirements with the least amount of time and cost) perspective, all users are not equal. To paraphrase Interviewee 12, users are "like the animals on Animal farm". The following comments by the interviewees explain this very clearly:

- "The 'wrong' users have a negative impact" (Interviewee 3).
- "Not all users' involvement is desirable" (Interviewee 6).
- "Not all users should be involved" (Interviewee 7).
- "Not every user's involvement is important" (Interviewee 14).
- "Not all users should be involved; the correct users should be involved" (Interviewee 15).
- "The average user is just completely out of their depth unless guided very clearly. The quality of your business analysts becomes more important than the user" (Interviewee 15).

However, the opposite to the over-involvement of users argued above is evident from the interview data from interviewees with less direct IT responsibilities that indicates the risk of not having users who would like to be involved, involved. Interviewee 4 was adamant that users can always decline to be involved but need to be asked, if just from a change management perspective. Interviewee 20 went as far as stating that, "[s]ome of our systems are like state secrets – you only get involved when you need to start using it". Interviewee 12 agreed with this and argued that involvement reduced the surprises that users will get and has a positive impact on systems usage. Interviewee 13 saw users' involvement as being both beneficial, although at times "painful' to use her expression. "By not involving users you are just increasing the time to the pain and the level of pain. Users and their involvement are painful; the longer you wait to involve them, the higher the level of pain" (Interviewee 13).

Although user involvement is not seen as "painful" by all participants, the language used in response to the BITA CSF was certainly more emotive than for other CSFs. Terms like "problem between the keyboard and the screen" (Interviewee 15) and "tired of licking people to be involved" (Interviewee 3) show the more challenging and emotive side of user involvement. Given the high level of abstraction of this research and the desire to create a high-level system dynamics diagram, it was decided to not descend into the wormhole of the emotive challenges of user involvement, but rather stay at the level of granularity that was used for the other five BITA CSF diagrams.

The key argument from those cautioning about user involvement is efficiency. Although not explicitly stated during the interviews, the data seems to indicate a trade-off between systems development efficiency and change management. This is a rather important trade-off since appropriate change management leads to higher levels of efficiency when systems commission. Rather like technical debts, it could be argued that 'user debt' is created when using only *the best users*. However, that may be defined during systems development, without potentially wasting time with users who cannot add value.

The extremely subjective decision in terms of the desirability of users as well as the extent of the user debt to be paid at a later stage, remains a challenge. Interviewee 18 provided a warning concerning the impact on efficiency by stating that, "there is something in user involvement … where a lot of dead [no value adding] time can be spent on herding the cats. IT is supposed to get users' inputs, but at times we are required to play prosecutor, judge and jury when differences in opinion derail user interaction sessions".

Interviewee 5 raised a very important concern about user involvement, equating it to a statistical process of getting a representative sample of users to be involved. She stated that her organisation is in essence serving three different customers with one service line, "the traditional, the transitional and the digital native. You have to be able to build systems to appeal to the digital native, don't scare the traditional and also allow the transitional to do their services online or they will not migrate to online channels where we want them". Clearly user involvement includes a balance between finding the correct users who accurately represent the end products' diverse customers as well.

A final argument made about user involvement is the convenience factor, where systems developers do not really buy deeply into the value of user involvement. In this instance, there are arguments that access to users do not always result in the best possible input, thereby negating the value to be gained from this. Interviewee 16 remarked that "the term 'user' is not that well understood or appreciated – I think we are led by accessibility and not necessarily the best quality input. We are more likely to involve internal users than customers in the design of systems like a mobile banking application."

Interviewee 1 pointed at the potential lack of convergence between the system objective, realistic company and development team objective, and the user who is available and willing to contribute using a motor vehicle analogy: "Users' involvement is an idealistic principle … in the end it is take what you can get and make the best of it! The best user can describe a Ferrari, we get one that describes a Tata, yet we are busy building a Toyota".

User involvement is clearly multi-faceted as mostly acknowledged in academic literature (Chebrolu & Ness, 2013; Chong et al., 2010) and the following section explore the feedback loops for this BITA CSF.

6.7.2 Analysis and interpretations

Figure 6.22 shows the interdependency between two important concepts of *User involvement*. Reinforcing feedback loop R1 deals with the impact of change management that will make user involvement more likely. Reinforcing feedback loop R2 deals with the knowledge element that will contribute to users' self-efficacy. Together *Change management success* and *User self-efficacy* will lead to the desire to be involved due to the perceived ability to influence the process, but are dependent on different factors.

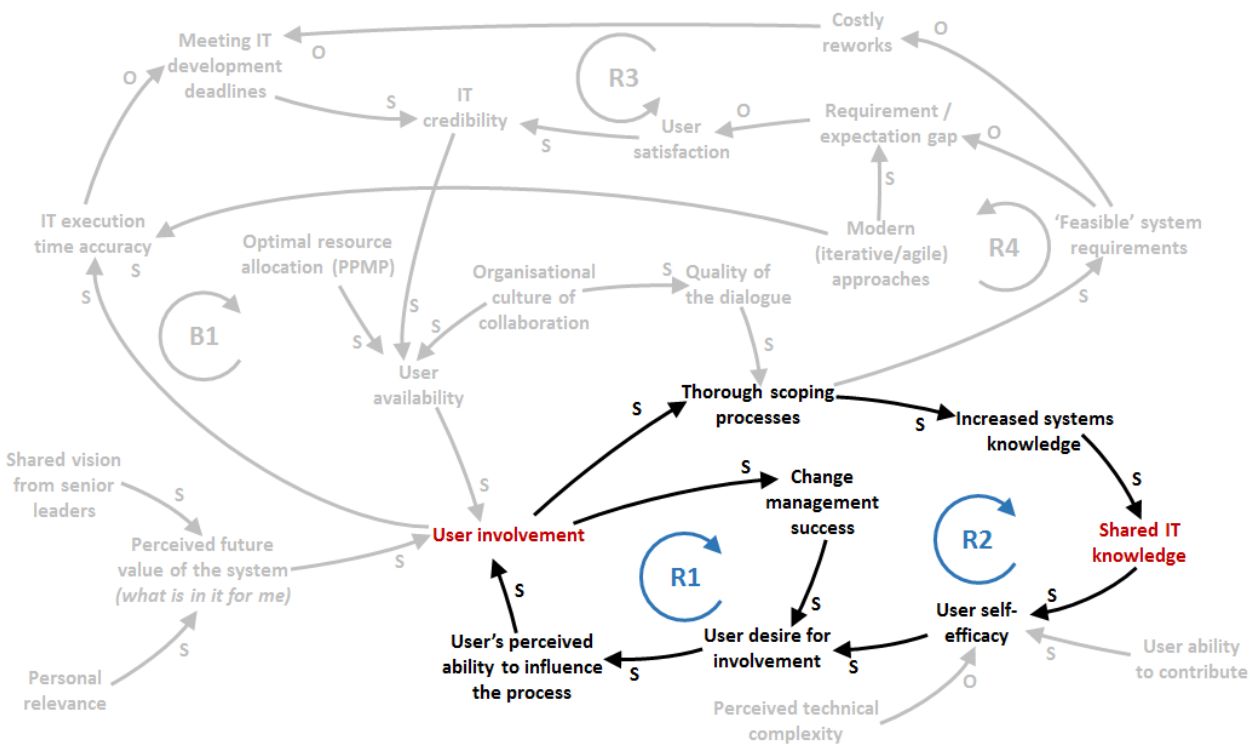

Figure 6.22: User involvement BITA CSF system and reinforcing feedback loops R1 and R2

Multiple interviewees commented on the willingness or not of users to contribute towards systems development in particular. Based on Figure 6.22, this is essentially based on two different factors. The first is change management, which if successful, will create a higher desire for the users to participate in the process. Interviewee 8 remarked that the "user can be very stagnant with an attitude of I will not be involved if IT does not involve me'".

The second important factor is the user's self-efficacy that is based on knowledge and self-perception of the ability to contribute to a system. As Interviewee 5 remarked: "most of the infrastructure of financial services institutions like [company name] is a spaghetti bowl of systems with many limitations and complex interdependencies". At times it is difficult for users to see that they can add value in this interconnected web of complexity. The self-efficacy is explained by Interviewee 11 who stated: "why should users contribute towards the planning of IT if they have no influence over the process? It becomes a tick box of having done it, with no inherent value."

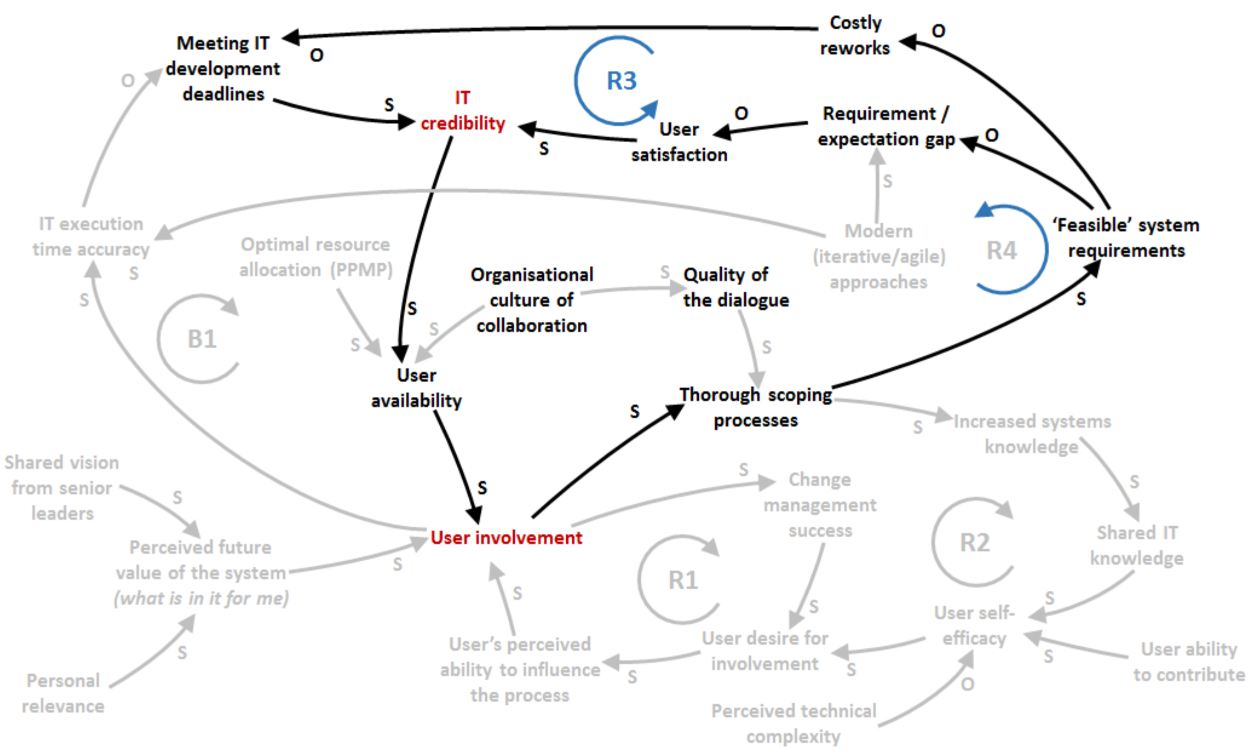

Figure 6.23: User involvement BITA CSF system and reinforcing feedback loops R1 and R2

Two other factors that do not form part of any of the feedback loops are evident. The first is the *Perceived future value of the system* (what is in it for me?*)* that governs if the user has an inherent desire to contribute due to some future value that may materialise from this involvement. The second factor is purely logistical in nature, namely *User availability*, but it can pose a problem. The biggest reason for the availability of users is that systems development often requires the users with the highest organisational opportunity cost. Interviewee 18 remarked that "… we are often not able to get the users we need and have to make do with second best – that is, assuming that we even know them well enough". These can be key or critical users who in many environments are already time constrained.

Figure 6.23 contains the two reinforcing feedback loops R3 and R4 that include the *IT credibility* variable. Reinforcing loop R3 deals specifically with the feasibility of requirements due to users' involvement, or lack of involvement, and the impact on rework with a negative influence on cost and timelines. It is clear that the quality of users' contributions will in principle limit cost and time overruns, specifically those associated with rework and have a positive effect on *IT credibility* together with all the associated benefits (see Section 6.6).

Reinforcing feedback loop R4 deals with the gap between requirements and expectations and the ultimate impact on user satisfaction. It is evident from the data that the scoping benefits from user involvement and the feasible requirements, that reduced the *Requirements / expectation gap,* ultimately lead to *User satisfaction.* This acceptance and approval of the systems by the users contribute towards *IT credibility* that is a key factor that supports *User involvement,* to complete the feedback loop. Within this loop sits the possible leverage *of Modern (Agile/Iterative) approaches* that is dealt with later.

Figure 6.24 contains the final balancing feedback loop B1 that deals with realistic timelines based on user involvement. Loop R3 dealt with the cost of rework and not necessarily cost overruns, although it is often reported as such. Loop B1 deals with timelines not due to rework, but merely the accuracy on the initial time estimates.

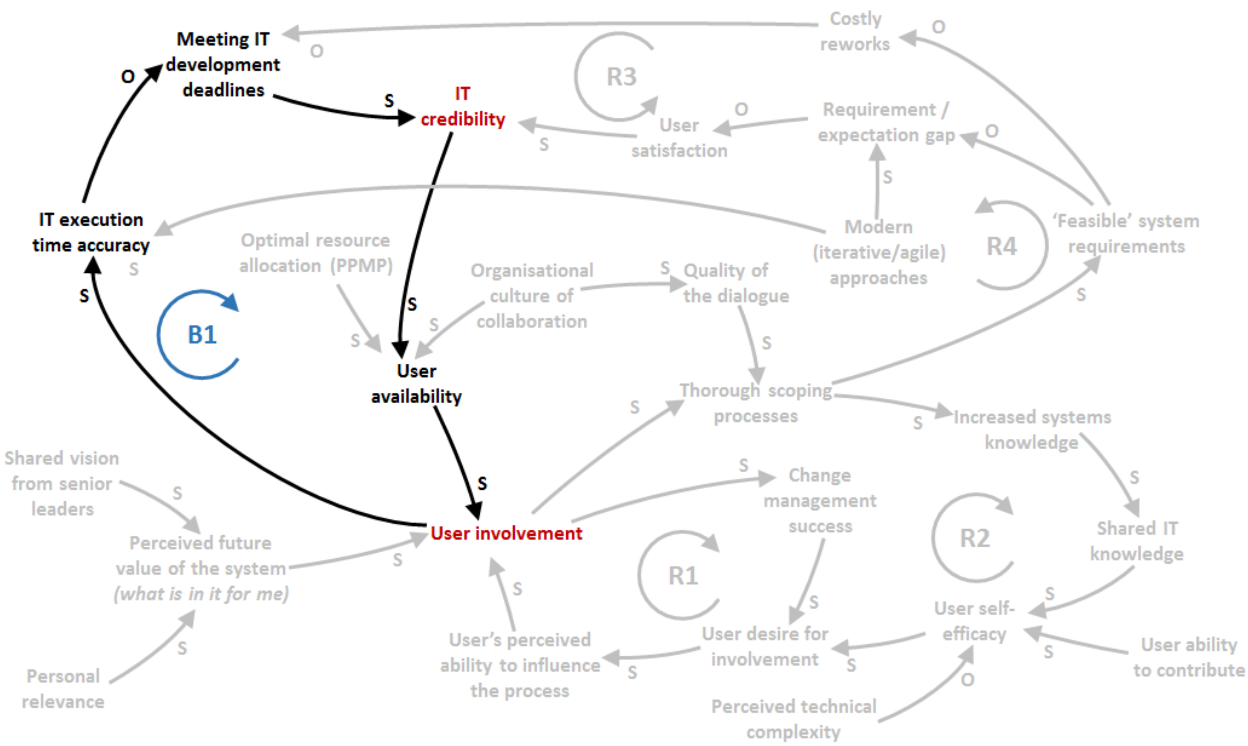

Figure 6.24: User involvement balancing feedback loop B1

It is evident from the data collected that timelines are potentially a more challenging aspect than cost for IT projects. Although cost overruns are mostly rework based and is equally undesirable, most IT costing diagrams for the organisations where the interviewees are employed either do internal development not directly costed to a project, or have fixed cost-oriented external service providers. The key challenge seems to be timelines, with Interviewee 14 remaking that, “[a]ccepting timelines from IT is like believing in the tooth fairy”. The general sentiment is that timelines are complex in projects with multiple interdependencies as well as dynamic resources assignments, not unlike the challenges concerning conflicting resource requirements for multiple concurrent initiatives described in Section 5.3.4

The leverage points for *User involvement* are evident from Figure 6.24 and seem to be centred around three different concepts. The first is that *IT credibility* leads to *User involvement*. All the arguments about *IT credibility* and leverage in the previous section hold true, to an extent, for the involvement of the users of systems as well. The second leverage sits around knowledge and user self-efficacy. Increasing the users’ knowledge about IT (see Section 6.2) will contribute to a belief that users are able to contribute towards the system that, when coupled with successful change management, will see an increased desire for involvement.

The final, yet important, leverage is the use of modern implementation and development methodologies. Although multiple agile and iterative systems development and deployment methods exist, they are grouped together as *Modern (iterative/agile) approaches*. This variable represents the collective movement to use methods other than the traditional sequential methods for quick feedback cycles.

6.8 SYNTHESIS

6.8.1 Generalised comments

Some interview responses did not relate to any of the particular BITA CSFs CLDs or variables within the diagrams, yet are important in addressing the research question. These comments were mostly made during the initial discussions about the principle of BITA, or towards the end when users were asked if they would like to make any general contributions about business and IT alignment, based on the conversation.

One important observation voiced clearly by Interviewee 13 is the different levels of alignment in the various sections of large organisations. “Different levels of business-IT alignment within [company name] are very evident based on how much tech is used in a particular department or service line.” This statement was echoed by other interviewees, who commented on the different levels of BITA maturity within numerous departments. Although important, it does not negate the value of the research that defines general actions for organisations not necessarily dependent on specific levels of BITA maturity. This observation is also aligned with the work of El-Mekawy and Rusu (2011), who investigated the impact of company culture on BITA and found different levels of BITA within the same organisation.

Another important observation is the transient nature of some of the value created by IT and the influence on alignment. “In some instances, cost savings realised in the short term by investments in IT have slowly been eroded and the cost base is nearly back at earlier levels. The [company name] need to operate on a low-cost basis, yet the IT systems that created this capability previously are no longer able to provide that” (Interviewee 11). The important argument here is the nature of competitive advantage that erodes away over a period of time. This strongly supports the literature (Gerow et al., 2015; Henderson & Venkatraman, 1999; Maes et al., 2000) that treated alignment as a process and not an end goal. It also relates to the concept of rigidity and the fact that alignment should not lock companies into certain technologies, but enable agility to evolve with the strategic intent.

One principle that was addressed within the Collaborative planning diagram (Figure 6.6) is well summarised by Interviewee 7, who stated: “… to succeed in business today, you don’t need a digital strategy; you need a business strategy… for the digital age”. This observation was echoed by several interviewees and to an extent encapsulates the essence of BITA shared in the multiple perspectives presented here. Just like technology, digital, IT or IS (all names used to describe the IT organisation and assets during the interviews) are interwoven with strategy, tactics and operations, the six different BITA CSFs are dependent on each other. Again, strong support for these views were evident in the academic literature with Preston and Karahanna (2009) suggesting an iterative co-evolution of strategy between business and IT, supported by Zhang et al. (2019), who referred to this as the business and IT coevolution process (BITC).

The final important comment made by some interviewees towards the end was that they felt there was a commonality between some of the BITA factors discussed. Interviewee 5 stated that, “it felt at times if we were discussing the same things, yet you started with a different question”. This concept is certainly supported by the level of commonality between the different diagrams that share different variables, and in certain instances, the key variable being modelled (see to Table 6.1).

6.8.2 Consolidation of the diagram

Due to the interdependency between all the different diagrams, it was decided to determine whether it was possible to combine the six different CLDs into one single diagram. During the academic discussions (see Section 3.4.7 and Section 6.9) all the academics expressed the opinion that it would be interesting to see a single diagram. Vermaak (2019) indicated that it would probably be of no value due to the complexity thereof. However, Maes (2019) commented that it may be possible to see key themes even clearer from a single diagram despite the increased complexity. Whelan (2019) supported this but was also sceptical about the potential value and stressed the importance of simplicity in a message when engaging with practitioners.

An element of consolidation is already evident in the diagrams. The inclusion of a BITA CSF (like *IT knowledge shared*) in a diagram for a different CSF (like Figure 6.6 for *Collaborative planning processes*) means that an element of consolidation or integration was obtained through a process that acknowledges the presence of other factors, in a particular diagram. This is the reason why *IT credibility* features so strongly in the leverage and research findings; it is common in multiple diagrams.

The different diagrams were first analysed to determine whether there is indeed commonality in variables between all the diagrams. Table 6.1 indicates the presence of the key variable from another BITA CSF in the diagram for the specific factor. It is evident from Table 6.1 that there is common links between the different diagrams at the level of the BITA CSFs. Further inspection revealed common variables between the different CLDs as well that led to a reduction in total variables in the final diagram. However, this resulted in an increased level of complexity due to multiple cause-and-effect relationships from multiple diagrams impacting on one common variable, one element of complexity acknowledged by Bureš (2017, p. 65).

Table 6.1: Interlinking between the different

BITA CSF	Shared knowledge	Collaborative planning processes	Executive commitment	Effective IT communication	IT credibility	User involvement
Shared knowledge		X	X			X
Collaborative planning processes						
Executive commitment						
Effective communication					X	
IT credibility	X			X		X
User involvement			X			

Although Vermaak (2016, p. 235) cautioned against diagrams with so much information that it obscures the underlying patterns, it was decided to create one consolidated diagram indicating all the relationships of the six different diagrams. However, following the methods of Bureš (2017) it would be possible to reduce the complexity again. Appendix L contains the consolidated diagram and it is clearly evident that the complexity indeed obscures patterns and feedback loops. The consolidation exercise turned out to satisfy the curiosity that Van den Hooff (2019) suggested would remain until it is attempted, but provided limited academic insight due to the complexity and challenge to find any feedback loops in a diagram with crossing links.

By looking at each diagram in isolation to find common variables it was discovered that the diagrams for the *IT Knowledge sharing* (Figure 6.1), *Collaborative planning processes* (Figure 6.6), *Executive commitment* (Figure 6.9) and *IT credibility* (Figure 6.17) sit at the same level of granularity. Multiple common variables are present in the diagrams for these four CSFs. The diagrams for *Effective communication* (Figure 6.14) and *User involvement* (Figure 6.21) presented a challenge since some variables were at different levels of granularity, when compared with the previous four diagrams.

The consolidated diagram quickly became rather complex and certain relationships became questionable, since one variable may be present in a particular format in some of the diagrams but in a different format in other diagrams. Variables used in the CLDs, as indeed for all CLD exercises, were not coded and uniquely documented as could be done for qualitative work, and was done in Chapters 4 and 5. This shows a potential limitation in the analysis due to variables using different terminology or levels of detail. However, this is only a limitation for the synthesis of the diagram into a single system dynamics model, and not for the analysis at CSF level.

Bureš (2017, p. 46-65) provided a novel method for reducing the complexity of large CLDs based on edogenisation, encapsulation and order-orientated reduction. His method focusses on an iterative approach using the three principles and focussing on multiple input variables. After just three iterations following this process, it became evident that the magnitude of multi-input variables leads to a very low level of reductionism and left a diagram at roughly the same level of complexity.

Although this consolidation effort is presented in Appendix L, it was not analysed due to the complexity, heeding the warning of Vermaak (2016) as well as the lack of accuracy described by Bureš (2017).

6.8.3 Contribution of PPM practices

Attention then turned towards the research proposition that suggested PPM practices could make a positive contribution towards business and IT alignment through their influence on the BITA CSFs.

It is evident from the six CLDs that PPM practices were present, if not always as a direct cause that influence other variables, as suggested via the research proposition. Table 6.2 provides the mapping of the different variables representing the PPM practices (see Table 5.11) that presented in the diagrams.

According to Table 6.2, all the PPM practices, with the exception of *Project portfolio ownership*, are indeed present in the BITA CSF diagrams. Upon inspection of this practice (see Table 5.8) it was established that it embodies the maturity of PPM as a practice in organisations and not necessarily the actions associated with PPM. It is thus to be expected that sub-practices associated with the maturity of PPM will not have an effect on BITA CSFs and should be expected to not be present in the diagrams.

Table 6.2 PPM practices mapped to BITA CSFs

BITA CSF PPM practices	Shared knowledge	Collaborative planning processes	Executive commitment	Effective IT communication	IT credibility	User involvement
Strategic alignment	X	X	X	X	X	
Portfolio optimisation		X	X		X	
Resource management	X	X		X	X	X
Project portfolio governance					X	
Project portfolio ownership						
Portfolio risk management	X			X		
Portfolio performance review		X	X			
Portfolio communication		X	X			
Integration management				X		

The mapping of the different practices did not always indicate a cause-and-effect relationship. In fact, many of the diagrams have the PPM practices on the periphery and not as part of a feedback loop indicating it may contribute towards, or inhibit, BITA. However, these PPM practices are sometimes part of the normal cause-and-effect relationships when looking at BITA from a system dynamics perspective could thus present leverage. It is thus important to analyse each diagram and specifically examine the presence of any PPM practices and its effect on the BITA CSFs from a system dynamics perspective.

Strategic alignment (presented by the variable *Degree of alignment*) was evident in five of the six CLDs. It is only the CLD for *User involvement* that did not contain the strategic alignment practice. In the *Shared knowledge* diagram (Figure 6.1) it forms part of reinforcing loop R1 that deals with business IT relationships, including the interest of management in IT and perceived IT value. In *Collaborative planning processes* (Figure 6.6), it forms part of a reinforcing loop (R1) and is the effect of accurate decision-making based on the levels of knowledge shared. When dealing with *Executive commitment* (Figure 6.9), it is again the result of accurate decision-making, once more based on knowledge sharing, this time being the cause of *Portfolio performance*. A somewhat unexpected appearance is in Figure 6.14 (*Effective IT communication*). Loop R3 provides credible evidence of increased insights in business and IT, influencing strategic planning and ultimately the *Degree of alignment*. The fifth and final appearance is in the *IT credibility* diagram (Figure 6.17) where it causes *Well-prioritised IT projects*. However, this is possibly the most important occurrence, since it indicates that this particular practice has a direct impact on the success of IT as well as the business value.

Portfolio optimisation (presented by the variable *Portfolio balance*) is present in three of the six diagrams. In *Collaborative planning processes* (Figure 6.6) it is merely the effect of two variables and has no direct influence on the diagram or any feedback loops. From an *Executive commitment* (Figure 6.9) perspective it is an important variable, located on four different feedback loops (R1, R2, R3a and R3b) and plays a role again in the demonstrated IT success and confidence, leading to the commitment of senior management. The presence in *IT credibility* (Figure 6.17) is merely the results (effect) of two other variables, which lead to portfolio balance. It is evident that this practice is present but not fundamental to BITA based on the diagrams.

Resource management (presented by the variable *Optimal resource allocation*) was evident in five of the six CLDs. In the *Shared knowledge* diagram (Figure 6.1) it has an impact on the effective deployment of IT staff that in turn influences IT delivery, IT systems, return on assets and ultimately, the perceived value of IT to the organisation. There is a delay present in this cause-and-effect relationship, but it is nonetheless possible to leverage resource allocation in principle. When dealing with *Collaborative planning processes* (Figure 6.6), it is a result of decision-making and has no impact on BITA. In *Effective IT communication* (Figure 6.14) it forms part of reinforcing feedback loop R1 that again deals with IT performance and ultimately credibility. The same relationship is evident in the *IT credibility* diagram (Figure 6.17) where the allocation of resources again influences the success of IT and business value. The fifth and final appearance is in the *User involvement* diagram (Figure 6.21) where it has a direct impact on the availability of the users to be involved in the IT processes. It is clear that, although some relationships contain delays, and others are via multiple intermediate variables, the PPM practice plays an important part in BITA.

Project portfolio governance (presented by the variable *Project portfolio governance*) was evident in only one the six CLDs. The appearance in the *IT credibility* diagram (Figure 6.17) is actually rather important since it has been identified as a potential leverage point in the diagram by influencing the types of projects that are prioritised, leading to trust in the IT governance processes that influences the BITA CSF modelled. This is an interesting observation since the number of occurrences is but one indicator of importance, where it occurs and the influence on the system, are equally of note. In the case of *Project portfolio governance*, the one occurrence is low, but the impact is moderate due to the positioning in the diagram.

Portfolio risk management (presented by the variable *Portfolio risk management*) was evident in two of the six CLDs. The presence of risk management in the *Shared knowledge* diagram (Figure 6.1) has an indirect effect on effective systems and ultimately on perceived IT value due to higher return on IT assets. The impact on *Effective IT communication (*Figure 6.14) deals with the IT intrinsic business risks and forms part of reinforcing feedback loop R1 that ultimately deals with effective communication. The presence in these two diagrams is not fundamental to either of the BITA CSFs being modelled.

Portfolio performance review (presented by the variable *Portfolio performance*) was evident in two of the six CLDs. In the *Collaborative planning processes* (Figure 6.6) the variable is the effect of business prioritising IT projects that sits in reinforcing loop R1, dealing with the business value from IT and the sharing of knowledge and trusted relationships. When dealing with *Executive commitment* (Figure 6.9), *Portfolio performance* forms part of three different reinforcing feedback loops (R2, R3a and R3b) and contributes to the demonstrated success of IT, building confidence in the capabilities that leads to *Executive commitment*. All three the loops have different factors impacting this performance that include *Strain in IT budgets* (R2), *Degree of alignment* (R3a) and *Accurate project prioritisation* (R3b). *Portfolio performance* clearly has an impact on BITA, but is equally affected by multiple other factors and not specifically a practice that could be manipulated in isolation to contribute towards either of the BITA CSFs.

Table 6.3: Support for the research proposition

PPM practice	PPM variable	Support for the research proposition
Strategic alignment	Degree of alignment	**Strong** support in five of the six diagrams and contribution to BITA CSFs through project prioritisation, leading to portfolio performance and business value from IT initiatives.
Portfolio optimisation	Portfolio balance	**Weak** support in three of the six diagrams, where in only one it forms part of a feedback loop and in the rest, it is merely a result of other variables.
Resource management	Optimal resource allocation	**Moderate** support, with the presence in five of the six diagrams and in three of the diagrams it has an indirect influence on multiple variables that ultimately influence the key BITA variable.
Project portfolio governance	Project portfolio governance	**Moderate** support as it is only present in one model, yet this presence is as a leverage point in the system. This BITA CSF is also central to many other CSFs.
Project portfolio ownership	Project portfolio ownership	**No** support, completely absent from all diagrams.
Portfolio risk management	Portfolio risk management	**Weak** support with a presence in two of the six diagrams, with no material effect in one and limited effect in the other.
Portfolio performance review	Portfolio performance	**Moderate** support with a presence in two of the six diagrams, embedded in reinforcing feedback loops that influence the BITA CSF together with multiple other variables.
Portfolio communication	Communication	**Weak** support with a presence in two of the six diagrams, although the one presence has no impact on the dynamics of the systems.
Integration management	Collaboration	**Weak** support with a presence in one of the six diagrams, although it is merely an effect of another variable and makes no contribution to the dynamics of the diagram.

Portfolio communication (presented by the variable *Communication*) was evident in two of the six CLDs. The diagram on *Collaborative planning processes* (Figure 6.6) indicates the impact that this has on effective communication channels and is one of three variables that affects *Collaborative planning processes* and does not form part of any reinforcing or balancing loop. In the *Executive commitment* diagram (Figure 6.9) it is only an effect of visible IT support and has no influence in the diagram and the dynamics of the system at all, confirming the relatively small impact that this practice has on BITA.

Integration management (presented by the variable *Collaboration*) was evident in only one of the six CLDs and that is *Effective IT communication* (Figure 6.14). Within this diagram it is also only a result of a culture of sharing knowledge that supports collaboration and thus has no effect on the rest of the system.

Table 6.3 summarises the contributions of the multiple PPM practices on the BITA CSFs as indicated in the preceding paragraphs, the primary research question of this research. It can be affirmed from the summary that of the nine PPM practices identified in Chapter 5, eight have an influence on BITA CSFs based on the system dynamics diagrams created. However, only one PPM practice has a strong influence on the BITA CSFs and another three PPM practices have a moderate influence. Four of the practices have a weak influence that will not significantly contribute towards alignment, or, are rather the results of alignment than the influencers of alignment.

In addition to strong evidence of PPM practices leading to BITA, very interesting leverage points have been defined in the different diagrams and are discussed next.

6.8.4 Leverage points

Section 2.6.5 dealt with the concept of leverage and the importance of leverage in system dynamics diagrams. Conant and Ashby (1970) argued that diagrams enable decision-makers to separate the irrelevant complexities of the real world in pursuit of directing efforts toward the most important parts of the analysed system. They introduced what came known as the Conant-Ashby theorem that indicates the “results of a management process are determined by the quality of the diagram on which that process is based” (Schwaninger, 2019, p. 16).

Both Senge (1997) and Sherwood (2011) argue that good diagrams is required to identify the correct leverage. Sherwood (2011, pp. 202 – 213) explains the concept of leverage and their impact on outcomes within CLDs. The outcomes to be influenced in the different CLDs are the variables presenting the BITA CSFs and the methods defined by Sherwood is used to identify the leverage points in the diagrams. This section identifies leverage points in line with the arguments made by Bureš and Racz (2016, p. 1082) who stressed the importance of find high-leverage interventions to improve a system’s performance.

In the diagram for ***Shared IT knowledge*** (Figure 6.1) the variable *Perceived IT value to the firm* is present in all of the loops R1, R2, R3 and R4 and is an important leverage point for organisations, since it could influence the reinforcing direction and action of all of the loops in the system. The best variable to manipulate here is *Impactful external coverage of IT success*. Although this leverage may seem counterintuitive, given its inability to influence the external coverage, it is justifiable to further explore the relationship by looking at the data. The narratives from the interviewees provided support that there is an opportunity to increase perceptions about the future value of IT, by accessing information about successful use of IT by other organisations. Based on the system structure, the sensitising of the executive management team for the potential contribution of IT to strategic intent is the most important leverage point to improve organisations' knowledge sharing.

Although the perceived value of IT to organisations is very strongly supported in academic literature (Chen et al., 2010; Coltman et al., 2015; Yeow et al., 2018), no support was found for impactful coverage of IT success outside the organisation or processes to share this information within organisations. Establishing these processes is a potential practitioner contribution of this research and a potential future research area.

The ***Collaborative planning*** (Figure 6.6) diagram has leverage in *Formalisation of strategic planning* that describes the joint or collaborative planning of IT and the business for both IT planning and business planning. This leverage is very well known in academic literature (Huang & Hu, 2007; Wong et al., 2012) and is well covered in Section 4.3.1. The research does thus not contribute by defining this leverage point, but it confirms the importance of formalised planning, as acknowledged by academic and practitioner (Poindexter, 2019) literature.

The leverage for ***Executive commitment*** (Figure 6.9) is multi-faceted and insightful, as highlighted by Figure 6.13. The first point of leverage, the *Seniority of the IT leaders*, is very well established in the academic literature (Huang & Hu, 2007; Scott, 2005; Tarafdar & Qrunfleh, 2009) and is confirmed in this research. The second factor is the *Innovativeness of the CIO* and although the sophistication of the IT organisation (Hussin, 2002) and flexibility to adapt (Jorfi et al., 2011) have been acknowledged in the literature, the innovativeness of the CIO in particular, does not feature strongly in the academic literature. This an important contribution of the research. The final leverage factor emerged very strongly in the interviews and that is the *Honesty and ownership of past failures*. This high-leverage point is not mentioned explicitly in the literature. It presents a strong contribution from this research, because it was confirmed in multiple diagrams as having a profound impact on the dynamics of BITA in organisations.

Although no particular leverage point was evident in the ***Effective IT communication*** (Figure 6.14) diagram it was established that this BITA CSF is strongly dependent on *IT credibility*. Striving for higher levels of credibility of the IT function within organisations, will have a positive influence on the communication as well. Improved communication was shown to then impact on multiple factors due to improved knowledge sharing and more accurate decision-making at both the operational and strategic levels. *Effective IT communication* thus remains a very important BITA CSF despite a lack of leverage from the CLD created.

Although Figure 6.17 provides the CLD for ***IT credibility,*** it is really in Figure 6.20 where the multiple leverage points are highlighted. The first leverage is *Project portfolio governance* that leads to a higher degree of trust in IT governance. Although literature on PPM governance does not explicitly link this to IT governance, the implied cause-and-effect relationship is to be expected and not a new contribution of this research, *per se*. The variable of *IT risk management* that will also impact *Trust in IT governance* is again rather intuitive and well covered in the academic literature. The interesting leverage points are those of *Ownership of past failure* and *Resolving past failure* that related to but also supported the notion of *Honesty and ownership of past failures* identified in *Executive commitment*. The combination of resolving failure and ownership of such failure is not explicitly acknowledged in the BITA literature based on the selected articles, yet features prominently in the data and is thus an important contribution of the system dynamics perspective on BITA.

The ***User involvement*** CLD presented in Figure 6.21 has an important leverage point of *Modern (Agile/Iterative) approaches*. Care should be taken to state that this leverage point is not well covered in the academic literature. It could also be due to the sampling method followed that may have prioritised older and well-known CSFs at the expenses of more modern and contemporary factors. This is a point that was also made by Clumps (2019) during the academic discussions (see Section 6.9). A second important observation is that *IT credibility* leads to *User involvement* and thus all the leverage about *IT credibility* also holds true for *User involvement*. The final leverage is the impact of IT knowledge on the *User self-efficacy*. The concept of self-efficacy is well explored in the IT security domain as a driver of human behaviour. However, it was not mentioned once in the selection of BITA articles in Chapter 5, neither in the literature review in Chapter 2, making it a final important contribution of this research.

Following the analysis of the CLDs for insights, a set of discussions were held with prominent academics to discuss the methods, rigour, insight and contributions of the diagrams to the body of knowledge (for both academia and practice).

6.9 ACADEMIC PERSPECTIVE

The discussions with the academic experts (see Section 3.4.7 and Appendix K) yielded the following thought-provoking insights on the scientific process, the academic merit, as well as the value of the research to practitioners in the current format.

The six academics were unanimous in their view that the diagrams are too complex and detailed to be of any value for practitioners in the format presented in this research. They stressed the importance of simplifying the diagrams into a format that practitioners could very quickly read and internalise in order to create value. It is also clear that this simplification does not represent a single complex merged diagram as attempted in the previous section.

Maes (2019) and Van den Hooff (2019) both suggested a short narrative description of the key learnings from each diagram to be shared with the practitioners. Clumps (2019) suggested a three-to four-point summary of the practical results of the research from all the diagrams, not per model. Vermaak (2019), the CLD expert in the group, suggested redrawing the diagrams to make the loops more explicit and evident for the reader, but also to make it easier to analyse. Based on the recommendation of Vermaak, the loops were made explicit from the rest of the diagrams as presented in this chapter. The recommendations by the academic experts lead to a brief narrative extraction of the value of the research that was included in the interviews with the practitioners.

Without exception, the academics remarked that the diagrams provide a fresh perspective on BITA, both from a practice and academic perspective. They commented on the dynamic nature of the diagrams and believe that new perspectives, given the mostly static take on BITA to date, always bring new insights. El Quammah (2019) was particularly impressed and suggested that a particularly interesting research avenue has been opened up for BITA that should be further explored. He sees significant value in the system dynamics methods followed since they are substantially different from methods used to date.

In terms of the academic rigour, the answers provided strong support for the methods, with warnings about how these are to be documented. All the academics mentioned the immense value stemming from taking a dynamic perspective and using system dynamics diagrams. However, they warned that the key challenge would be how well this process is documented. More than one expert mentioned the onus on the qualitative researcher to ensure that the research process and creation of the diagrams were rigorously documented. They stressed that qualitative research methods, as compared to quantitative methods, place an onus on the researcher to ensure that there is sufficient evidence in the research methods to strongly support the end results. Based on these inputs, Figures 3.5 and 3.6 were added to the methods and sections of Chapter 3 were substantially updated to reflect the details of the process followed.

The academics all suggested a merged model, with Van den Hooff (2019) suggesting that the research would not feel complete without such an amalgamated model, despite the interest that may, or may not, emerge from such a model. The diagrams were merged (see Appendix L) and the methods of Bureš (2017) were followed to attempt a consolidation, without success. Although no insight on the research proposition emerged from the consolidated model, some perspectives on the different levels of granularity of the diagrams (although the same process was followed) led to suggested future research (see Section 7.5.2).

In terms of limitations evident in the diagrams (apart from the complexity for the practitioner), the only comment was from Clumps (2019), who commented on the lack of centrality of modern iterative approaches when dealing with business and IT alignment. Working extensively in the financial services industry (be that in Europe), he believes that from personal experience it seems more central to alignment than what may be indicated in the diagrams. It could be that the BITA CSFs extracted from traditional literature do not yet sufficiently acknowledge these methods. By not including that explicitly in any questions or diagrams could have limited the research. However, it did emerge as contributing factors on the *IT credibility* diagram (Figure 6.17) as well as the *User involvement* diagram (Figure 6.21).

Maes (2019) made an interesting final observation that there seems to be a golden thread through all the different diagrams, namely, the human factors. He commented that, although the entry point for each diagram is different, in the end many of the loops and variables dealt with the human element of alignment. On inspection this was certainly confirmed and supports that the leverages identified in the research is dealing with the human element, be it from executive to operational level in the organisation.

The final comments from El Quammah (2019), Maes (2019) and Whelan (2019) and were extremely encouraging. They all commented on the fresh perspective of using system dynamics in IT research and in BITA in particular. Although they acknowledged that they have not had time to work through the details of the diagrams presented (this was not the objective of the discussions), they did have a very positive view on the potential value of the methods (system dynamics) within the academic discipline (information technology).

This chapter dealt with research questions 3 and 4 and depicted the systems diagrams for the different BITA CSFs. They were analysed to identify leverage and deeper levels of insight based on the methods chosen. The next chapter provides a set of recommendations based on the results presented in this chapter and also argues the contribution of the research.

CHAPTER 7

CONCLUSION, RECOMMENDATIONS AND FUTURE RESEARCH

7.1 BITA IN THE CONTEXT OF IT VALUE RESEARCH

Organisations continue to make significant investments in information technology (IT). The potential of IT as a transformational force of business strategy, enabler of digital capabilities to create customer value and operational efficiencies, is well established. Substantial empirical evidence, confirming the impact of IT on organisational performance, has been presented in academia. However, investment in IT assets and capabilities alone does not lead to improved organisational outcomes (see arguments in Sections 1.2.1, 1.2.2 and 1.2.3).

The acquisition of IT has extended ramifications for the modern enterprise. It introduces complexity into the business processes and requires meticulous management to ensure the adaption and utilisation of IT systems to gain value. This value, called IT value in the literature although it is the business value from IT deployment, is highly dependent on the extent of the IT systems' use. The value gained is also transient in nature as it may erode over time and require new investments and ongoing incremental improvements (See Chapter 2 and in particular Section 2.5.10).

The challenge for organisations in a digitised business environment with global competition and online markets is twofold. They need to defend traditional markets from new competitors and products with increasingly-digitised value propositions. However, they also have new opportunities to extend their own value propositions and delivery channels leading to new operating models that could also provide a competitive advantage. In the practitioner literature, these challenges and opportunities are known as the digital transformation and it is one of the dominating themes in practitioner journals.

Research on IT value has been an active field for nearly five decades as evidenced in the introduction of this research. Academia firstly focussed on finding empirical evidence of the value from IT, followed by defining the conditions that lead to value in the face on conflicting information as different authors both questioned and confirmed value from IT. Within the broader area of IT value, a research theme business and IT alignment (BITA) emerged that has attracted academic interest for more than three decades. The basic premise of BITA is that organisations are able to obtain benefits from IT and reinforce their competitiveness and improve performance only if IT and business strategies are aligned (see Sections 2.2 and 2.3).

For more than 30 years, research has consistently indicated that enterprise-level BITA is a pervasive problem. There are multiple challenges evident within the BITA literature, including the absence of a universal definition (addressed in Chapter 4) as well as multiple models that are not necessarily complementary and always static in their presentation of the dynamic complexity that is BITA.

Several authors (Amarilli et al., 2016; Chan 2007; Coughlan et al., 2005; Gerow et al., 2014; Luftman & Kempaiah, 2007; Maes et al., 2000; Preston & Karahanna, 2009; Tallon, 2003) have commented that the multiple definitions of alignment were mostly ambiguous, focussed on specific aspects of alignment, did not deal with the dynamic nature of BITA and lacked operational tools for implementation by practitioners.

It has been argued that, although strategic alignment leads to enhanced organisational outcomes, it can also create rigidity traps that pose complications for organisational agility, particularly in fast-paced industries where the execution of strategic intent can change rapidly. Researchers provided arguments for BITA both enhancing organisational agility as well as impeding it, and referred to it as the alignment paradox. Accordingly, increased BITA will ensure value to the organisation only if it does not impede the ability to react to sudden business changes, a common occurrence in modern enterprises (see Section 2.4.3).

The field of strategic management has moved from the *market-based view* and *resource-based view*, towards a *knowledge-based view* and a *relational view* that values different capabilities. This led to the notion of *dynamic capabilities* to complement strategic capabilities and an acknowledgement that it is effectively impossible to pre-define all capabilities required to achieve strategic intent. McGrath (2013) argued, given how the current business environment evolved (*inter alia* due to the impact of IT), that opportunities for leveraging competitive advantage are transient in nature. In her opinion, this requires a new perspective on formulating strategic intent, and she formulated a strategic view called *transient advantage*. This particular view embraces dynamic complexity as part of the decision-making processes and advocates for a continuous or dynamic process of strategy formulation.

Zhang et al. (2019) maintained that the co-evolution between the IT strategy and business strategy, where both strategies develop iteratively and reciprocally over time, is paramount to BITA success. This co-evolution suggests a dynamic process, although alignment may still be viewed as an outcome state at a given point in time, in similar vein as suggested by McGrath (2013). Thus, the organisational processes that influence alignment should reflect the dynamic interplay between the IT strategies and business strategies implied in co-evolution.

Even companies that have processes in place to perform appropriate IT and business planning are likely to encounter some formidable obstacles in their digital transformation as argued in Chapter 2 and Chapter 4. The first challenge is the magnitude of technologies required to correctly transform an organisation. The second challenge is the rate at which the large set of technologies is changing. A third challenge is redesigning business processes to capture the business value of newly-implemented IT. A final obstacle is the enablement and motivation of the workforce to fully utilise the newly-deployed technologies to gain the intended benefits.

The challenge to achieve BITA is significant for practitioners. BITA has consistently been ranked high on a list of top management concerns. Achieving and maintaining alignment remains extremely important for organisations as IT continues to change the way they operate. Advanced IT is indispensable to modern enterprises and senior management recognises the magnitude of the task. However, some technology transformations do not deliver the expected results simply because leaders have a difficult time in creating coherent strategies that seamlessly integrate their digital priorities with other major business objectives. In addition, the challenge is at times incorrectly framed as only IT having to adapt to business needs. This is not the entire picture, since there is also an important obligation on the business to use the IT resources and process capabilities that have been provided by the ITO.

Over the last decade, in the project management practice and literature, the challenge of managing an active portfolio of changing projects in organisations has led to the emergence of a new field of study in project portfolio management (PPM). The principles of PPM, although not about IT projects, are similar to those of BITA, as they deal with dynamic complexity. As an emergent area of research, the practices that define PPM is not well established and needed to be defined for this research. The collection of practices that define PPM is presented in Chapter 5.

Based on the contribution of PPM in the implementation of strategy, a set of research questions were formulated to investigate if certain practices from the project management domain could assist organisations with their BITA. These project portfolio management practices (see Chapter 5) deal with the dynamic complexity of an organisation's portfolio of projects that need to align to the strategic intent, whilst consuming multiple constraint resources and having a degree of interdependency on multiple levels between different projects. In addition, insights about dealing with dynamic complexity were also investigated through the use of qualitative system dynamics as a method to present the qualitative data obtained in the research as indicated in Chapter 6.

7.2 RESEARCH QUESTIONS

Based on the research question of determining the contribution of PPM practices towards BITA via their influence on the known BITA critical success factors (CSFs), a research design and set of research questions were developed iteratively.

The first problem encountered in the research was a lack of uniformly-accepted BITA CSFs and this led to the formulation of the first research question that was addressed in Chapter 4. The next problem identified was finding practices that represent the collective actions of PPM and this led to the formulation of research question two that was answered in Chapter 5. The pragmatic nature of the research dictated that the dynamic nature of BITA should be acknowledged leading to the third research question that dealt with this dynamic complexity as depicted in Chapter 6. The fourth and final research question dealt with the insights that could potentially be gained from analysis of the diagrams by using the principles embedded in the modelling techniques selected.

Table 7.1 contains the four research questions and techniques described in detail in Chapter 3 that were used to answers these questions. Also indicated is the chapter in the document where the results of the methods associated with each research question are presented.

Table 7.1: Research questions

Id	Question	Technique	Presented
RQ1	What are the critical success factors that contribute towards business and IT alignment according to the academic literature?	Systematic review	Chapter 4
RQ2	What collection of practices defines PPM, according to academic and practitioner literature?	Systematic review	Chapter 5
RQ3	What are the dynamic relationships between the PPM practices and business and IT alignment CSFs?	In-depth interviews and CLDs	Chapter 6
RQ4	What systems archetypes and leverages are prevalent within the qualitative system dynamics diagrams that depict the PPM practice and BITA CSF relationships?	Analysis of CLDs to identify and describe systems archetypes and leverage	Chapter 6

The research led to the construction of a set of qualitative system dynamics diagrams. The insight gained from these diagrams will assist practitioners to improve alignment of their strategic intent with efforts and investments in IT, whilst embracing the dynamic nature of BITA. That is, the actions are not intended to improve alignment at a certain instance in time, but rather deal with the systemic effects of alignment to ensure sustainability in the alignment efforts.

Beyond the practitioner insight, evidence is also presented about the potential value from the methods used for future IT research. The methods revealed interesting new trends and potential contributions to BITA. In addition to highlighting new relationships to explore, it also suggested new methods to explore these relationships that found support from prominent IT researchers.

The relationships between practices, both from the IT literature and PPM literature, confirmed certain known success factors, did not find evidence of others and also, identified new factors to be explored. It is suggested that future research is conducted to explore, validate and describe some of the uncovered relationships.

The contribution of the research, based on the answers to the research questions, is provided in Section 7.3 as well as the recommendations in Section 7.4. Limitations of the research and recommendations for future research are presented in Section 7.5.

7.3 RESEARCH CONTRIBUTION

7.3.1 Making a research contribution

Janes (2001, p. 193) remarked that researchers will rarely indicate that they have proven anything. It is more probable that they will provide strong evidence to indicate that something is possible, and this is indeed the case for this research, where evidence of known and new relationships was found during interviews and systematic reviews and was discussed within context.

Bacharach (1989, p. 496) stressed the significance of theory to reduce the complexity of systems and the importance of theoretical statements to organise appropriately and communicate clearly. Importantly, Bacharach (1989, p. 498) highlighted the importance of a theoretical contribution to address the how, when and why questions, instead of merely dealing with what was observed.

Another argument from Bacharach (1989, p. 501) is the utility of the theory presented. He argued that useful theories can explain observed phenomena and also predict the behaviour of a system for given disturbances. Bacharach (1989, p. 501) warned against “incomplete theoretical systems” that make certain predictions yet lack the ability to explain why these predictions are made. The utility is thus based on practical application as much as it is based on the rigour of the scientific process to ensure claims and observations made can be substantiated.

Corley and Giora (2011, p. 12) supported Bacharach and argued that a theoretical contribution includes both concepts and relationships, but importantly, also why a particular phenomenon occurs. They stressed the value in developing theory that extends beyond the academy and argued that there is a bigger potential to influence organisations and societies if theory is developed with the practical application in mind. The contribution of this research is for both academia as well as for practitioners and is argued using the structure of Table 7.2.

Table 7.2: Elements of a theoretical contribution of research

Element contribution	Description
What (descriptive)	Which factors logically should be considered as part of the explanation of the social phenomena of interest?
How (descriptive)	How are the factors related to conceptualise the explicitly delineating patterns?
Why (explanatory)	What are the underlying dynamics that justify the factors selected as well as the relationships?
Who, where, when (limitations)	The conditions deal with the limitations of the research contribution based on contextual factors that set the boundaries of generalisation

Source: Adapted from Whetten (1989, pp. 490-492).

According to Whetton (1989, pp. 490-492), research needs four essential elements to contribute as a complete theory. The four elements are listed and described in Table 7.2 and again the importance to explain *why* finds strong support. Whetton (1989, p. 492) added the importance of acknowledging the limitations of the research based on who provided the data, as well as where and when it was done. He stressed the importance of the boundary conditions to ensure that limitations of the research are properly acknowledged.

Management scholars have emphasised that a theoretical contribution cannot be claimed unless an author ventures into why certain observations have been made, are deemed to be correct, or even why a certain set of behaviours are expected. They also argued for clarity in any contribution made as well as an acknowledgement of the inherent limitations based on multiple factors, including the methodological choices made within the research design.

The CLDs developed in this research are not the definitive representation of the contribution of PPM practices towards the value of IT in the business environment. Taking cognisance of Lane's warning, proof of any relationships is not claimed. None the less, interesting relationships inherent in the design that use qualitative system dynamics to document the in-depth interviews of a small, yet rich sample of interviewees and interview data was observed, and this evidence is presented, in some cases to be further explored.

As a graphical representation of complex dynamic relationships strongly rooted in two active areas of research, the diagrams present a new perspective on BITA. The diagrams embrace dynamic complexity and indicate the potential contribution of practices from another field of study and most certainly deal with ***why*** certain success factors influence BITA and even more importantly, predict how these factors could be manipulated via points of leverage on the system dynamics diagrams.

The diagrams provide explanations of certain cause-and-effect relationships and venture into ***why*** certain sets of behaviours, both desirable and undesirable, are observed. The nature of system dynamics certainly supports the importance of the why question emphasised by management scholars. The research is definitely also practical as is evidenced from the recommendations that follow not only for academics to extend research, but also for practitioners to directly apply certain recommendations to improve the value gained from investments in technology. The diagrams could certainly encourage both practitioners and researchers to further refine them via research in this cross-section between IT, project management and strategic management.

The limitations of the research, emphasised by Whetten (1989, p. 492), are covered in detail in Section 7.5.1.

7.3.2 Contribution of the research

This research contributes to the theory on BITA by providing a set of qualitative system dynamics diagrams that defines the relationship between emergent PPM practices and the required factors (the CSFs) to address the ongoing BITA challenge from multiple perspectives. It explains why certain behaviours are persistent and also provides suggestions of actions to be taken to improve the alignment through the manipulation of variables that have been proven by prior research to contribute towards BITA.

Although the research problem, a lack of insight on how PPM practices impact on BITA, is not explicitly indicated in the literature, it is the nature of inductive research to work bottom-up from observations and patterns towards a new potential theory. Sufficient evidence is provided in Chapter 6 to support: (i) the dynamic complexity of BITA; (ii) the contribution of PPM practices in dealing with dynamic complexity; and (iii) the value of CLDs in modelling dynamic complexity to find new points of leverage to improve BITA. The insights gained are also split between confirming and supporting existing knowledge that has been well established and has provided a first level of evidence about unexplored mechanisms to improve business and IT alignment.

The method selected to document the dynamic relationship, causal loop diagrams (CLDs), is not widely used in IT research. The method is not unique *per se*, but the use of multiple CLDs to explore the complexity of different systemic effects of BITA CSFs was not found in any existing research. Although no methodological contribution is claimed, it was confirmed by multiple academics (see Section 6.9) that the approach used is novel and provides for an interesting research trajectory.

CLDs is an appropriate method to document dynamic relationships in complex social systems. It is especially the ability of CLDs to highlight systemic problems when dealing with complex socially-constructed phenomena that is applicable in this research. Franco et al. (2018, p. 59) indicated a growing interest in modelling the complexities involved in IT for evaluating long-term impacts, especially the dynamic dimension. They asserted that the system dynamics approach has been used in the scientific literature to model complexity in IT projects. Fang et al. (2018) strongly supported using the methods from system dynamics for IT research due to its potential contribution.

Vermaak (2011, p. 10) contended that CLDs do not represent *a single* intervention but rather refer to an umbrella term covering widely-contrasting interventions. He believes the toolkit (CLD) might be the same, but the goals for which they are used, the way the processes are designed, the types of people who are involved, and the way interaction plays a role, all differ. CLDs can be used to construct a more comprehensive picture of a situation based on various perspectives.

Connecting individual views or explanations can lead to multiple descriptions of the same phenomenon and the ability to identify emerging patterns to create rich new insights. The methods followed certainly led to new insights beyond the initial research questions. Not only was there evidence of PPM practices (see Table 6.3 and Section 6.8.3 for a detailed discussion) but also new high-leverage points to improve key BITA success factors (see Section 6.8.4 for a detailed discussion). A summary of the insights gained from the application of system dynamics is provided with the research recommendations in Section 7.5.2.

It was also evident that CLDs, as a modelling technique, imposed limitations during the execution of the research and two challenges were very evident. The first challenge dealt with the strength of the relationships documented. In the creation of CLDs, links are made when relationships exist and there is no notation to indicate when a specific relationship is stronger than another. For this research, a decision was made to include a relationship when it is confirmed by three separate interviews (see Figure 3.5). However, certain relationships were significantly stronger than other relationships and this is not evident from the diagrams. This limitation is inherent to CLDs but has an impact on the insights from the research.

The second limitation is the different levels of granularity in different diagrams. Interestingly enough, that was not evident prior to the attempt to consolidate the diagrams into a single diagram. Once consolidation was attempted, the different levels of detail became evident. It may be necessary to introduce additional mechanisms of standardisation not done in research if different diagrams are created with the explicit goal of integrating them at a later stage.

In terms of practice contribution**,** the research confirms the value of some current practices. It also identified a small number of additional practices not prominent in academic or practitioner literature, which should be applied by practitioners, or at the very least be subjected to further research, to determine the value of these practices. Each of these are presented as a recommendation in Section 7.4.

The pragmatic research approach (see Section 3.4.5) mandates a contribution to practice from the research and it is indeed in this dimension that a contribution is made. The leverage points in Section 6.8.4 provides practical guidance on several additional actions to be considered by IT practitioners when striving for alignment.

The rigidity paradox and dynamic nature of BITA were acknowledged in the identification of the leverage points from the systems diagrams. The nature of the suggested actions should not contribute towards the rigidity trap since the recommendations are not focussed on short-term value, but rather on high-leverage points with long-term effects on the qualitative system dynamics diagrams representing the BITA CSFs.

The research question led to a design that investigated how PPM practices, from a system dynamics perspective, could act as leverage to improve the BITA. The value of the following PPM practices was confirmed in Section 6.8 (see the summary in Table 6.3):

- **Strategic alignment** has a direct impact on many BITA CSFs and is the only practice strongly supporting the research hypothesis.
- **Project portfolio optimisation** could make a small contribution to BITA via multiple CSFs.

- **Resource management** could make a moderate contribution towards BITA via multiple CSFs.
- **Project portfolio governance** could have a positive impact on IT credibility and in turn influence BITA via the CSF.
- **Project portfolio risk management** could have a very limited impact on BITA via two different CSFs.
- **Project portfolio review** provides moderate support for BITA via the collaborative planning and executive commitment CSFs.
- **Portfolio communication** could have a very small impact on BITA, although it is evident in the effective IT communication CSF**.**
- **Integration management** could make a very small contribution to BITA via the effective IT communication CSF.

The detailed actions for each of the above practices are presented in Chapter 5. The practitioner who strives for value from PPM, will be guided by the set of actions assocated with each practice. The impact of the practices on alignment are presented in Chapter 6. The researcher who strives to extend the research or gain insighst from the research to compare and validate with existing work and models, is best served by reviewing the arguments made in Chapter 6.

Multiple general management and IT practices already exist that contribute towards alignment of IT with strategic intent as covered in Chapter 5. While creating the diagrams, some of these practices emerged during the modelling process. Although it was not the focus of the interviews, some practices received strong support as points of leverage to improve the entire system.

Several general business management or IT management practices were confirmed in the research as high-leverage points that should be emphasised by practitioners:

- Any and all practices leading to the **credibility of the IT function** and the IT organisation should strongly be supported and encouraged. These actions are mostly well documented in the academic literature.
- **IT risk management** will significantly impact the trust in IT governance and have a positive impact on BITA. The value of IT risk management is evident in the academic literature but not necessarily the positive net effect on IT governance and by implication the broad impact on BITA beyond addressing risk.
- **Modern (Agile/Iterative) approaches** contribute not only to accurate timelines and more realistic expectations from users with a higher degree of accuracy in requirements; they also play a role in change management by being more user intrinsic. These modern approaches are evident in some of the latest research and are starting to be acknowledged in the BITA academic literature.

These three practices, or rather practice groups, are not necessarily a contribution to practitioners since they have been identified in the academic literature to date.

Several new practices emerged from the research. Although these fall outside the research demarcation, since they are not from the PPM practices identified in Chapter 5, they are the result of the methods used and are therefore included in the research contribution. The following practices emerged from the research for consideration by IT practitioners:

- The concept of **impactful coverage of IT success** outside the firm, and establishing processes to share this information, is important leverage for BITA by impacting directly and indirectly on three different BITA CSFs.
- **Increased IT knowledge of users** was acknowledged as important in the literature, but not the impact thereof on user self-efficacy leading to higher levels of quality of user involvement and BITA. Literature often deals with the obligation of IT to know the business, but from a SD perspective, IT knowledge from the business users may be more important. This warrants special attention in organisations to enable better business and IT alignment.
- The **innovativeness of the CIO** is a strong contributor to BITA. Actions to be considered by practitioners could be hiring processes that ensure high levels of intrinsic innovativeness and as well as support for any procsses that allow current CIOs to be more innovative or build their personal capacity in this area.
- **Ownership of past failures** is potentially the strongest contribution of the research to practitioners. This factor was strongly supported by the data but also manifests strongly in two of the diagrams as a potential point of leverage. It is imperative for IT leaders to not forget their responsibilities when things go wrong, as it invariably does in IT, but to see this as an opportunity to create a higher level of executive commitment and IT credibility, as counter-intuitive as that may seem.

The recommendations from these insights for practitioners are listed in the next section together with academic and metholodogical recommendations.

7.4 RECOMMENDATIONS

7.4.1 Academic recommendations

Business and IT alignment is an important and much needed field of study as it enables insights about the degree of business and ITO congruence (measurements) as well as how improvements in alignment (sets of actions) can lead to better-performing organisations. Using qualitative system dynamics as a lens to investigate the dynamic complexity of BITA provided new insights and directions for research in this field.

> **Recommendation 1:** Researchers should consider using methods that embrace dynamic complexity in BITA research and using CLDs is recommended due to an original perspective provided.

Four new potential areas of research emerged from the research. Future empirical research to confirm the impact, or not, of each of these items is highly recommended.

> **Recommendation 2:** Researchers should perform empirical work to determine the contribution of: (i) the impactful external coverage of IT; (ii) the impact of IT knowledge on user self-efficacy; (iii) the innovativeness of the CIO; and (iv) ownership of past failure on the respective BITA CSFs as indicated in this research.

Although only two recommendations are made for academics, embedded in each is significant scope for future work. Methodogical recommendations (Recommendation 1) implies an entire stream of research and strongly supports the current discourse presented about new methods. This recommendation does not limit the research to qualitative system dynamics models, there is certainly room for extending the qualitative models to include simulations and behaviour of time of the endogenous variables in the diagrams in this research.

Recommendation 2 suggests four new fields of research to gain insight newly-observed relationships not well covered in IT literature. Similarly, each of these areas represent significant future work in interesting new IT research domains.

7.4.2 Methodological recommendations

Using CLDs to investigate dynamic complexity is recommended. It is both an appropriate method of research and provides rich insights. The research confirmed that substantial value can be derived from careful analysis of CLDs despite the absence of archetypes. The levels of complexity in the consolidated CLD (Appendix L) meant that no value was provided by the combined model. Further work on consolidating and simplifying CLDs is required.

> **Recommendation 3:** Researchers and practitioners using CLDs should search for insights from these diagrams beyond those provided by archetypes only.

> **Recommendation 4:** When creating multiple CLDs with a potential future amalgamation of the diagrams in mind, additional methods should be devised to work towards consistency in the granularity of the variables used.

> **Recommendation 5:** Qualittaive CLD notation could gain from a ‘strength indicator’ when certain cause-and-effect relationships are stronger than others. Although this seems to increase diagram complexity, it could be seen as the inverse of the delay indicator, as a kind of expedite indicator.

7.4.3 Practitioner recommendations

Although a significant number of BITA models are available, the most appropriate set of actions remains elusive. This research does not necessarily address the elusive nature of these actions. However, it provides: (i) support for the limited number of known and established practices; (ii) some support for practices present in the PPM domain that are worth exploring; and (iii) support for a small number of practices that could make a real contribution towards BITA for the practitioner. The following practitioner recommendations are made:

> **Recommendation 6:** Several project portfolio management practices can contribute towards business and IT alignment and should be explored and exploited for their contribution by organisations aiming for stronger alignment (see Section 6.8.3 for details).

> **Recommendation 7:** Some existing practices in the BITA literature contribute towards alignment and practitioners should familiarise themselves with the academic discourse and models suggested to improve BITA.

> **Recommendation 8:** Any practices to increase the awareness and consumption of IT success external to the organisation by non-IT leaders should be encouraged. It is suggested that mechanisms to create awareness of the successful transformation of organisations via IT are developed.

> **Recommendation 9:** Actions to increase the IT knowledge of potential systems users, especially those involved in systems development and deployment, will positively impact their self-efficacy. These actions should be encouraged, and where currently absent, developed.

> **Recommendation 10:** When appointing new CIOs, or IT leaders, the skillset associated with innovativeness should form an important part of the selection criteria. For incumbent IT leaders and CIOs, processes to support the development of these skills should be established.

> **Recommendation 11:** When appointing new CIOs, or IT leaders, questions on ownership of previous IT failures and resolution thereof are probably as important, if not more important, than questions about prior IT successes. For current IT leadership, the importance and opportunity embedded in failed initiatives should be highlighted.

Some of the practitioner recommendations have not yet been proved via empirical evidence but emerged from the system dynamics diagrams. Where empirical evidence would provide strong *how* and *what* answers (see Section 7.2), the qualitative methods already delve into the important *why* question. The recommendations to practitioners are thus made on the evidence from the system dynamics diagrams, although future empirical work on this is also strongly recommended (see Recommendation 2).

7.5 LIMITATIONS AND FUTURE RESEARCH

7.5.1 Limitations of the research

Critics of qualitative research in IT often point to the issue of generalisability of contributions as a limitation of qualitative research (Conboy, Fitzgerald & Mathiassen, 2012). In order to address these criticisms, whether valid or not, Conboy et al. (2012) suggested that researchers should focus on one or more of the following four concepts of generalisation: (i) development of concepts; (ii) generation of theory; (iii) drawing of specific implications; and (iv) contribution of rich insight. Whetten's (1989, p. 492) arguments about research limitations also centred on the sampling and methods followed.

Given the context of BITA provided, the vastness of the current academic discourse, and the remaining challenges specifically in dealing with dynamic complexity, it was decided to focus the generalisation on the contribution of rich insight. The purposive sampling done in this research, the dynamic nature of the industry selected, and the research methods used contribute towards the fourth concept of generalisation claimed, the provision of rich insight. Generalisability to all organisations is not claimed since the sample population was from within a single industry and this limitation is acknowledged, in spite of the sound reasons argued for using this specific sample (see Section 3.4.4).

The fact that all cause-and-effect relationships are just shown as the same influence on CLDs when an iterative approach is followed results in some useful information being lost in the process. It is acknowledged that certain influences or relationships between variables could be stronger than between others, yet this is lost in the final diagram despite being evident in the data. Although this may not necessarily have a material effect on the final diagram, the author of diagrams needs to be very clear on how it was constructed to ensure sufficient scientific rigour (see Section 3.4.6.1).

The different level of granularity in the different diagrams only became evident once consolidation of the different diagrams was attempted. The nature of creating CLDs is that no formal codes or coding are done, and the technique does not necessarily lend itself to creating different diagrams as was done for this research. None the less, when multiple diagrams are created it could be desirable to create fixed variables and re-use the variables and not allow different definitions or levels of granularity to inhibit the ability to amalgamate the different diagrams. Appendix L shows the attempt at amalgamation of the different diagrams and it is highly likely that even if this was done, that the final diagrams would still be too complex to add any value.

The research always intended to add value for practitioners and create diagrams that they could use. During the academic interviews it became evident that the format of the CLDs, although very useful for analysis and rich in insight, is beyond the quick grasp of practitioners and will very likely not be used by them to improve BITA. The research is thus limited by the absence of a practitioner orientated final diagram to provide a synopsis of the key factors and actions. The practitioner recommendations presented is an attempt to address this research limitation.

The sampling of the BITA CSF articles may have introduced some bias into the CSFs used. Academic articles present phenomena already observed in practices and it is likely that some more modern success factors or such factors are yet to be described and published in academic research. The systematic review may thus have prioritised established CSFs at the expense of newer factors, like agile and iterative methods of IT deployment, which are only emerging in the academic literature in recent times and have not yet been highly cited (the filter used for selection see Section 3.4.2.2).

7.5.2 Future research and the BITA challenge

Multiple interesting future research opportunities have been identified in this research.

The first set of opportunities are based on observed relationships not yet well covered in academic IT literature. Recommendation 2 suggests that IT researchers perform empirical work to investigate the following relationships:

- The impactful external coverage of IT on IT credibility;
- The impact of IT knowledge on user self-efficacy;
- The innovativeness of the CIO on IT credibility; and
- Ownership of past failure on IT credibility.

Variables used in the CLDs, as indeed for all CLD exercises, were not coded and uniquely documented as could be done for qualitative work, and was done in Chapters 4 and 5. This shows a potential limitation in the analysis due to variables using different terminology or levels of detail and users of system dynamics should investigate a level of formalisation in the process of creating CLDs that could ensure a higher degree of scientific rigour in the process.

It could be that the BITA CSFs extracted from traditional literature do not yet sufficiently acknowledge these methods. By not including that explicitly in any questions or diagrams could have limited the research. However, it did emerge as contributing factors on the *IT credibility* diagram (Figure 6.17) as well as the *User involvement* diagram (Figure 6.21).

Maes (2019) made an interesting final observation that there seems to be a golden thread through all the different diagrams, namely, the human factors. It is possible to use a lens not based on any of the CSFs, but rather perform a content analysis exercise on the narrative data from the interviews to find newly-emergent patterns that could be hidden in multiple diagrams. As indicated by Maes (2019), this is probably strongly influenced by human factors from both business and the ITO.

7.5.3 The complexity of the BITA challenge

A comment made, not *verbatim*, by one of the interviewees probably best summarise the challenge for researchers investing business and IT alignment, and probably more so from a practitioner perspective: *Striving for business and IT alignment is like hitting a moving target under construction with a moving gun that is still being assembled*.

The *moving target being constructed* is the continuous changes to strategic intent and multiple strategic initiatives that organisations define in a dynamic manner to retain their competitive positioning.

The *moving gun being assembled* is acknowledging the complexity of the IT systems and infrastructure that is always under construction as the ITO works tirelessly to deploy new assets, update business processes to utilise the capabilities deployed and build users' capacity to ensure that system are used.

This research makes a small contribution to both those constructing the moving target and assembling the moving gun to ensure organisations gain the value intended from their investment in information technology.

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APPENDIX A:

MEASURES OF ALIGNMENT (KSCs)

Study	Criterion	Focus	Method
Luftman (2000)	Communications maturity Competency/value measurement maturity Governance maturity Partnership maturity Scope and architecture maturity Skills maturity	Overall alignment maturity	38 attributes encompassing the 6 criteria 5 levels of maturity Survey Can be used for one organisation
Reich and Benbasat (1996)	Business and IT executives mutual understanding of each other's objectives Congruence between business/IT executives' long-term vision for IT's role Self-report on alignment level	Social dimension of alignment	Semi-structured interviews with executives Four levels of alignment For use on large studies with multiple organisations
Sledgianowski, Luftman & Reilly (2006)	Six factors from Luftman's SAMM Self-report on level of alignment	Overall alignment maturity	Validation of Luftmans SAMM Confirmatory factor analysis
Khaiata & Zualkerman (2009)	Extension and simplification of Luftman's SAMM	Overall alignment maturity	Unidimensional framework Survey: one question for each attribute
Tallon (2008)	Three value disciplines: • Operational excellence • Customer intimacy • Product leadership Five processes: • Supplier relations • Production and operations • Product and service enhancement • Marketing and sales • Customer relations	Process level focus for alignment at a value discipline level	Profile deviation as fit Moderation as fit Can be used for one organisation
Cragg, King & Hussin (2007)	Nine dimensions of strategy with corresponding IT dimensions • Quality service • Quality products • Production efficiency • New market • New products • Product diversification • Product differentiation • Intensive marketing • Pricing/cost reduction	Total IT alignment	Matching as fit Moderation as fit

Study	Criterion	Focus	Method
Chan et al. (1997)	IT to support: • Company aggressiveness • Company analysis • Internal defensiveness • External defensiveness • Company futurity • Company proactiveness • Company risk aversion • Company innovativeness	Total alignment	STROIS dimensions based on Venkatraman's STROBE methodology
Chen (2010)	Six criteria from Luftman's SAMM	Overall alignment maturity	Cross validation of Luftman's SAMM Confirmatory factor analysis
Avison, Jones, Powell & Wilson (2004)	Four domains of strategic choice: • Business strategy • IT strategy • Organisation infrastructure and processes • IT infrastructure and processes Each with three internal and external constituent components	Realised IT strategy	Based on Venkatraman's SAM, completed projects are mapped by category classification into domains of SAM.

APPENDIX B:

BITA PRACTICES AND CODES

BITA CSF	BITA sub-factor
Shared knowledge	Shared domain knowledge
	Social systems of knowing
	Structural systems of knowing
	Shared understanding
	Top management's knowledge of IT
	IT management's knowledge of business
	Clear and stable business goals and objectives that are known to IT management
Collaborative planning processes	Planning sophistication
	Understanding IT in strategy development
	Business and IT management partnering to prioritise applications development
	Business managers' participation in strategic IT planning
	IT managers' participation in business planning
Executive commitment	Line executive commitment to IS issues and initiatives
	Top management commitment to the strategic use of IT
	Joint architecture/portfolio selection
	CIO is a member of senior management
	Senior executive support for IT
Effective communication	Quality of IT communication
	Frequent communication between users and IT departments
	Communication and understanding between line and IT executives
	Business IT social capital (trust/respect)
IT credibility	IT implementation success
	IT sophistication and adaptability to keep up with changes
	The IT department's efficiency and reliability
	IT demonstrates leadership
	Well-prioritised IT projects from a business perspective
	The IT department being able to identify creative ways to use IT strategically
	IT flexibility to meet changing operational and strategic needs
	Extent of IT systems usage for real business value
	IT governance processes
User involvement	Deep end-user involvement
	The IT department is responsive to user needs
	Realistic expectations and sophistication of user managers

APPENDIX C:

BITA CSFs MAPPED TO LITERATURE

	BITA CSF	Shared knowledge							Planning processes					Executive commitment					Effective				IT credibility									User		
	Sub practices/Code	Shared domain knowledge	Social systems of knowing	Structural systems of knowing	Shared understanding	Top management's knowledge of IT	IT management's knowledge of business	Clear and stable business goals and objectives that are known to IT management	Planning sophistication	Understanding IT in strategy development	Business and IT management partnering to prioritize applications development	Business managers' participation in strategic IT planning	IT managers' participation in business planning	Line executive commitment to IS issues and initiatives	Top management commitment to the strategic use of IT	Joint architecture/portfolio selection	CIO is a member of senior management	Senior executive support for IT	Quality of IT communication	Frequent communication between users and IT departments	Communication and understanding between line and IT executives	Business IT social capital (trust/respect)	IT implementation success	IT sophistication and adaptability to keep up with changes	The IT department's efficiency and reliability	IT demonstrates leadership	Well-prioritized IT projects from a business perspective	The IT department being able to identify creative ways to use IT strategically	IT flexibility to meet changing operational and strategic needs	Extent of IT systems usage for real business value	IT goverance processes	Deep end user involvement	The IT department is responsive to user needs	Realistic expectations and sophistication of user managers
1	Luftman & Brier (1999)	0	1	0	1	0	1	1	0	1	1	0	1	1	1	1	0	1	0	1	1	1	0	0	0	0	1	1	0	0	0	0	0	0
2	Wagner, Beimborn & Weitzel (2014)	1	P	1	1	P	P	1	1	1	0	1	0	0	0	0	1	0	1	1	0	1	0	0	1	0	0	0	1	1	0	1	0	0
3	De Haes & Van Grembergen (2005)	0	0	1	1	0	1	0	0	1	1	1	1	0	0	0	1	0	1	1	1	0	0	0	1	0	1	0	1	0	P	0	0	1
4	Chen (2010)	0	0	0	0	1	0	0	0	0	1	0	0	1	0	1	0	1	1	0	0	1	1	1	1	0	1	0	1	1	0	0	0	0
5	Huang & Hu (2007)	0	1	P	1	0	1	1	P	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	0	1	1	1	0	1	0	1	1
6	Tarafdar & Qrunfleh (2009)	0	1	0	0	0	1	0	1	1	0	1	0	0	1	0	1	0	0	1	1	1	0	1	1	0	1	1	1	0	1	1	1	0
7	Lee, Kim, Paulson & Park (2008)	0	1	0	0	0	0	0	1	1	1	1	1	0	0	1	0	1	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	1
8	Saat, Franke, Lagerstrom & Ekstedt (2010)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	0	1	0	0	0	1	0	0	0
9	Hu & Huang (2006)	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	0	0	1	0	0	0	0	0	0	0	1
10	Schlosser, Wagner & Coltman (2012)	0	1	0	1	0	1	1	1	1	1	1	1	1	0	1	0	1	0	0	0	1	0	1	1	1	1	0	1	1	1	1	0	0
11	Wong, Ngan, Chan & Chong (2012)	0	0	0	1	1	1	0	1	0	P	1	0	0	0	0	0	0	1	0	0	P	0	0	0	0	0	0	0	0	0	1	0	1
12	Charoensuk, Wongsurawat & Khang (2014)	1	0	0	0	0	0	1	1	0	1	0	0	1	0	0	0	1	1	1	0	0	1	0	0	0	0	0	1	0	1	0	0	0
13	Vermerris, Mocker & van Heck (2014)	1	0	0	1	0	1	0	1	1	1	0	0	1	1	0	0	1	1	1	0	0	1	1	1	1	P	0	0	0	0	0	0	0
14	Chong, Ooi, Chan & Darmawan (2010)	0	0	0	0	0	0	1	0	0	1	1	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	P	0	1
15	Yayla & Hu (2009)	1	1	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
16	Kurniawan & Suhardi (2013)	0	1	1	0	1	1	1	0	1	0	1	1	0	0	P	0	1	1	0	1	1	0	1	0	0	1	0	1	0	1	1	0	0
17	Jorfi, Nor & Najjar (2011)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0	1	1	1	P	0	0	0	1	0
18	Chebrolu & Ness (2013)	1	0	0	0	0	0	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	P	0	0	P	0
19	Schlosser, Wagner, Beimborn & Weitzel (2010)	1	1	0	1	0	1	1	0	1	1	1	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	P	1	0	0
20	Brown & Motjolopane (2005)	0	0	0	0	0	0	0	1	1	0	1	1	0	1	0	1	0	1	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0
21	Almajali & Dahalin (2011)	0	1	1	1	1	1	1	0	1	1	1	0	0	0	0	0	1	1	0	0	1	1	0	1	1	0	0	0	1	0	0	1	0
22	Holland & Skarke (2008)	0	0	0	0	0	1	1	0	0	1	1	0	1	1	1	0	1	0	0	0	1	1	1	0	1	1	1	0	0	0	1	0	0

APPENDIX D:

CODE DISTRIBUTION IN BITA ARTICLES

	Authors	Code family distribution		Code distribution	
1	Luftman & Brier (1999)	5	83%	16	48%
2	Wagner, Beimborn & Weitzel (2014)	6	100%	16	48%
3	De Haes & Van Grembergen (2005)	6	100%	16	48%
4	Chen (2010)	5	83%	13	39%
5	Huang & Hu (2007)	6	100%	25	76%
6	Tarafdar & Qrunfleh (2009)	6	100%	18	55%
7	Lee, Kim, Paulson & Park (2008)	6	100%	12	36%
8	Saat, Franke, Lagerstrom & Ekstedt (2010)	2	33%	6	18%
9	Hu & Huang (2006)	6	100%	13	39%
10	Schlosser, Wagner & Coltman (2012)	6	100%	21	64%
11	Wong, Ngan, Chan & Chong (2012)	4	67%	10	30%
12	Charoensuk, Wongsurawat & Khang (2014)	5	83%	10	30%
13	Vermerris, Mocker & van Heck (2014)	5	83%	15	45%
14	Chong, Ooi, Chan & Darmawan (2010)	4	67%	8	24%
15	Yayla & Hu (2009)	5	83%	9	27%
16	Kurniawan & Suhardi (2013)	6	100%	18	55%
17	Jorfi, Nor & Najjar (2011)	5	83%	8	24%
18	Chebrolu & Ness (2013)	5	83%	8	24%
19	Schlosser, Wagner, Beimborn & Weitzel (2010)	5	83%	12	36%
20	Brown & Motjolopane (2005)	4	67%	10	30%
21	Almajali & Dahalin (2011)	6	100%	17	52%
22	Holland & Skarke (2008)	6	100%	15	45%

APPENDIX E:

PPM PRACTICES AND CODES

Practice	Code
Strategic alignment	Portfolio objectives
	Strategic alignment
	Portfolio dynamic re-assessment
	Future preparedness
	Value capturing
Portfolio optimisation	Portfolio prioritisation
	Project selection / termination / delay
	Portfolio categorisation
	Portfolio balance
Resource management	Resource management
	Conflict management
	Resource planning and scheduling
Project portfolio governance	Stakeholder interest
	Stakeholder management
	Portfolio leadership
	Decision-making
	Facilitating control
	Portfolio steering
Project portfolio ownership	Management support
	Organisational learning
	Formalisation of project portfolio management
	Portfolio manager empowerment
Portfolio risk management	Managing uncertainty
	Portfolio risk
	Portfolio uncertainty
	Risk management
Portfolio performance review	Portfolio ROI
	Portfolio efficiency
	Portfolio performance
Portfolio communication	Information needs
	Information sharing
	Communication
Integration management	Cross-functional integration
	Project interdependence
	Portfolio collaboration
	Single project influence
	Organisational complexity

APPENDIX F:

PPM PRACTICES MAPPED TO LITERATURE

Project portfolio management practices		Strategic alignment						Portfolio optimization			Resource management			Project portfolio governance							Project portfolio ownership			Risk management				Performance management			Communication			Integration management				
Authors	Sub practices / code	Portfolio objectives	Strategic alignment	Portfolio dynamic re-assessment	Future preparedness	Value capturing	Portfolio prioritisation	Project selection / termination / delay	Portfolio categorization	Portfolio balance	Resource Management	Conflict Management	Resource Planning and Scheduling	Stakeholder Interest	Stakeholder Management	Project portfolio leadership	Decision making	Facilitating Control	Formalisation of PPM	Portfolio Steering	Management Support	Organisational learning	Portfolio Manager Empowerment	Managing Uncertainty	Portfolio Risk	Portfolio Uncertainty	Risk Management	Portfolio ROI	Portfolio efficiency	Portfolio performance	Information Needs	Information sharing (transparency)	Communication	Cross-functional integration	Project Interdependence	Project collaboration	Single project influence	Organisational complexity
1	Pajares & López, 2014	0	1	1	0	0	1	1	0	P	1	1	1	0	0	0	1	1	0	0	0	0	0	0	1	0	1	1	1	1	0	0	1	1	1	0	1	0
2	Korhonen, Lain & Martinsuo, 2014	1	1	0	0	0	0	1	0	0	1	0	0	1	0	0	1	1	0	0	0	0	0	1	1	1	1	0	0	0	1	0	0	0	1	1	0	0
3	Young & Conboy, 2013	1	1	1	0	0	1	1	0	1	1	0	1	1	1	1	0	0	1	0	1	0	1	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0
4	Siew, 2016	1	0	0	0	1	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Gutiérrez & Magnusson, 2014	1	1	1	0	0	1	1	0	0	1	1	1	1	1	1	1	1	1	0	0	0	1	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0
6	Killen & Hunt, 2010	0	1	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	Killen & Hunt, 2013	0	1	1	1	1	0	1	0	1	1	1	1	0	0	0	1	1	1	1	1	1	0	1	0	1	1	1	1	1	0	0	0	1	1	0	0	1
8	Laslo, 2010	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1
9	Beringer, Jonas & Gemünden, 2012	1	1	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	1	1	0	0	1	1	0	1	0
10	Daniel, Ward & Franken, 2014	1	1	1	1	0	1	1	1	1	1	0	1	1	0	1	1	1	0	0	0	0	0	1	1	1	1	0	0	1	1	1	1	1	0	0	0	1
11	Voss, 2012	1	1	0	0	1	1	0	1	1	1	1	1	1	1	0	0	1	1	1	0	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1
12	Jonas, Kock & Gemünden, 2013	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	P	1	1	0	1	0	1	0	1	1	1	1	1	1	1	1	1	0
13	Teller, 2013	1	1	0	1	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	P	1	P	1	1	0	1	1	1	1	1	1	0	1
14	Brook & Pagnanelli, 2014	1	1	0	0	0	0	0	P	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	0	0	0
15	Costantino, Di Gravio & Nonino, 2015	1	1	1	1	0	1	P	0	0	1	0	1	1	0	0	1	1	0	0	1	0	0	1	1	1	1	1	0	0	1	0	1	0	0	0	0	0
16	Teller & Kock, 2013	1	1	1	1	0	0	0	0	0	1	0	0	0	0	1	1	0	1	0	0	1	0	1	1	1	1	1	1	1	1	0	1	0	1	0	0	1
17	Heising, 2012	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	1	0	P	0	0	0	1	0	0	0	0
18	Teller, Unger, Kock & Gemünden, 2012	1	1	0	1	0	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
19	Jonas, 2010	1	1	0	1	1	1	1	0	1	1	1	1	0	0	1	1	1	1	1	1	1	1	0	1	1	1	0	0	1	1	1	1	1	1	1	1	1
20	Killen, Jugdev, Drouin & Petit, 2012	1	1	1	1	1	1	1	1	1	0	0	0	0	0	1	1	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	Unger, Gemünden & Aubry, 2012	1	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	0	0	1	1	0
22	Kaiser, El Arbi & Ahlemann, 2015	1	1	0	1	0	1	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	1	1	1	1	0	0	1	1	1
23	Martinsuo, 2013	1	1	1	0	0	1	1	1	0	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	0	1	1	1	1	0
24	Beringer, Jonas & Kock, 2013	1	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	1	1	1	1	0	1	1	0	1
25	Meskendahl, 2010	1	1	1	0	0	1	1	0	1	1	0	1	1	0	0	1	0	1	0	0	0	0	1	1	1	1	1	1	1	1	1	0	1	0	1	1	0
26	Frey & Buxmann, (2011	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	1	P	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	Frey & Buxmann, 2012	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0
28	Rank, Unger & Gemünden, (2015	0	0	1	P	1	0	P	0	1	0	0	0	0	0	0	P	0	0	1	0	0	0	0	1	0	1	0	0	1	0	0	0	P	1	0	1	0
29	Hyväri, 2014	1	1	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	P	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
30	LaBrosse, 2010	0	1	1	0	1	1	1	0	1	1	0	1	1	1	1	1	0	0	0	1	1	1	1	1	0	1	1	0	1	1	1	1	1	0	1	0	0
31	Lerch & Spieth, 2013	0	1	0	1	1	0	0	1	1	1	1	0	0	0	0	1	0	1	0	0	0	0	0	1	0	1	0	1	1	0	1	1	1	1	0	1	1

APPENDIX G:

CODE DISTRIBUTION IN PPM ARTICLES

	Authors	Code family distribution		Code distribution	
1	Pajares & López, 2014	8	89%	19	51%
2	Korhonen, Laine & Martinsuo, 2014	7	78%	14	38%
3	Young & Conboy, 2013	7	78%	17	46%
4	Siew, 2016	3	33%	5	14%
5	Gutiérrez & Magnusson, 2014	7	78%	19	51%
6	Killen & Hunt, 2010	4	44%	7	19%
7	Killen & Hunt, 2013	8	89%	24	65%
8	Laslo, 2010	2	22%	6	16%
9	Beringer, Jonas & Gemünden, 2012	8	89%	21	57%
10	Daniel, Ward & Franken, 2014	8	89%	24	65%
11	Voss, 2012	9	100%	29	78%
12	Jonas, Kock & Gemünden, 2013	9	100%	31	84%
13	Teller, 2013	7	78%	20	54%
14	Brook & Pagnanelli, 2014	7	78%	15	41%
15	Costantino, Di Gravio & Nonino, 2015	8	89%	19	51%
16	Teller & Kock, 2013	8	89%	20	54%
17	Heising, 2012	7	78%	22	59%
18	Teller, Unger, Kock & Gemünden, 2012	9	100%	32	86%
19	Jonas, 2010	9	100%	30	81%
20	Killen, Jugdev, Drouin & Petit, 2012	5	56%	14	38%
21	Unger, Gemünden & Aubry, 2012	8	89%	24	65%
22	Kaiser, El Arbi & Ahlemann, 2015	7	78%	20	54%
23	Martinsuo, 2013	9	100%	27	73%
24	Beringer, Jonas & Kock, 2013	8	89%	28	76%
25	Meskendahl, 2010	8	89%	23	62%
26	Frey & Buxmann (2011)	3	33%	7	19%
27	Frey & Buxmann (2012)	7	78%	8	22%
28	Rank, Unger & Gemünden (2015)	7	78%	13	35%
29	Hyväri (2014)	5	56%	8	22%
30	LaBrosse (2010)	9	100%	25	68%
31	Lerch & Spieth (2013)	8	89%	19	51%

APPENDIX H:
INTERVIEW QUESTIONS

Organisation code		
Interviewer code		
Informed consent form completed	**Yes**	**No**

INTERVIEW PROTOCOL SHEET: **REV2**

The following questions will be used as basis for primary data collection during the interview phase of the research to assess the relationship between Project Portfolio Management practices and Business and IT alignment factors in organisations.

This interview protocol consists of terminology to be discussed and agreed with the participant prior to the interview as well as 23 questions in 5 sections with different objectives, as stated in each section.

Although all participants will be vetted prior to interviews, an interview decision point exists after the first three questions to determine general insight on the effect of IT on their organisation. Should this prove that the participant is not at least aware of the transformative nature of IT on their organisation or industry, or unable to answer from an organisational perspective, the interview is terminated.

Interview terminology (clear with participant before interview):

- The term **initiative** is used to indicate any substantial collective of efforts or actions that may, or may not be, defined as a project.
- The term **technology intrinsic project** is preferred to IT projects since it encapsulates all business projects with a substantial technology component.
- The term **IT** refers to the IT organisation and deployment of IT assets, both hardware and software.
- The term **business** refers to the non-IT functions of the organisation, including support functions but focussed specifically on the core functions of operations and marketing and sales.
- The term **Business and IT alignment (BITA)** signifies the alignment of the information systems with business requirements (deliver what business needs) as well as the utilisation of available capabilities by business – i.e. are IT systems fully utilised.
- **The term Project portfolio management (PPM)** refers to *the centralised management of one or more project portfolios to achieve strategic objectives.* It can be described as doing the right projects at the right time, from a strategic perspective.
- The term **practice** refers to the actual application or use of an idea, belief, or method, as opposed to theories relating to it.
- The term **driver** is used to define an action or practice that leads to a change of some variable, if the execution of A causes B to change, A is a driver of B.

A: Perceived external volatility and industry challenges in the appropriate deployment of IT to achieve organisational strategic intent

This section is used to determine insight into the dynamic nature of the participant's organisation and industry and hence the importance of strategic alignment. It is also used to determine if the participant can answer on behalf of the organisation (the unit of measure) and not only from a personal opinion.

1. **To what extent do you think IT will continue to disrupt the financial services industry and market in which <u>your organisation</u> operates in the foreseeable future? What will the impact be on your organisation?**

2. **How involved are you in IT-related initiatives in your organisation? *(Determine level of insight on <u>organisational</u> decisions and processes since the unit of analysis is the organisation, not the participant that merely represents the organisation)*.**

<u>Interview decision point:</u>

If the participant is unable to define impact on organisational level and is not involved in IT intrinsic processes and decisions, he/she is not deemed fit for the interview;

or,

The participant is able to represent their organisation and has sufficient insight about the deployment of IT assets and the associated management processes and strategic challenges associated with it and the interview can continue.

B: Investigative the challenges in prioritisation of technology intrinsic projects and high-level business alignment

This section is intended to determine general challenges in Business and IT alignment using terminology that should be recognisable for the participant to “ease into” the interview, yet determine some baseline metrics about the maturity of project portfolio management practices in their organisation.

3. **To what extent does your organisation have a challenge in prioritising technology intrinsic projects? These challenges can be in terms of too many projects “chasing” available resources, or having clarity in project prioritisation.**

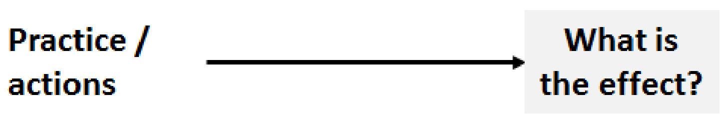
4. **Do you have a clearly-defined and communicated list of current active projects or initiatives (not just technology intrinsic projects)? If so, how is this list compiled, updated and communicated?**

5. **Do you believe, in general, that your IT projects/initiatives are aligned with the strategic intent of your organisation on an ongoing basis, i.e. from inception through execution – the entire life cycle? Kindly elaborate on your answer, i.e. why is this the case / not the case in your opinion?**

C: Determining the prevalence of PPM practices and the impact thereof

In this section we will probe for the prevalence of PPM practices, what is being done, within the organisation (ensure the focus is on execution), and the influence of said practices towards the factors that lead to BITA (see Section D).

The emphasis in this section is on the <u>influence of the action</u>, i.e. investigating the actions taken and the result of these actions.



6. **Strategic alignment:** How does your organisation ensure that technology intrinsic projects / initiatives align with strategic intent?

	Determine the presence of <u>actions</u> that lead to ____ and the effect thereof: • Portfolio objectives • Future preparedness • Strategic alignment • Dynamic re-assessment

7. **Project optimisation:** How are projects actively managed as part of the strategic portfolio identified, categorised and prioritised?

	Determine the presence of <u>actions</u> that lead to ____ and the effect thereof: • Portfolio balance • Portfolio categorisation • Portfolio prioritisation • Project selection/termination/delay

8. **Resource management**: How are resources deployed across multiple projects, or that are required to work on multiple projects, managed and allocated, especially when there are conflicting priorities?

	Determine the presence of <u>actions</u> that lead to ____ and the effect thereof: • Conflict management • Resource management • Resource planning and scheduling

9. **Portfolio governance:** What governance mechanisms exist within your organisation to ensure that portfolios of technology initiatives are well managed, integrated and reviewed on an ongoing basis to account for both the dynamic nature of projects but also the organisational complexity?

	Determine the presence of <u>actions</u> that lead to ____ and the effect thereof: • Stakeholder interest • Stakeholder management • Portfolio leadership • Decision-making • Facilitating control • Portfolio steering

10. **Portfolio ownership:** How are portfolio decisions, which influence the entire IT project portfolio, made in your organisation? What forums and mechanisms exist and what is the prevailing culture in decision-making about these matters?

	Determine the presence of actions that lead to ____ and the effect thereof: • Management support • Organisational learning • Formalisation of project portfolio management • Portfolio manager empowerment

11. **Portfolio risk management:** How is risk dealt with at the portfolio level, i.e. not project intrinsic risk, but risk re strategic alignment and inter-project risk?

	Determine the presence of actions that lead to ____ and the effect thereof: • Managing uncertainty • Portfolio risk • Portfolio uncertainty • Risk management

12. **Portfolio performance management and review:** How is portfolio success defined and what mechanisms exist to review and manage different project and IT initiative portfolios on an ongoing basis?

	Determine the presence of actions that lead to ____ and the effect thereof: • Portfolio ROI • Portfolio Efficiency • Portfolio Performance

13. **Portfolio communication:** How is portfolio success defined and what mechanisms exist to review and manage different project and IT initiative portfolios on an ongoing basis?

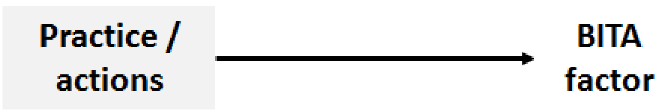
	Determine the presence of actions that lead to ____ and the effect thereof: • Information needs • Information sharing • Communication

14. Portfolio integration management: How is portfolio success defined and what mechanisms exist to review and manage different project and IT initiative portfolios on an ongoing basis?

	Determine the presence of <u>actions</u> that lead to ____ and the effect thereof: • Cross-functional integration • Project interdependence • Portfolio collaboration • Single project influence • Organisational complexity

D: Testing for actions to contribute towards achieving the factors identified as being important for BITA.

In this section we will probe for the actions that “lead into”, or will result in the attainment of these factors, i.e. not the effect of the execution of the CSF, but rather what results in the CSF being achieved or met.



15. **Shared knowledge:** How is the sharing of knowledge about IT projects and the objectives of IT projects disseminated in your organisation, both in structured and unstructured ways? What are the actions that lead to the sharing of this knowledge?

	Potential <u>drivers</u> of shared knowledge: • Social systems of knowing • Structural systems of knowing • Shared domain knowledge • Top management’s knowledge of IT • IT management’s knowledge of business • Clear and stable business goals and objectives known to IT

16. Appropriate planning processes: Explain the joint planning of IT planning between business and IT done within your organisation, i.e. how do you decide on new IT initiatives and how is this embedded in the strategic and tactical planning of your organisation?

	Potential drivers of appropriate planning processes • Planning sophistication • Understanding IT and corporate planning • IT involved in strategy development • Business and IT management partnering to prioritise applications development • Business managers’ participation in strategic IT planning • IT managers’ participation in business planning

17. **Executive commitment:** How would you describe the level of executive commitment towards IT investment and utilisation? What are the factors that lead to executives being involved in the definition, approval, execution and governance of IT initiatives?

	Potential drivers of executive management commitment • Line executive commitment to IS issues and initiatives • Top management commitment to the strategic use of IT • Joint architecture/portfolio selection • CIO is a member of senior management • Deep commitment to IT planning by senior management • Senior executive support for IT

18. **Effective communication:** To what extent is there effective communication between IT and the rest of the organisation, both formal and informal? Is this communication credible and efficient?

	Drivers that contribute towards effective communication: • Quality of IT communication • Frequency of the communication • Communication leads to understanding between line and IT executives • Shared culture of communication

19. **IT credibility:** What factors contribute to the credibility of the IT organisation and IT systems in your organisation? How are past IT successes, either at project or initiative level, communicated in the organisation?

	Drivers that contribute towards IT credibility: • Previous IT implementation success • IT sophistication • The IT department's efficiency and reliability • IT demonstrates leadership • Well-prioritised IT projects • IT department identifies creative ways to use IT strategically • IT staff keeps up with advances in IT

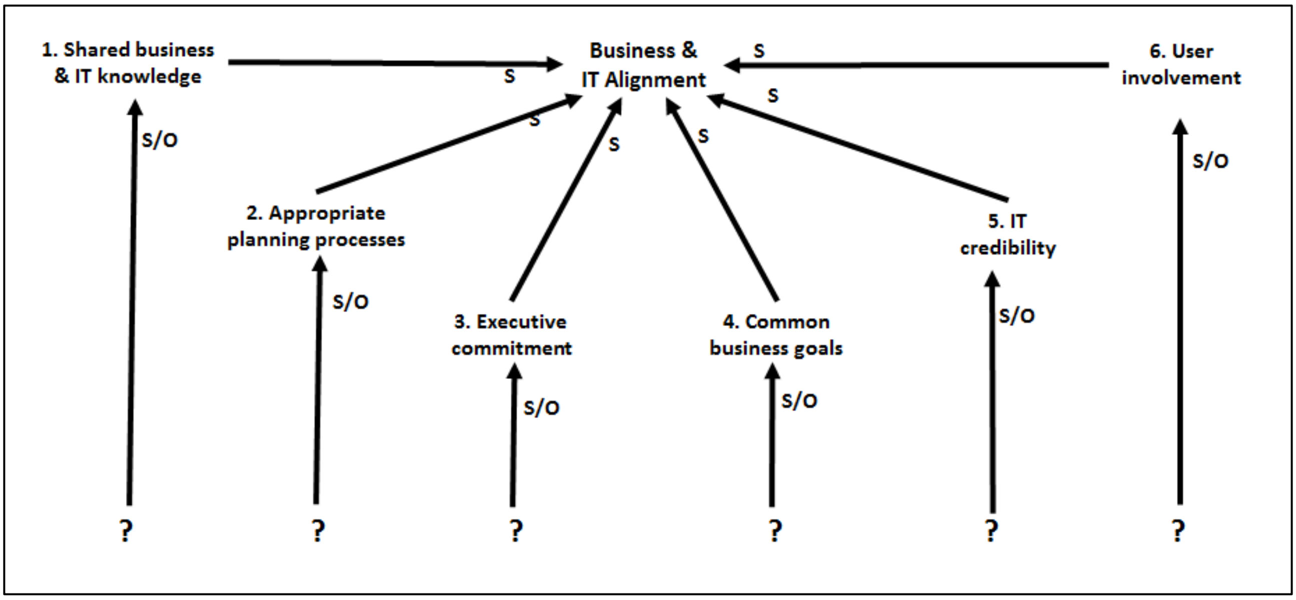
20. **User involvement:** To what extent are the end-users of applications, initiates and project involved in IT projects through the entire life cycle? Do the users trust the IT department to represent their requirements accurately and are they willing to sacrifice the time and effort to define requirements at the appropriate level of detail?

	Drivers that contribute towards appropriate user involvement: • Deep end-user involvement • IT responsive to user needs • Realistic expectations and sophistication of user managers

Section E: Catch all section

The intent of this section is to allow an opportunity to list any practice that may not have emerged from the preceding set of questions that will contribute towards Business and IT alignment, irrespective of whether it is within the ambit of PPM practices, or not.

Interviewer: Explain the principles of influence diagrams and the factors (according to literature) that lead to business and IT alignment. Explain the same (S) and opposite (O) indicators to show both supporting and opposing influence using the diagram below.



21. **Factors to reinforce from the discussion:** Are there any factors covered in the preceding set of questions that you would like to emphasise at this stage as contributing to one of the direct contributors of BITA (1 to 6 listed)?

22. **New factors that should be at this level of granularity:** Are there any factors that lead to BITA that should be elevated to this level of detail, i.e. they do not influence BITA "via" 1 – 6, but rather have a direct influence upon BITA?

23. **New factors that did not emerge from the discussion:** Are there any factors that lead to improved BITA that you feel did not emerge from our preceding conversation?

Thank you.

APPENDIX I:

WEILL & ROSS QUESTIONNAIRE

5	Strongly agree;
4	Agree;
3	Neither Agree nor Disagree;
2	Disagree; and
1	Strongly disagree

1. Top Management Commitment to Information Technology

Senior Managers:

- attend IT council meetings themselves and don't send a nominee;
- define the target degree of business process standardization and integration and the necessary capabilities of the digitized platform (e.g. business processes, data and technology);
- required carefully considered business cases for investments with measures and responsibilities identified;
- support the strategic uses of IT by providing seed funding not requiring traditional net present value financial justifications and stopping poorly performing projects early;
- encourage post-implementation reviews that are not witch-hunts, and facilitate the gathering and dissemination of the lessons learnt;
- encourage, fund and actively support training in the use of IT.

2. Integrating IT with Business

In your organisation there are/is:

- executive management considerations of information and IT implications in business strategy discussions;
- regular high-level briefings on the implication of IT developments in your industry;
- accountabilities for achieving strategies that are clear and documented;
- articulation of the respective roles and responsibilities of business and IT management in achieving effective and efficient systems and delivering business benefits. Managers are named and held accountable.

3. Organizational Politics and Political Turbulence

Your organisation:

- exhibits a strong sense of community;
- a feeling of shared interests and purpose and cooperation among managers. This is reinforced with reward systems and incentives that are based on the right balance of firm wide and local measure;
- captures relevant data in one business area and willingly shares it across the firm. Cross-functional and business opportunities are actively sought to innovate, improve service, and reduce cost;
- encourages cooperation across cross-functional teams, secondments, and movement of personnel.

4. Empowered and Satisfied Users:

There is:

- a feeling of empowerment for all people in the form resulting from immediate access to data and systems that helps with their job;
- confidence in the reliability of systems and the completeness of information;
- a sense of relevance and accuracy of the information in the systems;
- excellent support provided to those using the systems. Help desks are very effective, and assistance from technical personnel is excellent;
- excellent user understanding resulting from easy-to-use systems and good training;
- the attitude and responsiveness of those who provide support for systems is enthusiastic and professional.

5. Learning from Experience:

Your organisation always:

- redesigns, simplifies, or reengineers business processes before any money is spent on information systems;
- maximizes the reuse of business process information systems components;
- ensures that every new IT project that is not infrastructure has a businessperson as champion with clearly identified deliverables and responsibilities of the business and IT people;
- ensures that infrastructure investments are treated separately from investments in applications to take account of their shared nature and long life;
- encourages innovative use of IT in the business units even if organisation wide standards are not always followed. Integration can be achieved later if successful.

APPENDIX J:

SAMM ATTRIBUTES AND LEVELS

Alignment Criteria

Alignment Criterion:	**Level 1: With Process (No Alignment)**	**Level 2: Beginning Process**	**Level 3: Establishing Process**	**Level 4: Improved Process**	**Level 5: Optimal Process (Complete Alignment)**
Understanding of Business by IT	IT management lacks understanding	Limited understanding by IT management	Good understanding by IT management	Understanding encouraged among IT staff	Understanding required of all IT staff
Understanding of IT by Business	Managers lack understanding	Limited understanding by managers	Good understanding by managers	Understanding encouraged among staff	Understanding required of staff
Organizational Learning	Casual conversation and meetings	Newsletters, reports, group e-mail	Training, departmental meetings	Formal methods sponsored by senior management	Learning monitored for effectiveness
Style and Ease of Access	Business to IT only; formal	One-way, somewhat informal	Two-way, formal	Two-way, somewhat informal	Two-way, informal and flexible
Leveraging Intellectual Assets	*Ad hoc*	Some structured sharing emerging	Structured around key processes	Formal sharing at all levels	Formal sharing with partners
IT–Business Liaison Staff	None or use only as needed	Primary IT–Business link	Facilitate knowledge transfer	Facilitate relationship building	Building relationship with partners
IT Metrics	Technical only	Technical cost; metrics rarely reviewed	Review, act on technical, ROI metrics	Also measure effectiveness	Also measure business ops, HR, partners
Business Metrics	IT investments measured rarely, if ever	Cost/unit; rarely reviewed	Review, act on ROI, cost	Also measure customer value	Balanced scorecard, includes partners
Link between IT and Business Metrics	Value of IT investments rarely measured	Business, IT metrics not linked	Business, IT metrics becoming linked	Formally linked; reviewed and acted upon	Balanced scorecard, includes partners
Service Level Agreements	Use sporadically	With units for technology performance	With units; becoming enterprisewide	Enterprisewide	Includes partners
Benchmarking	Seldom or never	Sometimes benchmark informally	May benchmark formally, seldom act	Routinely benchmark, usually act	Routinely benchmark, act on, and measure results
Formally Assess IT Investments	Do not assess	Only when there is a problem	Becoming a routine occurrence	Routinely assess and act on findings	Routinely assess, act on, and measure results
Continuous Improvement Practices	None	Few; effectiveness not measured	Few; starting to measure effectiveness	Many; frequently measure effectiveness	Practices and measures well-established
Formal Business Strategy Planning	Not done, or done as needed	At unit functional level, slight IT input	Some IT input and cross-functional planning	At unit and enterprise, with IT	With IT and partners
Formal IT Strategy Planning	Not done, or done as needed	At unit functional level, light business input	Some business input and cross-functional planning	At unit and enterprise, with business	With partners
Organizational Structure	Centralized or decentralized	Central/decentral; some collocation	Central/decentral or Federal	Federal	Federal
Reporting Relationships	CIO reports to CFO	CIO reports to CFO	CIO reports to COO	CIO reports to COO or CEO	CIO reports to CEO
How IT Is Budgeted	Cost center, spending is unpredictable	Cost center by unit	Some projects treated as investments	IT treated as investment	Profit center
Rationale for IT Spending	Reduce costs	Productivity, efficiency	Also a process enabler	Process driver, strategy enabler	Competitive advantage, profit

Alignment Criteria (Continued)

Alignment Criterion:	**Level 1: With Process (No Alignment)**	**Level 2: Beginning Process**	**Level 3: Establishing Process**	**Level 4: Improved Process**	**Level 5: Optimal Process (Complete Alignment)**
Senior-Level IT Steering Committee	Do not have	Meet informally as needed	Formal committees meet regularly	Proven to be effective	Also includes external partners
How Projects Are Prioritized	React to business or IT need	Determined by IT function	Determined by business function	Mutually determined	Partners' priorities are considered
Business Perception of IT	Cost of doing business	Becoming an asset	Enables future business activity	Drives future business activity	Partner with business in creating value
IT's Role in Strategic Business Planning	Not involved	Enables business processes	Drives business processes	Enables or drives business strategy	IT, business adapt quickly to change
Shared Risks and Rewards	IT takes all the risks, receives no rewards	IT takes most risks with little reward	IT, business start sharing risks, rewards	Risks, rewards always shared	Managers incented to take risks
Managing the IT–Business Relationship	IT–business relationship is not managed	Managed on an *ad hoc* basis	Processes exist but not always followed	Processes exist and complied with	Processes are continuously improved
Relationship/Trust Style	Conflict and mistrust	Transactional relationship	IT becoming a valued service provider	Long-term partnership	Partner, trusted vendor or IT services
Business Sponsors/ Champions	Usually none	Often have a senior IT sponsor or champion	IT and business sponsor or champion at unit level	Business sponsor or champion at corporate level	CEO is the business sponsor or champion
Primary Systems	Cost of doing business	Becoming an asset	Enables future business activity	Drives future business activity	Partner with business in creating value
Standards	Not involved	Enables business processes	Drives business processes	Enables or drives business strategy	IT, business adapt quickly to change
Architectural Integration	IT takes all the risks, receives no rewards	IT takes most risks with little reward	IT, business start sharing risks, rewards	Risks, rewards always shared	Managers incented to take risks
How IT Infrastructure Is Perceived	IT–business relationship is not managed	Managed on an *ad hoc* basis	Processes exist but not always followed	Processes exist and are complied with	Processes are continuously improved
Innovative, Entrepreneurial Environment	Discouraged	Somewhat encouraged at unit level	Strongly encouraged at unit level	Also at corporate level	Also with partners
Key IT HR Decisions Made by:	Top business and IT management at corporate	Same, with emerging functional influence	Top business and unit management; IT advises	Top business and IT management across firm	Top management across firm and partners
Change Readiness	Tend to resist change	Change readiness programs emerging	Programs in place at functional level	Programs in place at corporate level	Also proactive and anticipate change
Career Crossover Opportunities	Job transfers rarely occur	Occasionally occur within unit	Regularly occur for unit management	Regularly occur at all unit levels	Also at corporate level
Cross-Functional Training and Job Rotation	No opportunities	Decided by units	Formal programs run by all units	Also across enterprise	Also with partners
Social Interaction	Minimal IT–business interaction	Strictly a business-only relationship	Trust and confidence is starting	Trust and confidence achieved	Attained with customers and partners
Attract and Retain Top Talent	No retention program; poor recruiting	IT hiring focused on technical skills	Technology and business focus; retention program	Formal program for hiring and retaining	Effective program for hiring and retaining

APPENDIX K:

ACADEMIC VALIDATION INTERVIEWS

Dear participant, thank you for availing yourself for a final set of model validation interviews with selected academics as part of my PhD research project.

Scope

The interviews are intended to discuss the System dynamics diagrams that present the collective insight about business and IT alignment (BITA), gathered during interviews with senior managers in the Financial Services industry in South Africa. The interviews are presented as Causal Loop Diagrams (CLDs).

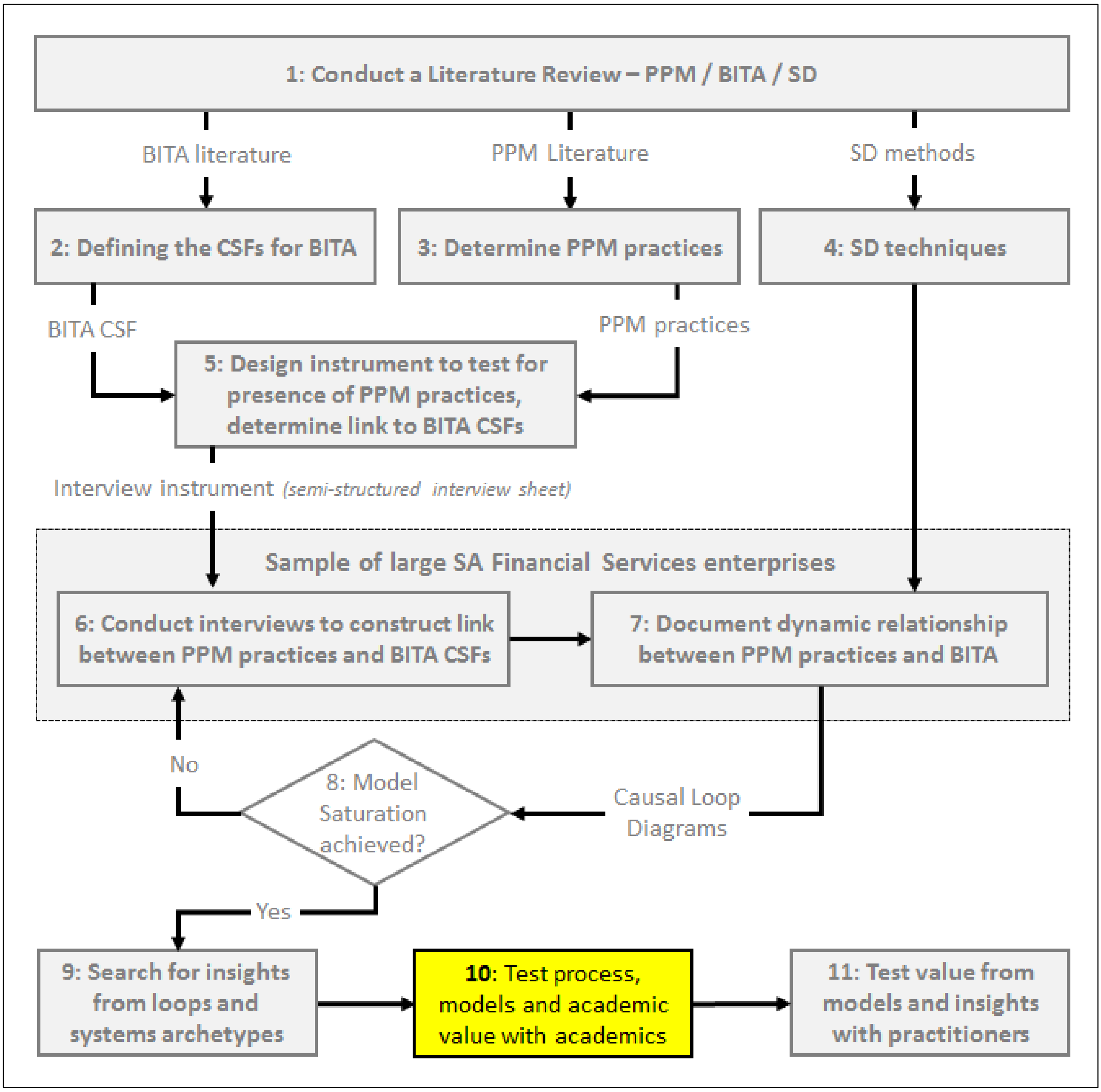
A structured literature review identified six BITA success factors contained in Chapter 4 of the draft dissertation. Six different diagrams, one per factor, indicate the complex and dynamic relationship between the multiple variables influenced by management actions that impact the alignment of IT efforts with strategic intent.

The CLDs were constructed from the transcribed interviews and represent the variables and influences that described the dynamic complexity of business and IT alignment for each factor. Included in the first set of diagrams are the Project Portfolio Management (PPM) practices that contribute to these factors. The second set of diagrams are nearly identical but does not explicitly indicate PPM practices.

This interview intends to answer some final questions about (i) potential practitioner value, (ii) potential academic value and (iii) the best possible representation of the results.

Process

The figure below shows the research process.



This interview forms part of Step 10 in the research process that will include interviews with academics, of which you form part.

Research objective

The research title is: *A Systems Dynamic perspective on the contribution of Project Portfolio Management practices towards Business and IT alignment.*

Although the research intended to investigate the contribution of PPM practices towards BITA in particular, significant insight was gained from the modelling process about BITA and the influences at play in dynamic environments. The value is thus more than initially anticipated with new BITA insights beyond the contribution of the PPM practices.

Two sets of diagrams are presented below and the intent is to only include one of these in the final dissertation. The first set of diagrams (1a – 6a) includes PPM practices (indicated in blue) and the second set (1b – 6b) does not explicitly indicate PPM practices, but include feedback loops. In both sets of diagrams, variables that represent the BITA success factor, are indicated in red.

The research proposes a contribution towards BITA for both practitioners (application value) and academics (potential new insights in dealing with dynamic complexity). Your contribution will assist to achieve these objectives.

Questions for discussion

1. **Practitioner value:** Do you think there is any specific value to be gained in terms of business and IT alignment through the diagrams (with or without detailed descriptions) for practitioners?

2. **Academic value:** Do you think there is any specific value to be gained in terms of business and IT alignment through the diagrams (with or without detailed descriptions) for researchers?

3. **Presentation** (there are three different presentation questions)**:**

   3a: The first set of six diagrams includes the PPM practices, often on the periphery of the model. It can create the impression that modelling continued until a PPM practice(s) was identified, i.e. a 'forced variable'. Are you comfortable with the diagrams as is or do you think I should rather use the second set of diagrams that does not include the PPM practices explicitly?

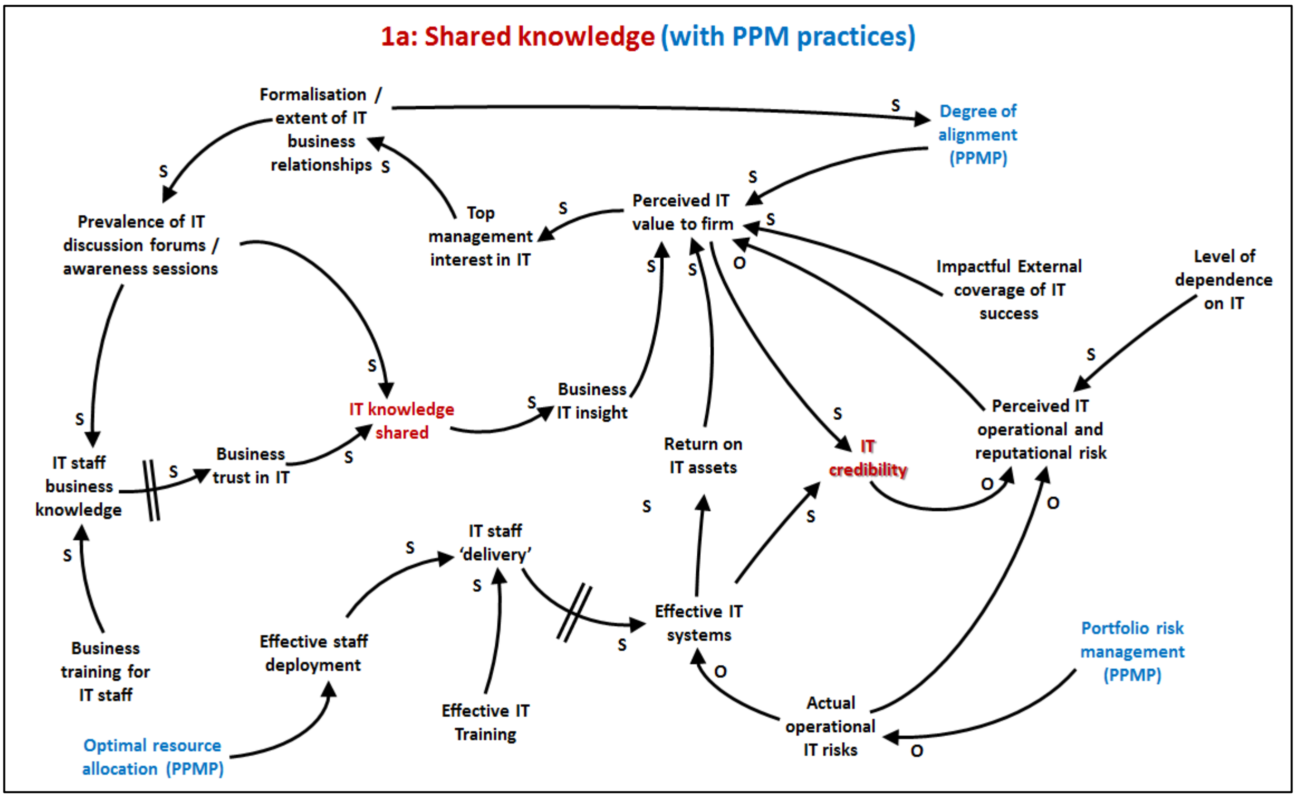
   3b: With the multiple common elements between the six diagrams, will there be value in merging them into a single model? Will that result in something overly complex and defeat the purpose of doing a CLD in the first instance?

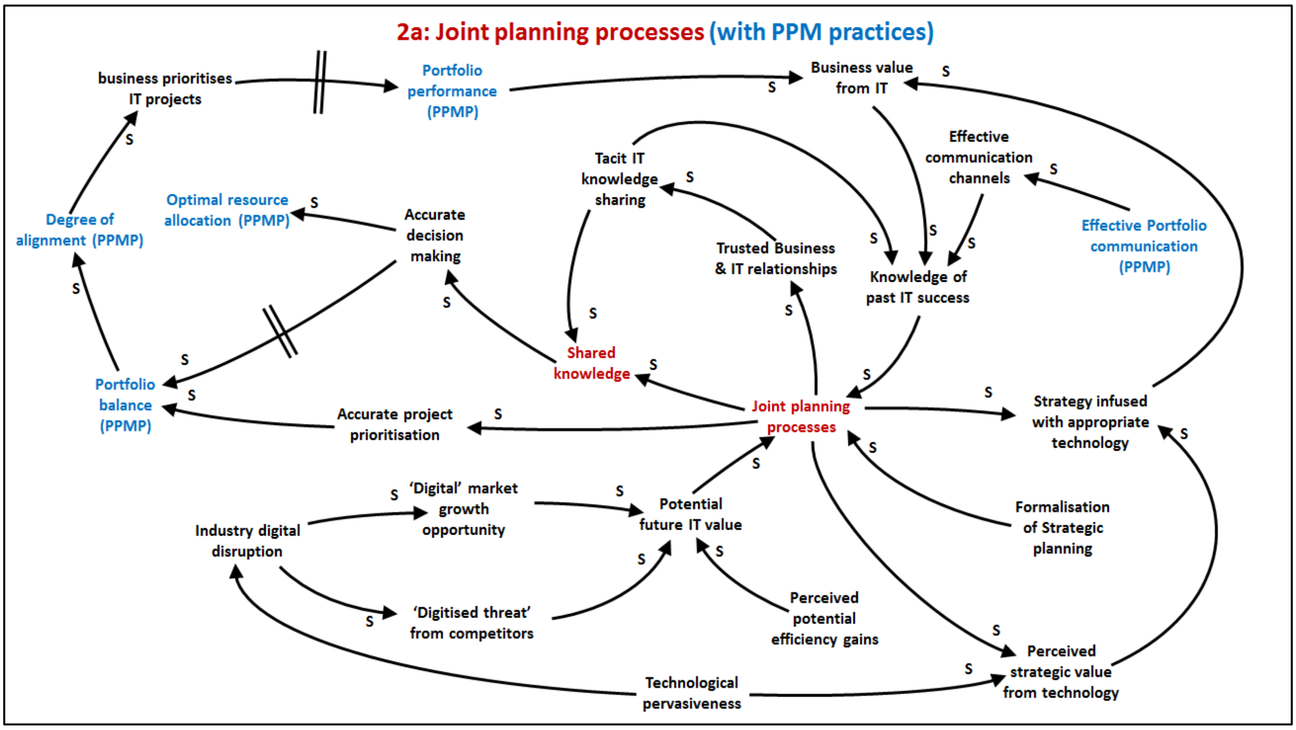
   3c: Do you think there could be potential value in creating a single model, but from a particular stakeholder / functional perspective? For example, IT Governance view, Executive Management view, IT systems user view? Any other perspective?

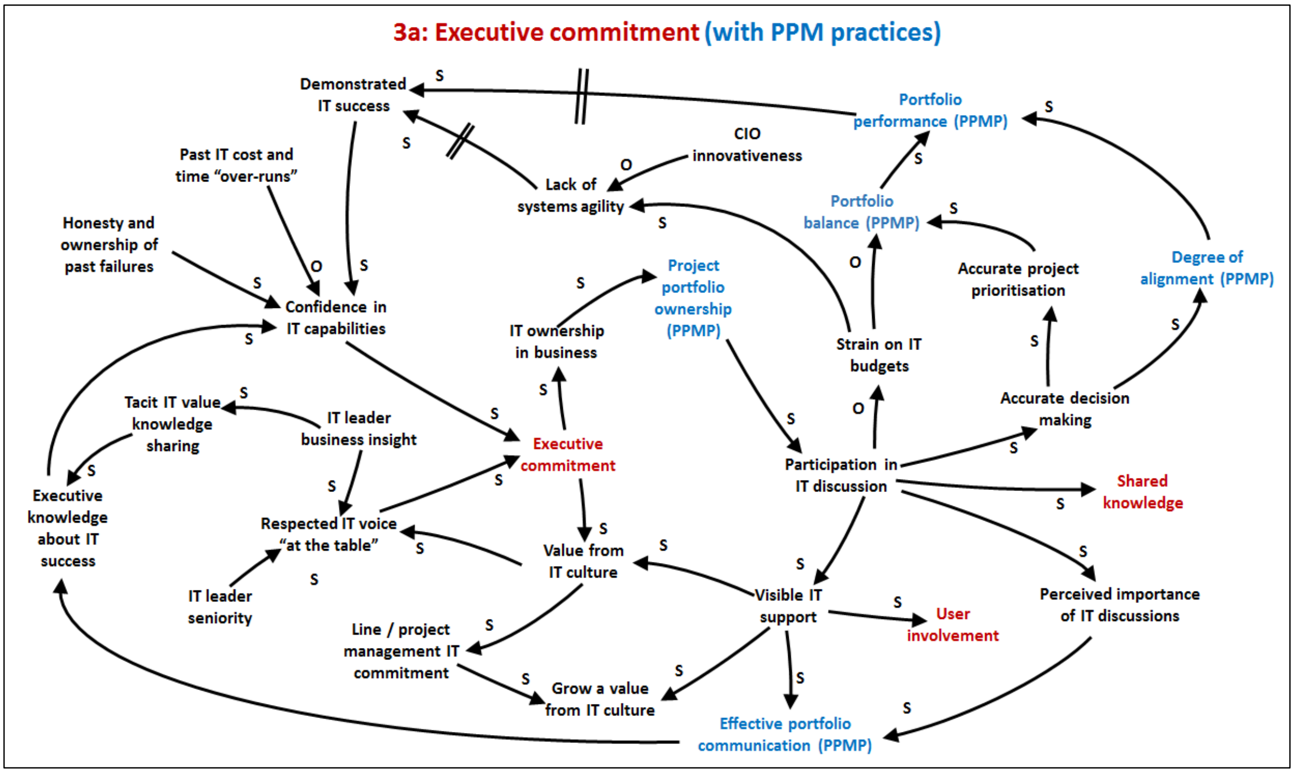
4. **Optional question:** Although the diagrams were carefully constructed from the interviews conducted with the business representatives, is there anything that you feel uncomfortable with or that does not align with your own beliefs and insights on business and IT alignment?

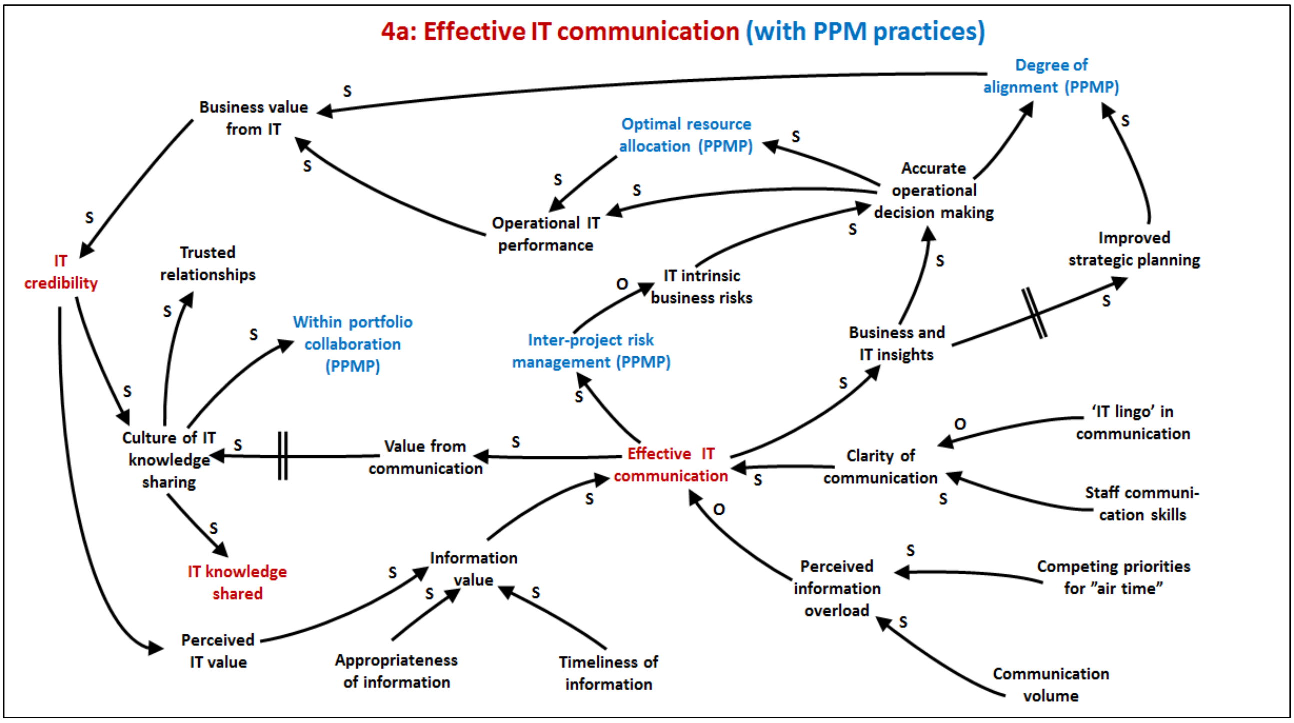
Business and IT alignment diagrams (*including PPM practices*)

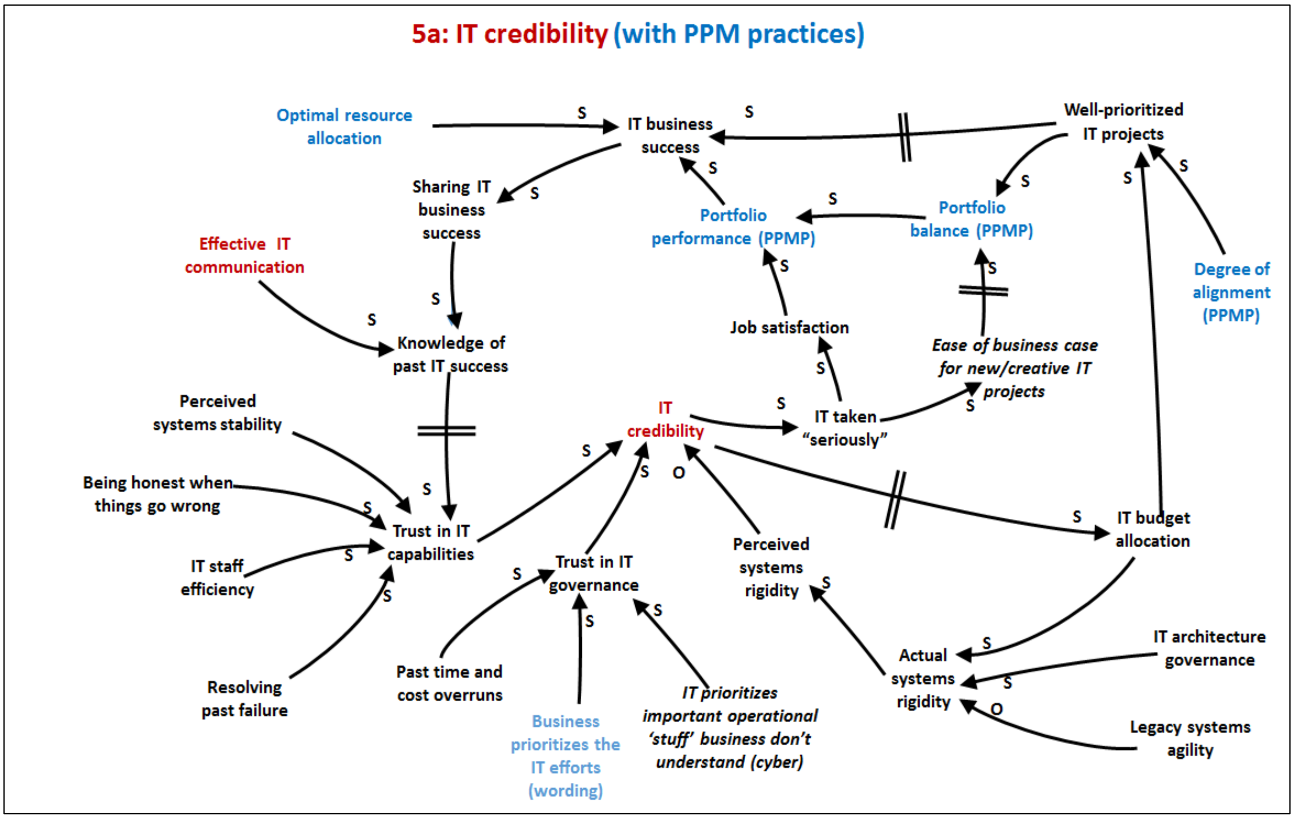
The description of the diagrams below is contained in Chapter 6 of the draft dissertation (work in process) as well as some supporting comments from the interviews.

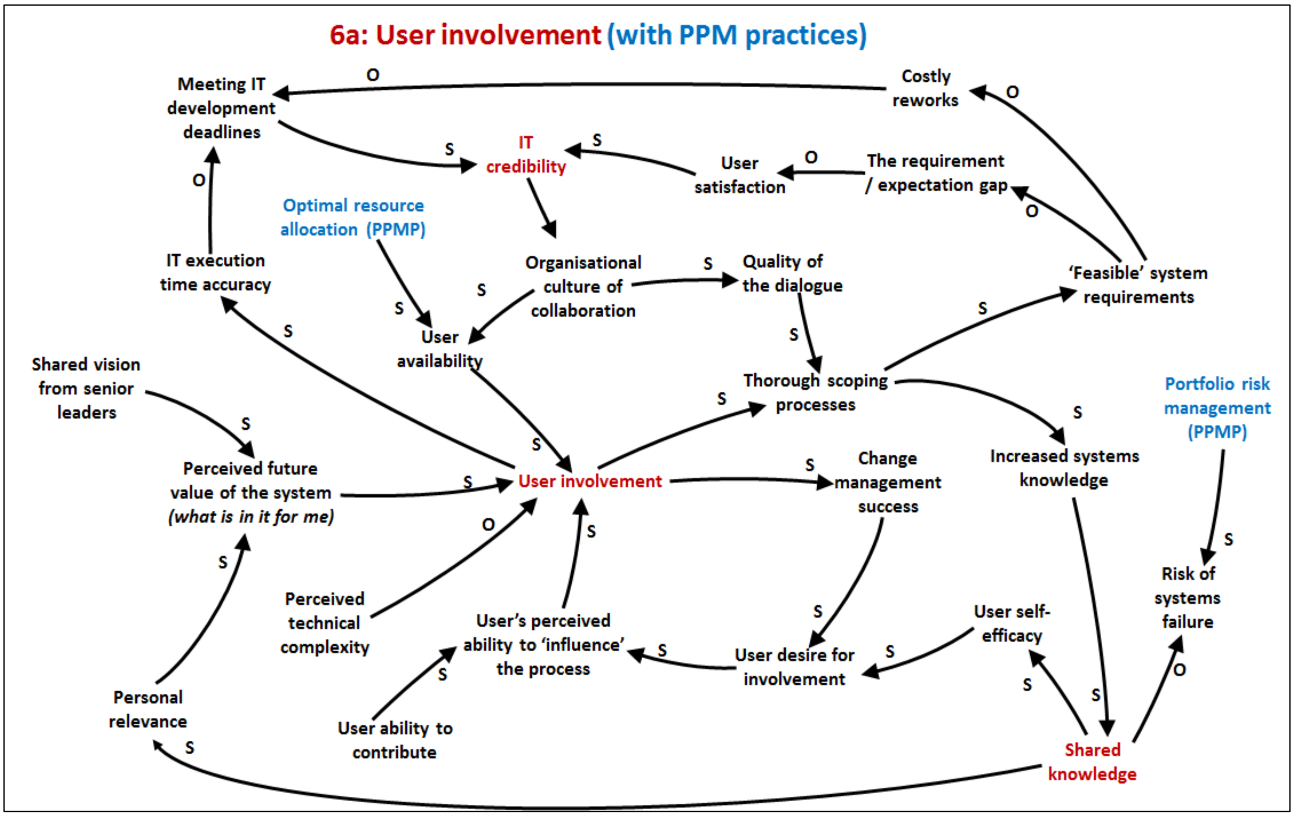





3a: Executive commitment (with PPM practices)
Demonstrated IT success
Portfolio performance (PPMP)
CIO innovativeness
Lack of systems agility
Past IT cost and time "over-runs"
Honesty and ownership of past failures
Confidence in IT capabilities
Portfolio balance (PPMP)
Accurate project prioritisation
Degree of alignment (PPMP)
Project portfolio ownership (PPMP)
IT ownership in business
Strain on IT budgets
Accurate decision making
Tacit IT value knowledge sharing
IT leader business insight
Executive commitment
Participation in IT discussion
Shared knowledge
Executive knowledge about IT success
Respected IT voice "at the table"
Value from IT culture
Visible IT support
User involvement
Perceived importance of IT discussions
IT leader seniority
Line / project management IT commitment
Grow a value from IT culture
Effective portfolio communication (PPMP)

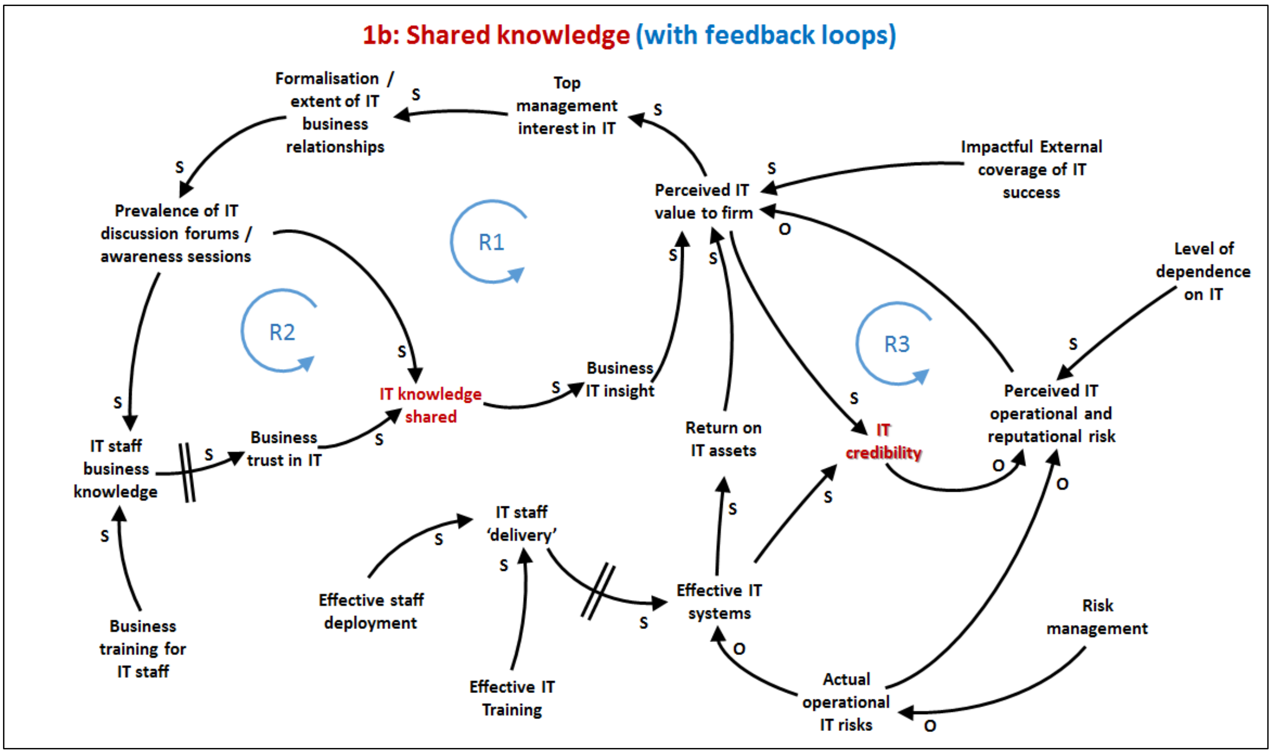

4a: Effective IT communication (with PPM practices)
Degree of alignment (PPMP)
Business value from IT
Optimal resource allocation (PPMP)
Accurate operational decision making
Operational IT performance
IT credibility
Trusted relationships
IT intrinsic business risks
Improved strategic planning
Within portfolio collaboration (PPMP)
Inter-project risk management (PPMP)
Business and IT insights
Culture of IT knowledge sharing
Value from communication
Effective IT communication
Clarity of communication
'IT lingo' in communication
Staff communi-cation skills
IT knowledge shared
Information value
Perceived information overload
Competing priorities for "air time"
Perceived IT value
Appropriateness of information
Timeliness of information
Communication volume

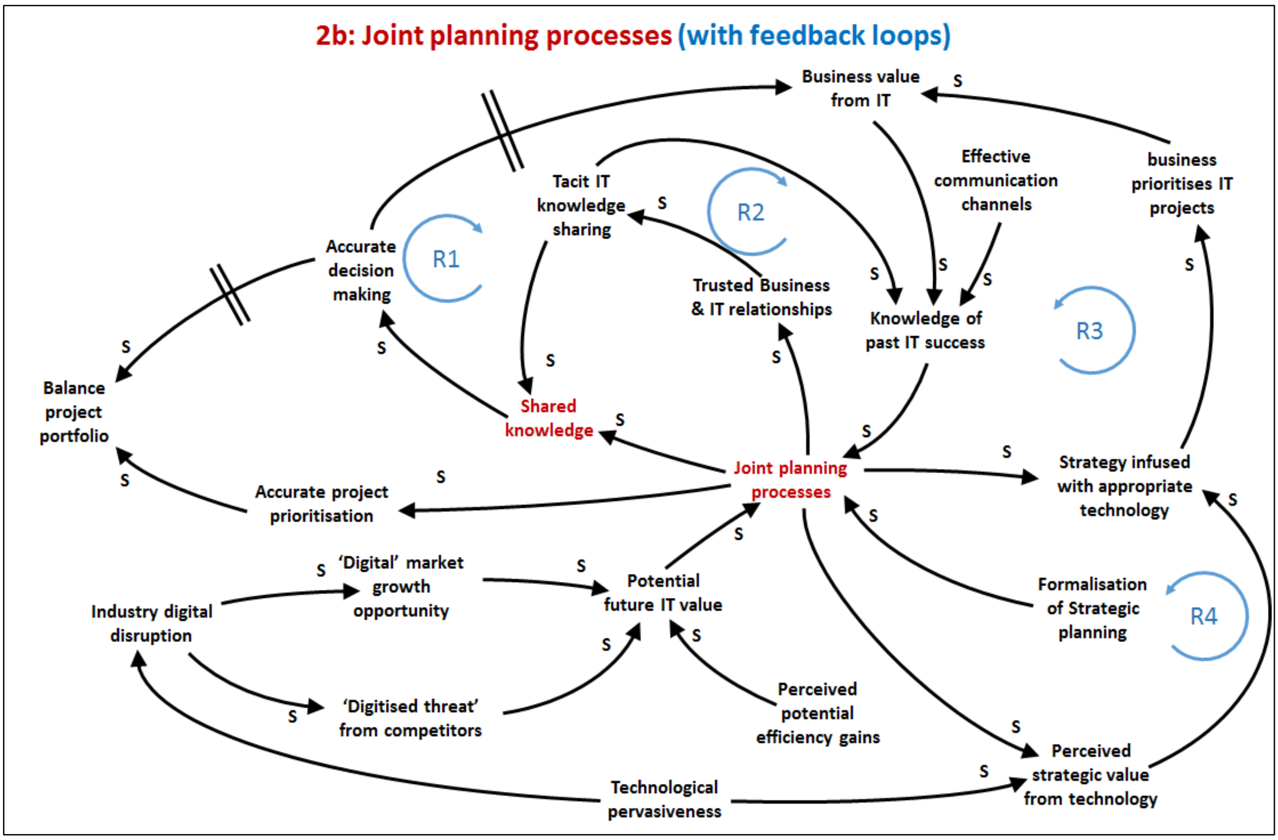

5a: IT credibility (with PPM practices)
Optimal resource allocation
IT business success
Well-prioritized IT projects
Sharing IT business success
Portfolio performance (PPMP)
Portfolio balance (PPMP)
Degree of alignment (PPMP)
Effective IT communication
Job satisfaction
Ease of business case for new/creative IT projects
Knowledge of past IT success
Perceived systems stability
IT credibility
IT taken "seriously"
Being honest when things go wrong
Trust in IT capabilities
IT budget allocation
IT staff efficiency
Trust in IT governance
Perceived systems rigidity
Resolving past failure
Past time and cost overruns
Actual systems rigidity
IT architecture governance
Legacy systems agility
Business prioritizes the IT efforts (wording)
IT prioritizes important operational 'stuff' business don't understand (cyber)

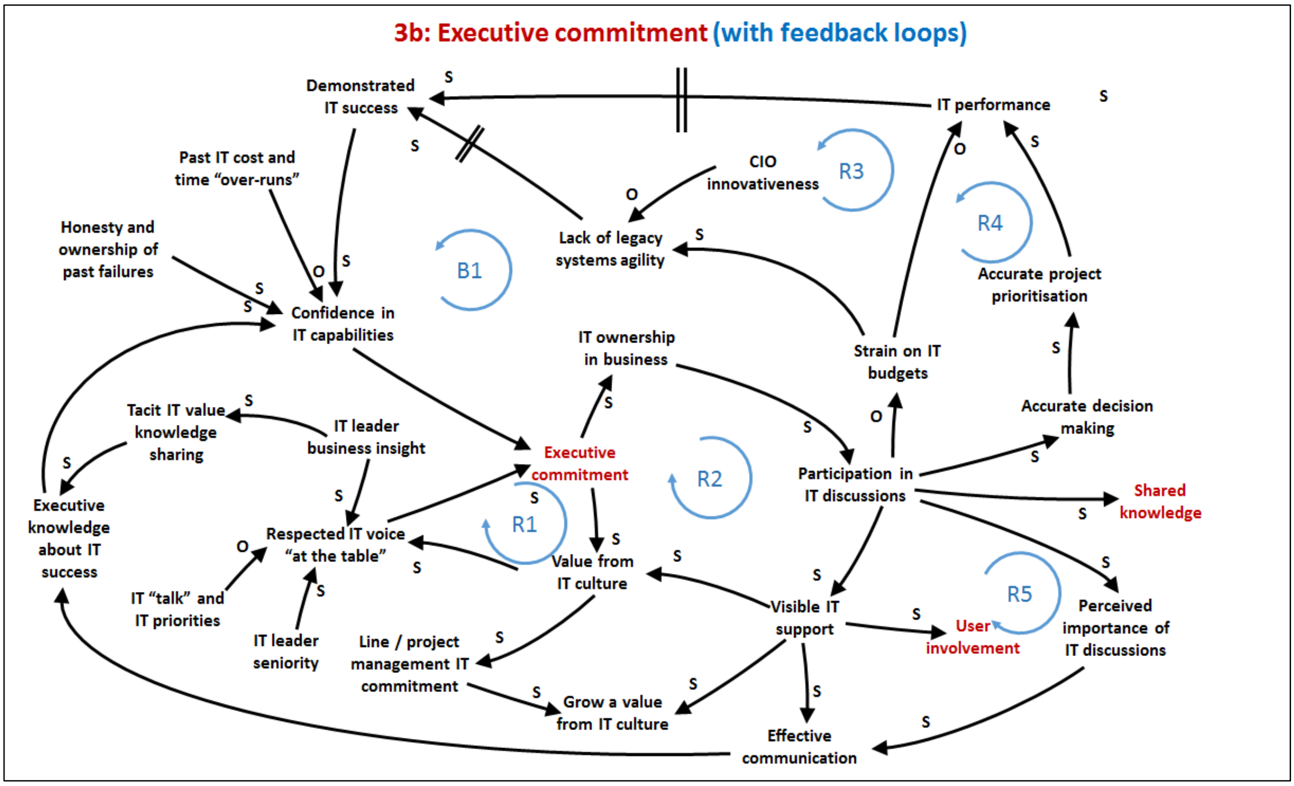

6a: User involvement (with PPM practices)
Meeting IT development deadlines
Costly reworks
IT credibility
User satisfaction
The requirement / expectation gap
Optimal resource allocation (PPMP)
IT execution time accuracy
Organisational culture of collaboration
Quality of the dialogue
'Feasible' system requirements
User availability
Shared vision from senior leaders
Thorough scoping processes
Portfolio risk management (PPMP)
Perceived future value of the system (what is in it for me)
User involvement
Change management success
Increased systems knowledge
Risk of systems failure
Perceived technical complexity
User's perceived ability to 'influence' the process
User desire for involvement
User self-efficacy
Personal relevance
User ability to contribute
Shared knowledge

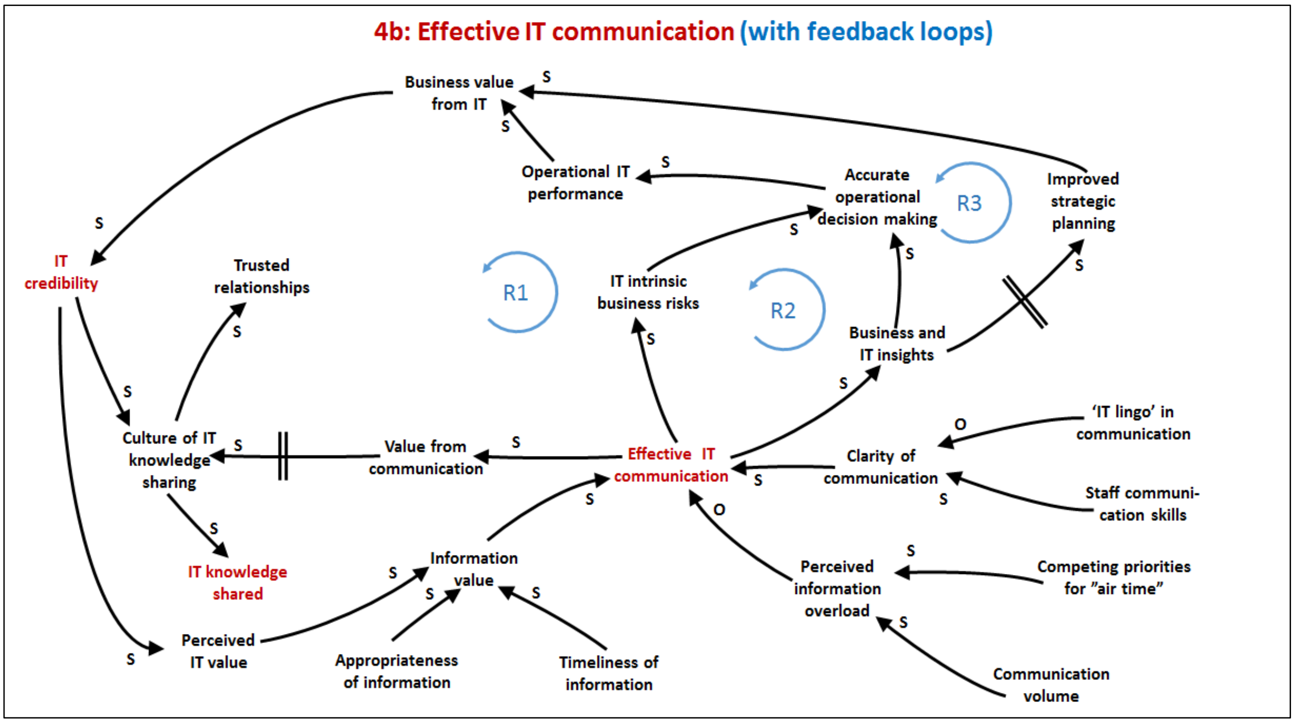
Diagrams without explicitly PPM practices with feedback loops

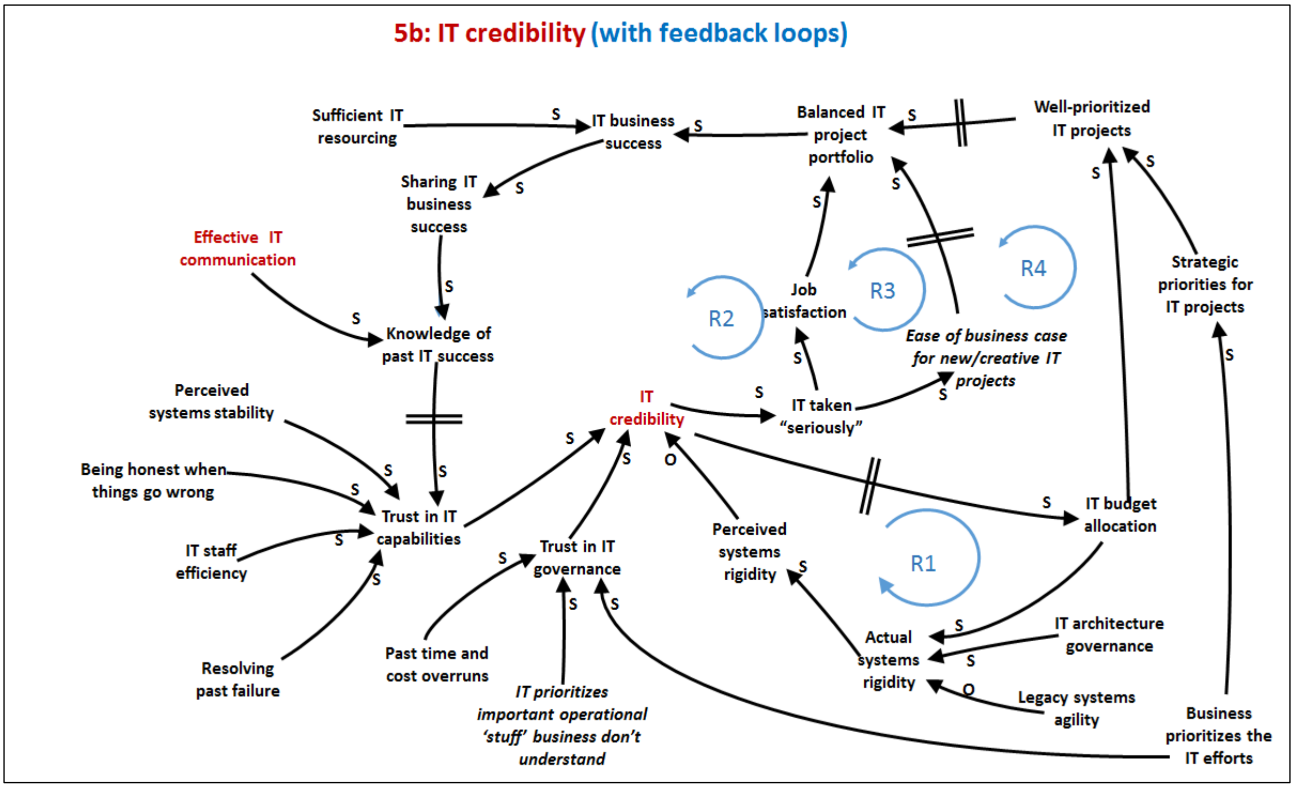
The description of the diagrams below is contained in Chapter 6 of the draft dissertation (work in process). Analysis of the feedback loops, the impact and the potential systems archetypes is work in process.

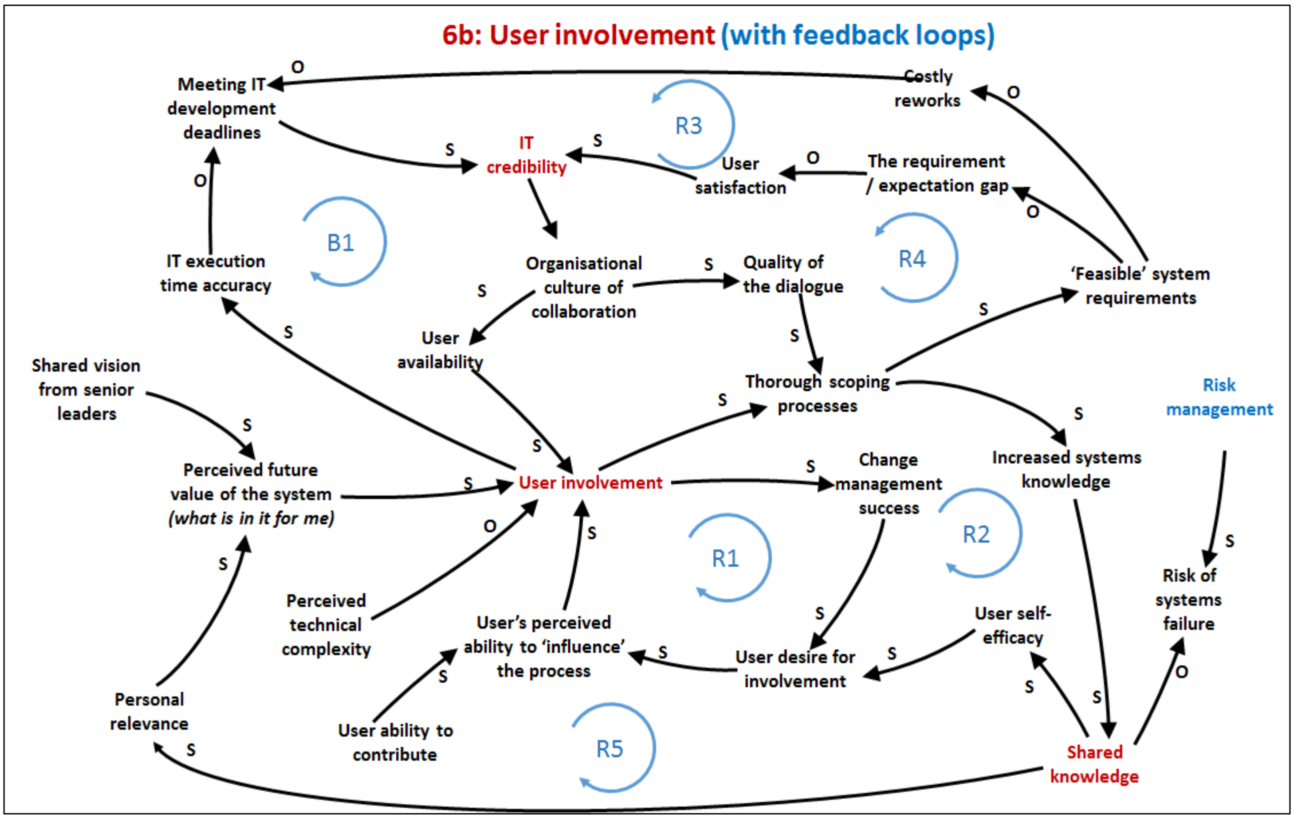




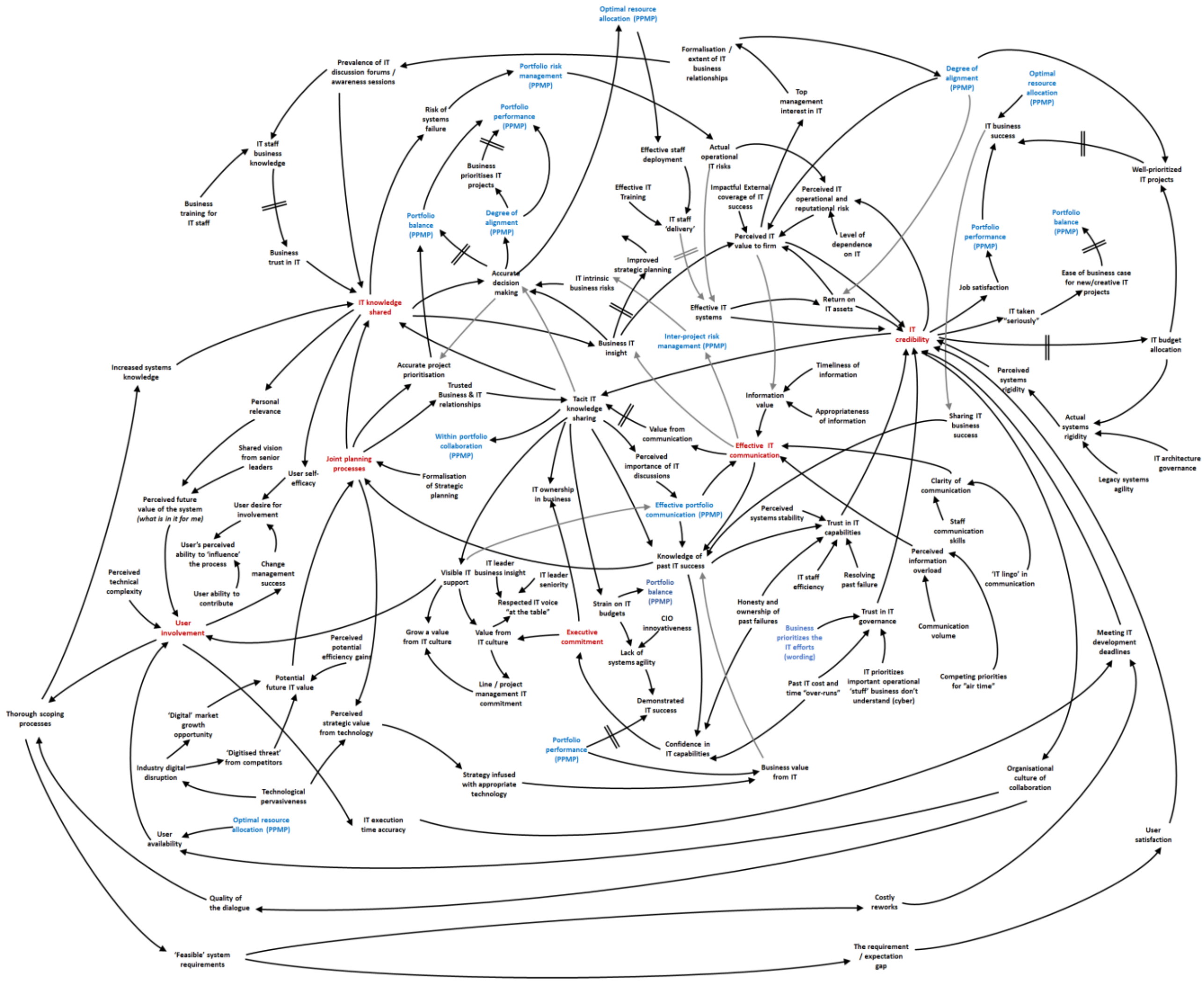

3b: Executive commitment (with feedback loops)
Demonstrated IT success
IT performance
Past IT cost and time "over-runs"
CIO innovativeness
R3
R4
Honesty and ownership of past failures
Lack of legacy systems agility
B1
Accurate project prioritisation
Confidence in IT capabilities
IT ownership in business
Strain on IT budgets
Tacit IT value knowledge sharing
IT leader business insight
Executive commitment
R2
Participation in IT discussions
Accurate decision making
Shared knowledge
Executive knowledge about IT success
Respected IT voice "at the table"
R1
Value from IT culture
Visible IT support
R5
User involvement
Perceived importance of IT discussions
IT "talk" and IT priorities
IT leader seniority
Line / project management IT commitment
Grow a value from IT culture
Effective communication


4b: Effective IT communication (with feedback loops)
Business value from IT
Operational IT performance
Accurate operational decision making
R3
Improved strategic planning
IT credibility
Trusted relationships
R1
IT intrinsic business risks
R2
Business and IT insights
'IT lingo' in communication
Culture of IT knowledge sharing
Value from communication
Effective IT communication
Clarity of communication
Staff communication skills
IT knowledge shared
Information value
Perceived information overload
Competing priorities for "air time"
Perceived IT value
Appropriateness of information
Timeliness of information
Communication volume


5b: IT credibility (with feedback loops)
Sufficient IT resourcing
IT business success
Balanced IT project portfolio
Well-prioritized IT projects
Sharing IT business success
Effective IT communication
Knowledge of past IT success
Job satisfaction
Ease of business case for new/creative IT projects
Strategic priorities for IT projects
R2
R3
R4
Perceived systems stability
IT credibility
IT taken "seriously"
Being honest when things go wrong
Trust in IT capabilities
IT budget allocation
IT staff efficiency
Trust in IT governance
Perceived systems rigidity
R1
Resolving past failure
Past time and cost overruns
Actual systems rigidity
IT architecture governance
Legacy systems agility
IT prioritizes important operational 'stuff' business don't understand
Business prioritizes the IT efforts


6b: User involvement (with feedback loops)
Meeting IT development deadlines
Costly reworks
IT credibility
R3
User satisfaction
The requirement / expectation gap
IT execution time accuracy
B1
Organisational culture of collaboration
Quality of the dialogue
R4
'Feasible' system requirements
User availability
Thorough scoping processes
Shared vision from senior leaders
Risk management
Perceived future value of the system (what is in it for me)
User involvement
Change management success
Increased systems knowledge
R1
R2
Risk of systems failure
Perceived technical complexity
User's perceived ability to 'influence' the process
User desire for involvement
User self-efficacy
Personal relevance
User ability to contribute
R5
Shared knowledge

APPENDIX L: CONSOLIDATED CAUSAL LOOP DIAGRAM



APPENDIX M:
PRACTITIONER VALIDATION INTERVIEWS

Dear participant, thank you for availing yourself for a final set of diagram validation interviews with selected practitioners as part of my PhD research project.

Scope

The interviews are intended to discuss the System dynamics diagrams that present the collective insight about business and IT alignment (BITA), gathered during interviews with senior managers in the Financial Services industry in South Africa. The interviews are presented as Causal Loop Diagrams (CLDs).

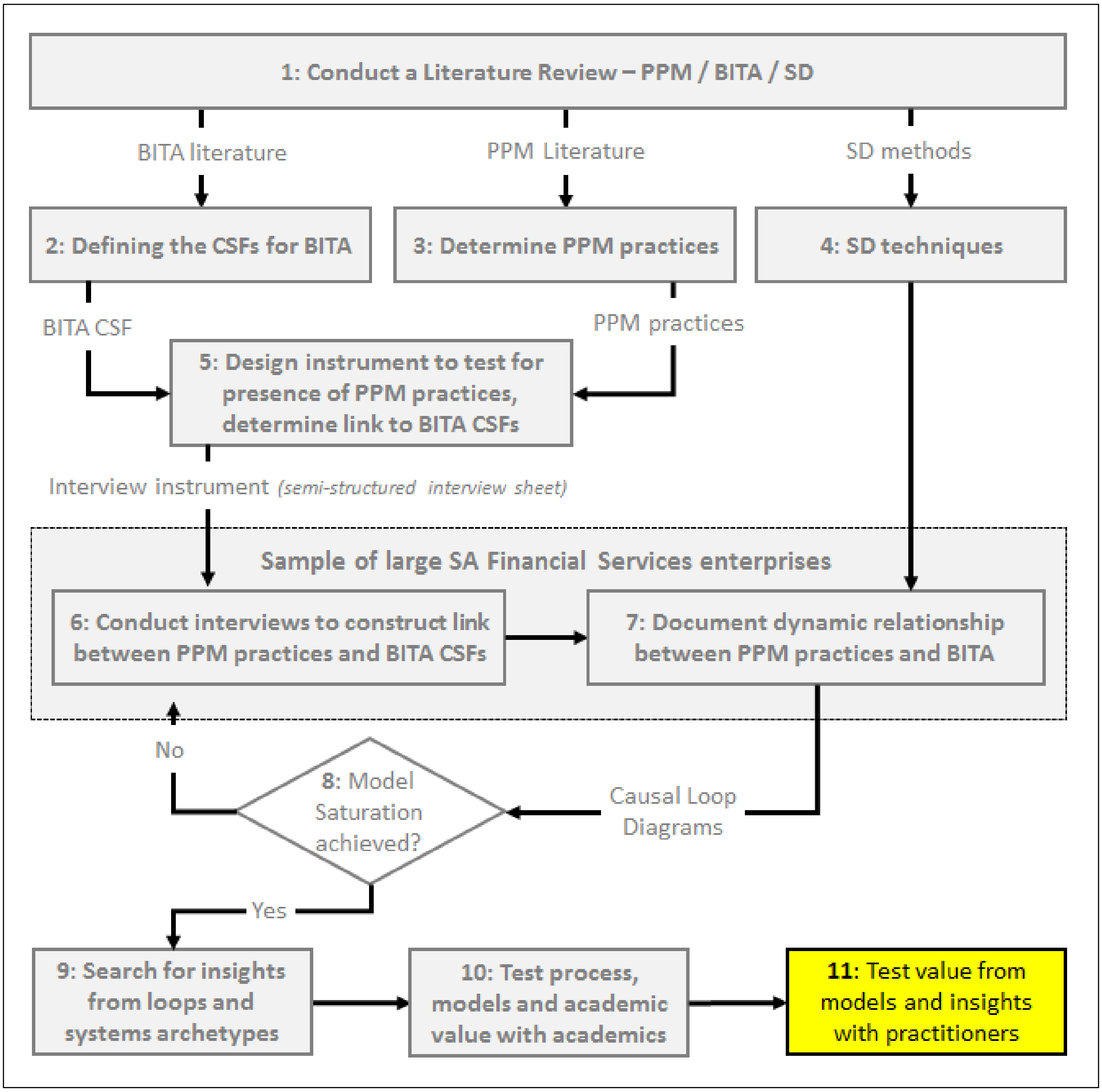
A structured literature review identified six BITA success factors contained in Chapter 4 of the draft dissertation. Six different diagrams, one per factor, indicate the complex and dynamic relationship between the multiple variables influenced by management actions that impact the alignment of IT efforts with strategic intent.

The CLDs were constructed from the transcribed interviews and represent the variables and influences that described the dynamic complexity of business and IT alignment for each factor. Included in the diagrams are the Project Portfolio Management (PPM) practices that contribute to these factors.

This interview intends to answer some final questions about potential practitioner value from the research.

Process

The figure below shows the research process.



This interview forms part of the final Step 11 in the research process that will include interviews with practitioners, of which you form part.

Research objective

The research title is: *A Systems Dynamic perspective on the contribution of Project Portfolio Management practices towards Business and IT alignment.*

Although the research intended to investigate the contribution of PPM practices towards BITA in particular, significant insight was gained from the modelling process about BITA and the influences at play in dynamic environments. The value is thus more than initially anticipated with new BITA insights beyond the contribution of the PPM practices.

The diagrams presented below is the results of the interviews and each diagram represent a perspective on the particular success factor. Beneath each diagram is a very brief narrative description of the key finding associated with the particular model. The research proposes a contribution towards BITA for both practitioners and your contribution will assist to achieve these objectives.

Questions for discussion

1. **Practitioner value diagrams:** Do you think there is any specific value to be gained in terms of business and IT alignment **through the diagrams** (with or without detailed descriptions) for practitioners?

- Shared knowledge
- Collaborative planning processes
- Executive commitment
- Effective communication
- IT credibility
- User involvement

2. **Practitioner value narrative descriptions:** Do you think there is any specific value to be gained in terms of business and IT alignment **through the diagrams** (with or without detailed descriptions) for practitioners?

- Shared knowledge
- Collaborative planning processes
- Executive commitment
- Effective communication
- IT credibility
- User involvement

3. **Interesting insights:** Do you think there is any specific value to be gained in terms of business and IT alignment through the diagrams (with or without detailed descriptions) for researchers?

4. **Limitations:** Although the diagrams were carefully constructed from the interviews conducted with the business representatives, is there anything that you feel uncomfortable with or that does not align with your own beliefs and insights on business and IT alignment?

- Shared knowledge
- Collaborative planning processes
- Executive commitment
- Effective communication
- IT credibility
- User involvement

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