The Integration of Project Management Processes with a Methodology to Manage a Radical Innovation Project

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Declaration

I, the undersigned, hereby declare that the work contained in this thesis is my own original work and has not previously in its entirety or in part been submitted at any university for a degree.

Ek, die ondergetekende verklaar hiermee dat die werk gedoen in hierdie tesis my eie oorspronklike werk is wat nog nie voorheen gedeeltelik of volledig by enige universiteit vir 'n graad aangebied is nie.

Signature: ………………………..

Date: 3 March 2007

Synopsis

In today's business environment it is widely accepted that innovation is key to improving the economic performance of companies (Van der Panna et al. 2003) and for achieving and sustaining a competitive advantage in the market place.

Based on the definition of radical innovation, a radical innovation project involves a high level of "newness" (Damanpour 1996), which in turn leads to high levels of complexity and uncertainty. However, it is difficult to manage these high levels of complexity and uncertainty within the structured framework of the traditional project management bodies of knowledge (Williams 2005). The following problem was thus formulated: Project management concepts alone, captured in the various bodies of knowledge, are not sufficient enough to successfully manage radical innovation projects. Companies therefore struggle to gain a competitive advantage through innovation, as the implementation of the radical innovation is seldom successful.

The thesis presents a methodology termed the "Innovation Implementation Methodology" (IIM), which combines a range of components and concepts that support radical innovation projects. The IIM combines concepts such as knowledge management, project and team integration, project principles, design objectives, prototypes and risk and change management into four main components. Each component provides a different view of the radical innovation project. These views include:

- A view of the different levels of detail required,
- A view of the roles and responsibilities,
- A view of the project structure and team integration, and
- A scientific and experimental view.

However, a well-planned and organised approach is also required to successfully complete a radical innovation project (Hiatt & Creasey 2003). A framework was thus developed to integrate the components and concepts of the IIM with the processes of PMBoK, a well-known project management body of knowledge. The level and type of integration is determined by the level and type of innovation required in a specific project. A project filter was developed to assist companies in categorising projects based on the required level of innovation, as a typical radical innovation project requires more IIM components during a specific phase compared with a replication-type project, which requires more PMBoK processes during the same project phase.

A case study of a project in the financial services industry is presented. The IIM, along with a limited number of project management processes, was used to manage this project through its entire life cycle. The project filter revealed a high-level of innovation in the project and thus

the integration of IIM with the project management processes favoured using more IIM components and concepts.

The case study reveals several important successes and shortcomings of the project. From these, important lessons can be developed for the integration of IIM and project management processes in future radical innovation projects. Some of the key lessons were:

1. IIM can assist in achieving project buy-in.
2. While initial high-level scope, objectives, mandates, schedules and risk plans are in place, formal processes are required to add detail to these as the project evolves and the uncertainty decreases.
3. A formal process modelling management methodology is required to keep the process models updated through the design and implementation phases of the project and into the operational environment.
4. Governance principles are an excellent way of ensuring that the initial innovation concept is respected throughout the detailed design process and maintained after implementation.
5. Prototypes and mock-ups are a cost effective way of testing innovative concepts and gathering information in order to make important design decisions.
6. An overall programme plan can be broken down into more detailed sub-project plans, but a project manager is required to manage the execution of these plans.
7. Roadmaps are an excellent way of supporting innovation teams, but it is important for the team members to agree on the roadmap structure and to take ownership of the roadmap from the start.
8. Management commitment is a key factor in the successful completion of a radical innovation project.

The main conclusions that were drawn from the thesis are:

1. Innovation management is vital for a company to develop and sustain a competitive advantage.
2. Project management processes alone cannot support radical innovation projects.
3. The correct integration of IIM components and concepts and project management processes are required to successfully support a radical innovation project.

4. The level and type of integration is determined by the level of innovation required in the project.
5. The IIM can be used to develop a highly innovative concept.
6. Project management processes should not be introduced too late into a radical innovation project process, and formal project management control should assist in evolving the scope, objectives, mandates, schedules and risk plans as the levels of uncertainty decrease.

Overall, from an innovation and implementation perspective, the project presented in the case study was deemed a success by the majority of the stakeholders involved. This partly supports the theory that the correct integration of IIM components and project management processes, based on the innovativeness of the project, can successfully support the management of a radical innovation project. This is the first step in validating the IIM and the technique of integrating the IIM with project management processes.

Further research should include the following aspects:

1. Detailed categorisation of projects into different levels of innovation for a variety of generic project types (e.g. process improvements, system implementations, product development) and
2. Several cases studies of projects being supported by the IIM, integrated with project management processes.

Opsomming

In die hedendaagse besigheidswêreld word dit aanvaar dat innovasie van sleutelbelang is om maatskappye se ekonomiese prestasie te verbeter (Van der Panna et al. 2003) en om ‘n mededingende voorsprong in die mark te bewerkstellig en te handhaaf.

'n Radikale innovasieprojek omvat ‘n hoë vlak van “nuutheid” (Damanpour 1996), wat gevolglik lei tot hoë vlakke van kompleksiteit en onsekerheid. Dit is moelik om hierdie hoë vlakke van kompleksiteit en onsekerheid binne die gestruktureerde raamwerk van tradisionele projekbestuur kennisraamwerker (Williams 2005) te bestuur. Die volgende probleem is dus geformuleer: “Projekbestuurkonsepte, soos vervat in verskeie kennisliggame, is alleen nie voldoende om radikale innovasieprojekte suksesvol te bestuur nie. Maatskappye sukkel dus om ‘n mededingende voorsprong deur innovasie te verkry, aangesien implementering van die radikale innovasie selde suksesvol is.”

Hierdie tesis stel ‘n metodologie, *genaamd* die “Innovasie Implementering Metodologie” (IIM) voor, wat bestaan uit ‘n kombinasie van komponente en konsepte wat radikale innovasieprojekte ondersteun. Die IIM kombineer konsepte soos kennisbestuur, projek- en spanintegrasie, projekbeginsels, ontwerpsdoelwitte, prototipes en risiko- en veranderingsbestuur in vier hoofkomponente. Elke komponent verskaf ‘n ander blik op die radikale innovasieprojek. Hierdie gesigspunte sluit onder meer in:

- ‘n Blik op die verskillende vlakke van detail benodig;
- ‘n Blik op rolle en verantwoordelikhede;
- ‘n Blik op die projekstruktuur en spanintegrasie;
- ‘n Wetenskaplike en eksperimentele blik.

‘n Goedbeplande en georganiseerde benadering word ook benodig om ‘n radikale innovasieprojek suksesvol te ontplooi (Hiatt & Creasey 2003). ‘n Raamwerk is daarom ontwikkel om die komponente en konsepte van die IIM met die prosesse van PMBoK, ‘n welbekende projekbestuur kennisraamwerk, te integreer. Die vlak en tipe van integrasie word bepaal deur die vlak en tipe van innovasie vereis deur ‘n spesifieke projek. ‘n Projekfilter is ontwikkel om maatskappye by te staan in die kategorisering van projekte. Hierdie kategorisering is gebaseer op die verlangde vlak van innovasie aangesien ‘n tipiese radikale innovasieprojek meer IIM komponente noodsaak gedurende ‘n spesifieke fase, in vergelyking met ‘n roetine projek, wat weer meer PMBoK prosesse gedurende dieselfde projekfase noodsaak.

‘n Gevallestudie van ‘n projek uitgevoer in die finansiële dienste sektor word aangebied. Die IIM, tesame met ‘n beperkte aantal tradisionele projekbestuurprosesse is gebruik om hierdie projek gedurende die hele projeklewensiklus te bestuur. Die projekfilter het ‘n hoë vlak van

innovasie in die projek aangedui, en dus het die IIM komponente en konsepte wat deel vorm van die integrasie van IIM en tradisionele projekbestuurprosesse, meer aandag geniet.

Die gevallestudie het ‘n aantal belangrike suksesse en tekortkominge van die projek aan die lig gebring. Belangrike insigte ten opsigte van die integasie van IIM en projekbestuurprosesse in toekomstige projekte is ontwikkel. Die belangrikste insigte is:

1. IIM kan help om inkoop in ‘n projek te verkry;
2. Met die aanvanklike hoë-vlak bestek, doelwitte, mandate, skedules en risikoplanne in plek, word formele prosesse benodig om detail hierby te voeg soos die projek verander en onsekerheid verminder;
3. ‘n Formele prosesmodelleringsbestuursmetodologie word benodig om die prosesmodelle op datum te hou gedurende die ontwerps- en implentasiefases van die projek, asook in die operasionele omgewing;
4. Bestuursbeginsels is ‘n uitstekende manier om te verseker dat die aanvanklike innovasie konsep gedurende die detail ontwerpsproses gerespekteer word en gehandhaaf word ná implementering;
5. Prototipes en modelle is koste-effektiewe maniere om innoverende konsepte te toets en inligting in te win, soos benodig in die maak van belangrike ontwerpsbesluite;
6. ‘n Oorkoepelende programplan kan afgebreek word in meer gedetailleerde sub-projekplanne, maar ‘n projekbestuurder is nodig om die uitvoering van hierdie planne te bestuur;
7. Projekpadkaarte is ‘n nuttige manier om innovasiespanne te ondersteun, maar dit is belangrik dat spanlede saamstem met die padkaartstruktuur en van die begin af eienaarskap neem van die projekpadkaart;
8. Bestuurstoewyding is ‘n sleutelfaktor vir die suksesvolle uitvoering van ‘n radikale innovasieprojek.

Die hoof gevolgtrekkings van die tesis is:

1. Innovasiebestuur is noodsaaklik vir ‘n maatskappy om ‘n mededingende voorsprong te bewerkstellig en te handhaaf;
2. Projekbestuurprosesse alleen ondersteun nie radikale innovasieprojekte voldoende nie;
3. Die korrekte kombinasie van IIM komponente en -konsepte en projekbestuurprosesse word benodig om ‘n radikale innovasieprojek suksesvol te ondersteun;

4. Die vlak van en tipe integrasie word bepaal deur die vlak van innovasie deur projek vereis;
5. Die IIM kan gebruik word om ‘n hoogs innoverende konsep te ontwikkel;
6. Projekbestuurprosesse behoort vroeg genoeg in ‘n radikale innovasieprojekproses ingespan te word. Formele projekbestuur behoort by te dra tot die verandering in die bestek, doelwitte, mandate, skedules en risikoplanne soos die vlakke van onsekerheid verminder.

Die projek, soos beskryf in die gevallestudie, was uit ‘n innovasie- en implementeringsperspektief, as ‘n sukses beskou deur die meerderheid van belanghebbers. Dit ondersteun gedeeltelik die teorie dat die korrekte integrasie van IIM komponente en projekbestuurprosesse, gebaseer op die mate van die projek se innoverendheid, die bestuur van ‘n radikale innovasieprojek suksesvol kan ondersteun. Dit is die eerste stap in die validering van die IIM asook die tegniek om die IIM met projekbestuurprossesse te integreer.

Verdere navorsing behoort die volgende aspekte in te sluit:

1. Detail kategorisering van projekte in verskillende vlakke van innovasie, vir ‘n verskeidenheid van generiese projektipes (bv. prosesverbeteringe, stelselimplementerings, en produkontwikkeling); en
2. Verskeie gevallestudies van projekte, geondersteun deur die IIM, geïntegreer met projekbestuurprosesse.

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List of Abbreviations

BCG	Boston Consulting Group
BCI	Business Concept Innovation
BEI	Business Enhancement Initiative
CII	Confederation of Indian Industry
IIM	Innovation Implementation Methodology
IPMA	International Project Management Association
KM	Knowledge Management
NB	New Business
NSI	National System of Innovation
PM	Project Management
PMBoK	Project Management Body of Knowledge
PMI	Project Management Institute
TPP	Technology, Product and Process
US	United States of America
WBS	Work Breakdown Structure

1. Introduction

The French novelist, Alphonse Karr (1808-90) wrote, “The more things change, the more they stay the same”. The question is why do things remain the same if change is happening. This statement is true in many facets of today’s world, and especially so in the context of companies. Despite many company’s best efforts, successful innovation and change projects remain elusive and rare (Cozijnsen, Vrakking & Van IJzerloo 2000). The failure of innovation and change projects in companies thus results in an entrenchment of the statues quo, a comfort in the current situation and an increased fear of and resistance to change. The quote could read; *the more things* ***fail*** *to change, the more they stay the same.*

This thesis investigates the integration of project management processes with a methodology for managing a radical innovation project. Project management processes often fail to manage the complex and uncertain environment of most radical innovation projects (Williams, 2005). Furthermore, the use of project management techniques may restrict the creativity and flexibility required for a successful innovation and stifle an innovative culture, especially in the early phases of a radical innovation project. However, innovation projects, as with all major changes, require a level of structure and control (Hiatt & Creasey 2003) in order meet the objectives of the project without exposing a company to unnecessary risks. The thesis structure along with the key research questions in each chapter is presented in Table 1.

Chapters 1 and 2 initiate the report by defining and categorising innovation and describing the innovation landscape in a company. In Chapter 3 projects and project management are defined. The interdependence between project management and innovation is investigated. The work of Williams (2005) is central to this chapter, as it shows how project management processes alone do not offer sufficient support for managing projects with high levels of uncertainty and complexity.

Once the groundwork of the first three chapters has been laid, the problem statement is developed. Chapter 4 summarises the first three chapters and concludes with the following problem statement:

> Project management concepts alone, captured in the various bodies of knowledge, are not sufficient enough to successfully manage and facilitate radical innovation projects. Therefore, companies struggle to gain a competitive advantage through innovation, as the implementation of radical innovations is seldom successful.

In Chapter 5 the methodology for managing the implementation of a radical innovation project is described. This methodology is called the Innovation Implementation Methodology (IIM). Once this methodology has been defined, the following hypothesis is presented in Chapter 6:

> The appropriate integration of IIM components and PMBoK processes, based on the innovativeness of the project, can successfully support the management of a radical innovation project.

The integration of project management processes and IIM begins by defining the criteria for measuring the level of innovation required in a project. Chapter 7 illustrates how these criteria can be used in a project filter in order to determine the level of innovation required in a project.

The integration of the IIM and project management processes is achieved by categorising a set of generic projects and indicating which project management processes and IIM components are required at specific project phases. The aim of this exercise is to develop a framework that a project manager can use to determine the level of innovation management and project management required at different stages of their projects.

The hypothesis is substantiated with the development of a case study in Chapter 8. The case study presents a project in the financial services industry and identifies the successes and shortcomings of the project, and makes recommendations as to how the balance between project management and innovation management can be improved. The overall success of the project and important lessons learned are also discussed.

The author has been personally involved in the case study project for the past two and a half years, and much of the work in this thesis is based on the literature as well as on the author's personal experience and interaction with team members of the implementation team. The research method followed in this thesis was as follows:

- The literature was used to develop the problem definition (Chapters 1, 2, 3, 4),
- The literature, author's experience and input from consulting team members was used to develop the IIM methodology and the hypothesis (Chapters 5, 6),
- The literature, author's experience and input from consulting team members was used to do the integration between IIM and the project management processes (Chapter 7), and
- The author's experience, in conjunction with input from the implementation team, was used to substantiate the hypothesis through the case study and to identify lessons learned (Chapter 8).

Table 1: Thesis Structure

Ch	Concepts	Research Questions
1	Innovation	What is the definition of innovation? How should innovations be categorised?
2	Innovation Landscape	What operational environment can support innovation? Can innovation provide a competitive advantage? What are the drivers of innovation? What are the barriers to innovation?
3	Project Management (PM) and Innovation	What is the definition of a project and project management? What are project management bodies of knowledge? How should projects be categorised? What is the relationship between project management and innovation management? Can project management support radical innovation projects?
4	Thesis Problem Definition	
5	A Methodology for the Implementation of a Radical Innovation (Innovation Implementation Methodology-IIM)	What are the require components of such a methodology? What are the important concepts of such a methodology? How do these components and concepts support a radical innovation project?
6	Thesis Hypothesis	
7	Integration of PM with IIM	How to determine the level of innovation of a project? How to select the PM processes and IIM concepts for a particular phase of a particular type of project?
8	Financial Services Case Study	How was the integration achieved in a radical innovation project in the financial services sector? What were the successes and shortcomings of the integration in the case of a radical innovation project in the financial services sector? What lessons can be learned from the case study for future radical innovation projects?
9	Conclusion	

2. Innovation

2.1 Definition of Innovation

As with most research that involves ideas relating to innovation, this thesis starts by describing several definitions of the concept of innovation. The aim of providing these definitions is to provide an overview of the literature and to ultimately decide on a definition that is appropriate for the chapters that follow. The aim is not to provide an in-depth analysis of the different definitions of innovation, as this is not the main focus of this thesis.

The definitions of innovation are almost as varied as the number of researchers that have studied the concept. A possible reason for this is because of the variety of different disciplines that have focused their attention on innovation; their definitions are thus based on their particular perspectives and experiences. Another reason for the variety in definitions is that the concept of innovation has become more complicated (Baker, 2002) over time.

Traditionally, a more linear approach to innovation was adopted. This approach involved the management of a life cycle from research to invention, to engineering, to manufacturing a product and marketing (21st Century Innovation Working Group 2004).

Due to the increased understanding of the complexity of innovation, the 21st Century Working Group defines innovation as follows:

> *Innovation transforms insight and technology into novel products, processes and services that create new value for stakeholders drive economic growth and improve standards of living (21st Century Innovation Working Group 2004:pg 11).*

Baker (2002), referring to the work of Burns & Stalker (1961) and Hull & Hage (1982), states that initial research focused on a company's ability to adapt to changes in the internal and external business environment whereas recent work has introduced a more proactive approach to innovation, as well as a variety of innovation types and levels.

An early definition of innovation, from an economics perspective, was presented by Schumpeter. An innovation – by definition –

> *had a substantial economic impact. An innovation was something that changed the market place in a profound way. The innovating organization was, thus, likely to become the new market leader and to gain an immense advantage over its competitors (Schumpeter 1943).*

An analysis of the meaning of Innovation in a services company was conducted by Oke (2004a). It was determined that employees of service companies described innovation as:

- Bringing new, market leading, products and services to customers,
- The successful commercialisation of new ideas,
- The application of creativity to further enhance the value-offering to clients,
- Improvement of service processes, and
- A process of research, build, test and learning leading ultimately to the creation of new services.

Oke summarises the above descriptions by saying:

> *From the definitions stated above, it would seem that respondents' understanding of innovation is related to the introduction of new 'things' (from conception to commercialisation) and improvement of existing 'things' (from conception to implementation). The 'things' could be products, services or processes (Oke 2004a: pg 38).*

Johannessen, Olsen & Lumpkin (2001) also believe that most of the definitions for innovation focus on newness and novelty.

The idea of novelty is illustrated in a European Union Green Paper (European Commission, 1995), which defines innovation as, "the successful production, assimilation and exploitation of novelty in the economic and social spheres".

Damanpour (1991) defined innovation as "the generation, development, and adaption of novel ideas on the part of the firm".

The interesting relationship between innovation and invention plays a significant role in defining the concept of innovation. Freeman (1982) explains that an invention can be seen as a new idea, model or even physical product or service product, whereas an innovation, from an economics perspective, is only achieved when the new idea or product achieves its first commercial success.

This idea extends the concept of *invention* to *innovation*, as it is no longer only seen as something new or novel, but something that is new, novel *and* that provides a company with commercial success. This clearly relates to an aspect of the definition (provided earlier) by Schumpeter (1943), where an innovation allows a company to become a market leader.

Although the above definitions are different, they encapsulate similar themes relating to innovation. These themes that can be extracted to form a single definition of innovation for use in the chapters that follow. The themes that seem to be repeated throughout the literature are the following:

The successful generation, development and implementation of new and novel ideas, WHICH

- introduce new products, processes and/or strategies to a company OR
- enhance current products, processes and/or strategies LEADING TO
- commercial success and possible market leadership AND
- create value for stakeholders, driving economic growth and improving standards of living.

2.2 Categorising Innovation

The categorisation of innovation is not an exact science. There are numerous ways in which innovation has been categorised in the literature. The aim of this section is to present some of these categorisations so that a clear description of the type and level of innovation can be developed for use in the chapters that follow.

Baker (2002) addresses the categorisation of innovation in three ways:

- types of innovation
- newness of the innovation
- impact of the innovation.

2.2.1 Types of Innovation

Doblin (2006) suggests four high-level categories of innovation and several different innovation types for each category:

Table 2: Doblin's Table of Innovation Types

Finance	1 Business model
	2 Networks and alliances
Process	3 Enabling process
	4 Core processes
Offerings	5 Product performance
	6 Product system
	7 Service
Delivery	8 Channel
	9 Brand
	10 Customer experience

Johannessen et al. (2001) suggest six areas of innovative activity that can be seen as different innovation types:

- new products
- new services
- new methods of production
- opening new markets
- new sources of supply
- new ways of organizing.

Moore (2006) defines a "broad universe of innovation types". In Figure 1 Moore (2006) illustrates how different innovation types are appropriate at different stages of market development. These market development stages are:

- growth markets
- mature markets
- declining markets.

For a growth market the following innovation types are appropriate:

- disruptive innovation
- product innovation
- application innovation
- platform innovation.

For a mature market, the innovation types are divided into customer-focused and operational-focused innovations:

- Customer-focused
    - line extension innovation
    - enhancement innovation
    - marketing innovation
    - experiential innovation.
- Operations-focused
    - value engineering innovation
    - integration innovation
    - process innovation
    - value migration innovation.

For a declining market the following innovation types are appropriate:

- organic innovation
- structural innovation.

The life cycle of the market along with the appropriate innovations is illustrated in Figure 1.

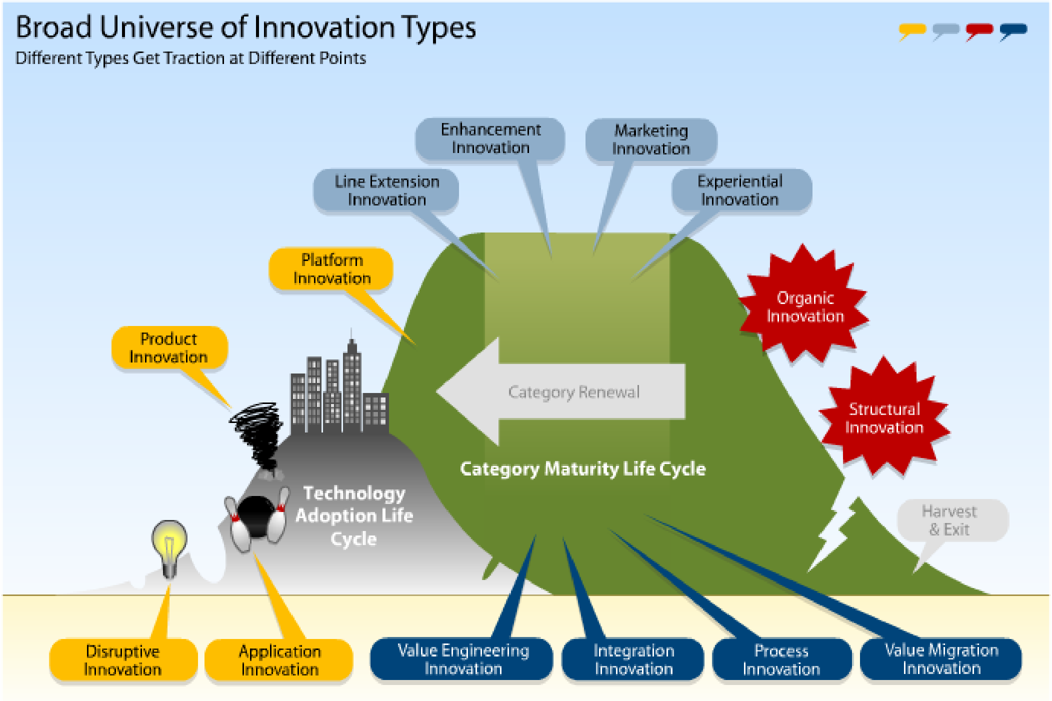

Figure 1: Dealing with Darwin, Types of Innovation

Other ways of categorising innovation involve the levels of technological uncertainty (Dismukes 2005). These levels are:

- low-tech
- medium-tech
- high-tech
- super-high-tech.

Where low-tech innovations involve little or no new technology, medium-tech innovations incorporate some new technology and these technologies are well defined.

Dismukes goes on to state:

> *High-tech innovations require the integration of new, but known technologies into new, first of a kind product, process or service. … Super high tech innovations require the design and integration of new, key technologies into a new family of product, process or service representing a quantum leap in performance and cost effectiveness for the user (Dismukes 2005:pg 26).*

Table 3: Dismukes (2005) Differentiating Innovation Characteristics

Differentiating Innovation Characteristics	Incremental Innovation		Radical Innovation	
	Low-Tech	Medium-Tech	High-Tech	Super-High-Tech
Technology	No new technology	Some new technology	Integration of new, existing technology	Development and integration of new technology and system
Scope of Product or Service	Existing material, component, subsystem, system, array	Some newness of scope	Major newness of scope	Broad newness of scope
Time (months, years, decades)	Months, estimated with high accuracy	Months to several years, estimated with fair accuracy	Several to many years, estimated with uncertainty	Many years to decades, estimated with extreme uncertainty due to numerous re-do loops
Company or Organization Size	Small, medium or large	Small, medium or large	Venture, small, medium, large	Venture, small, medium, large
Industry	Various product, process, and service providers	Various product, process, and service providers	Various product, process, and service providers	Various product, process, and service providers
Supply Chain or Value Chain	Regional, national or global	Regional, national or global	Regional, national or global	Regional, national or global
Market	Known market and customer	Known market and customer	Anticipated customer	Anticipated product or service need
Company Structure and Culture	Age, Core Values, Vision	Age, Core Values, Vision	Age, Core Values, Vision	Age, Core Values, Vision

In an investigation into the outcomes of different innovation types Neely, Filippini, Forze, Vinelli and Hii (2001) categorise innovation into the following forms:

- manufacturing technology innovation
- information technology innovation
- management system innovation
- organisational innovation.

Innovation has also been categorised into three different degrees of innovation (Johannessen et al. 1999). First-degree innovation brings about changes to the production methods and management philosophy within the boundaries of the current framework. Second-degree innovation brings about changes from the existing situation to a totally new set of production methods and management philosophies. Third-degree innovation brings about changes to the production methods and management philosophies within a new framework.

By far the most common categorisation for innovation is into two high-level categories, Product and Process innovations. Neely et al. (2001) explain that product innovations involve the development and commercialisation of new and improved products and services, whereas process innovations involve the introduction of new or the improvement of current manufacturing, distribution and service processes.

When looking at types of innovation, Baker (2002) states that a company's ability to support product and process innovation is no longer adequate and that a third type of innovation, strategy innovation, needs to be introduced in order to provide further support. This type of innovation specifically emphasises the importance of a longer-term view of the contribution of innovation towards competitiveness and success as a company.

Strategy innovations are a type of innovation that allow companies to break the traditional rules of their industry, to look at the future without the orthodox industry constraints and to develop strategies that will redefine the market place and change industry borders forever (Hamel 1996).

Hamel (2000) refers to strategy innovation as Business Concept Innovation (BCI). He explains that many of the companies that created true wealth in the 1990s did so through more than just process and product innovation - through BCI. BCI involves innovations to a variety of business design variables including pricing structures, distribution channels and value webs or relationships. Hamel (2000) goes on to say that BCI can happen all at once but can also occur slowly over time.

2.2.2 Levels of Innovation

The levels of innovation are also used to categorize innovations. Baker (2002) suggests that the level of innovation can be categorised in two ways: either by the impact the innovation has on the company/industry or by the newness of the innovation. The scale for an innovation's impact runs from sustaining to discontinuous (Baker 2002), while the scale for an innovation's newness runs from incremental to radical (Wright 2005).

2.2.2.1 Innovation Newness: Radical to Incremental

Research conducted by Johannessen et al. (2001) indicates that the central theme of innovation was newness and that different innovations can be distinguished by how radical they are. This is the scale from radical to incremental.

Johannessen et al. (2001) go on to explain that the term "radical" has been associated with revolutionary innovations, whereas, according to Dosi (1982) *"incremental is associated with innovations within a paradigm"* .

Damanpour described the difference between radical and incremental innovation as follows:

> *Radical innovations are those that produce fundamental changes in the activities of an organization and large departures from existing practices, and incremental innovations are those that result in a lesser degree of departure from existing practices (Damanpour 1996: pg 699).*

Radical innovation provides the opportunity to turn an industry on its head. It often introduces totally new performance measures (Wright, 2005) or results in a large improvement in known performance measures (Simon, McKeough, Ayers, Rinehart, Alexia 2003). Radical innovation often comes about through companies adopting processes or technology from other industries.

Incremental innovation can be described as the enhancement of or extension to current products or processes. Many companies favour this type of innovation as it involves lower risk, more immediate rewards and smaller projects than a radical innovation (McDermott & O'Connor 2002).

2.2.2.2 Innovation Impact: Discontinuous to Sustaining

Discontinuous innovations are those that have a dramatic effect on a company or industry. This type involves the introduction of a new product, process or technology, which leads to a discontinuation of the current product, process or technology. For example, the amateur photographic industry is currently feeling the affects of such a discontinuous innovation. The introduction of the digital camera to the market is very rapidly causing the demise of the old style photographic film. This discontinuous, innovative new technology has totally transformed the industry.

Sustaining innovations are those which enhance a current product, process or technology and thereby extend the life of the product, process or technology. A sustaining innovation would add value to the product, process or technology so that the user continues to experience extended benefits.

Baker (2002) explains the difference between the two as follows,

> *Sustaining innovations improve the performance of established products or services. Discontinuous innovations bring to market very different products or services that typically undermine established products and services in the particular market sector (Baker 2002: pg 3).*

The levels of innovation can be represented on two axes, one for newness and the other for impact (Figure 2).

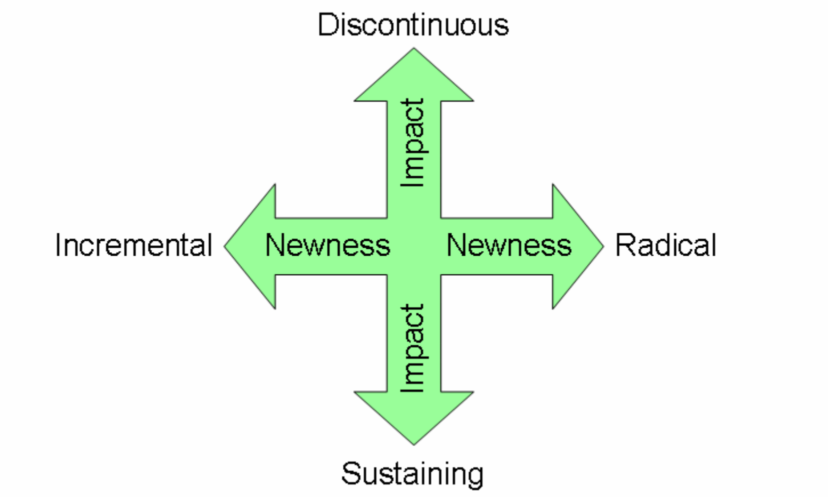

Figure 2: Levels of Innovation, Newness and Impact

2.2.2.3 Categorising Innovation: The Overall Picture

The Oslo Manual (European Commission 2000) distinguishes between Technology Product and Process (TPP) Innovations, other company related innovations and non-innovative changes. These distinctions are presented in Figure 3. The figure also provides a high-level description of the different types and degrees of innovation.

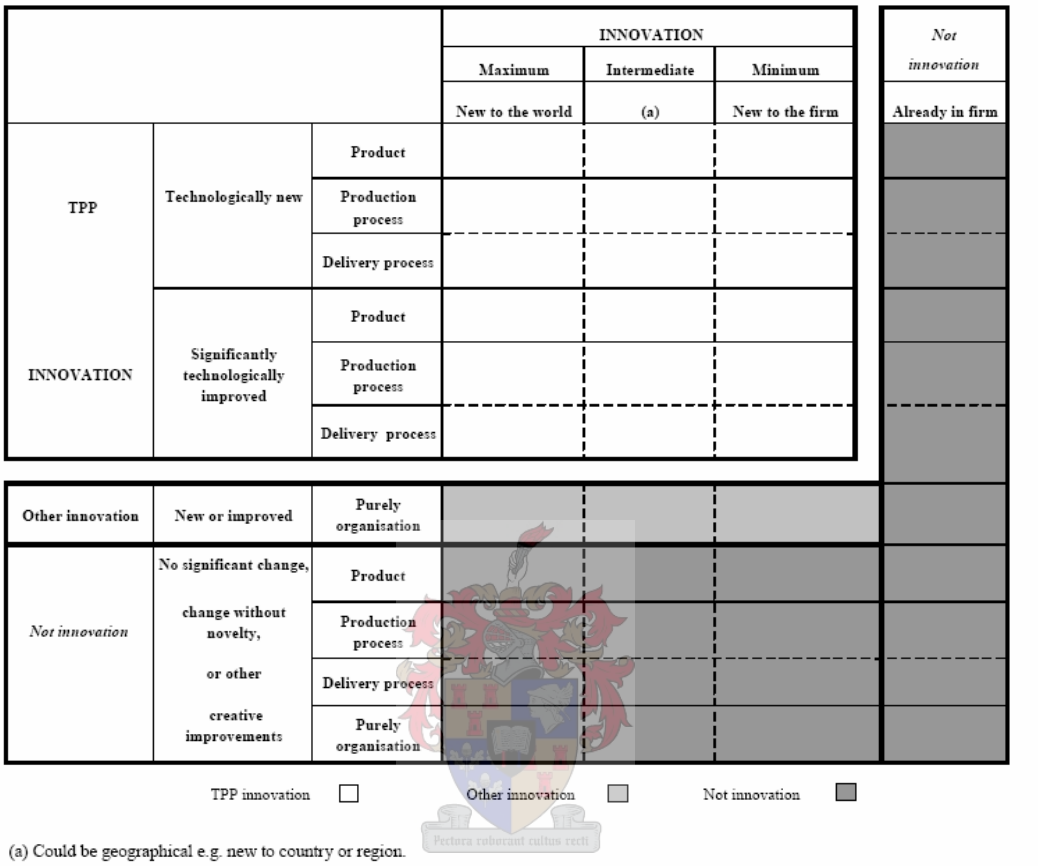

Figure 3: Oslo Manual - Technology, Product and Process Levels of Innovation

3. Innovation Landscape

3.1 Innovation Systems & Processes

As with the definition of innovation and innovation types, there are a myriad of different representations of Innovation systems and processes. Five such representations have been selected and are explained below.

As a starting point a national innovation system is investigated, followed by innovation processes that are more applicable at company level.

The 21st Century Innovation Working Groups (2004) perspective of the United States' (US) innovation system is presented in Figure 4.

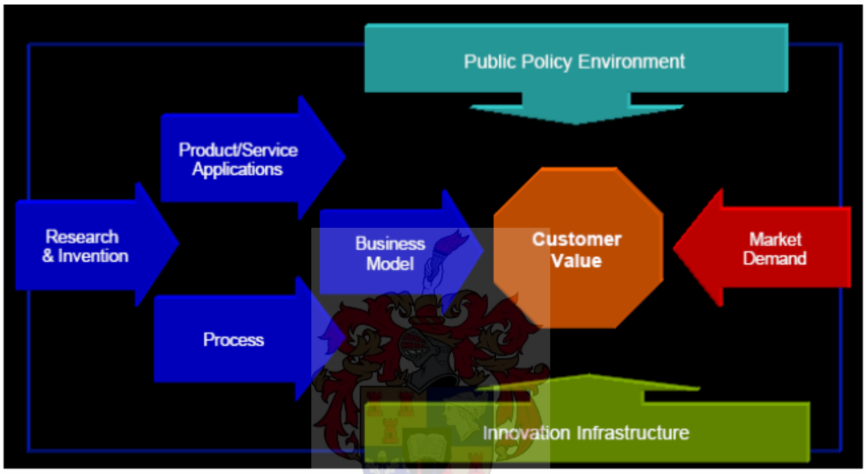

Figure 4: USA Innovation System (21st Century Working Group, 2004)

Traditionally, the focus of innovation in the US has been on research and invention. This was supported by efforts to train scientists and engineers. It was assumed that the required products, services and processes would follow naturally from a concerted research and invention effort, and that that would drive the US's global competitiveness.

The 21st Century Working Group now believes that these components alone are not enough. A comprehensive innovation system needs to take market demand and value creation into account and the correct policy environment and innovation infrastructure is required for the system to succeed.

The innovation system in Figure 3 therefore illustrates the importance of both technological expertise and an appreciation for the market demand. Most importantly, it illustrates how innovation solutions should be driven by the need for value creation for the customer.

Figure 5 illustrates a typical linear model of innovation (Martinez 2005) where invention and innovation are separated. This contradicts the initial definition of invention and innovation in Section 1.1, where invention is seen as one of the first steps in the overall innovation process and not as a separate concept. This model does, however, include the commercialisation aspects within the innovation step, which is in line with previous definitions.

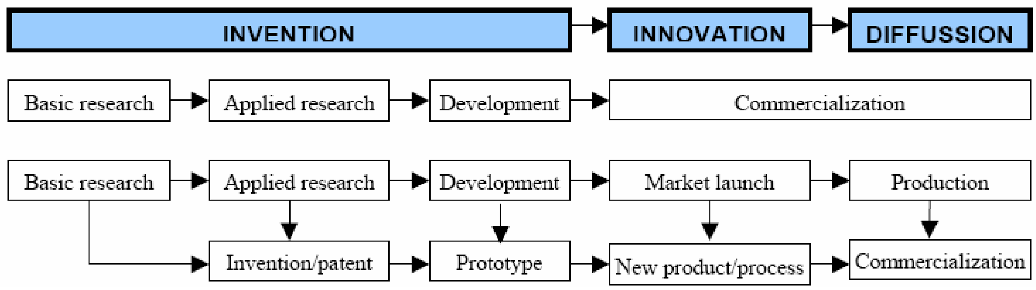

Figure 5: Linear Innovation Model (Martinez, 2005)

As cited by Van Zyl (2006), Figure 6 illustrates Utterback's (1994) three-stage model for innovation. This model includes idea generation, problem solving and implementation.

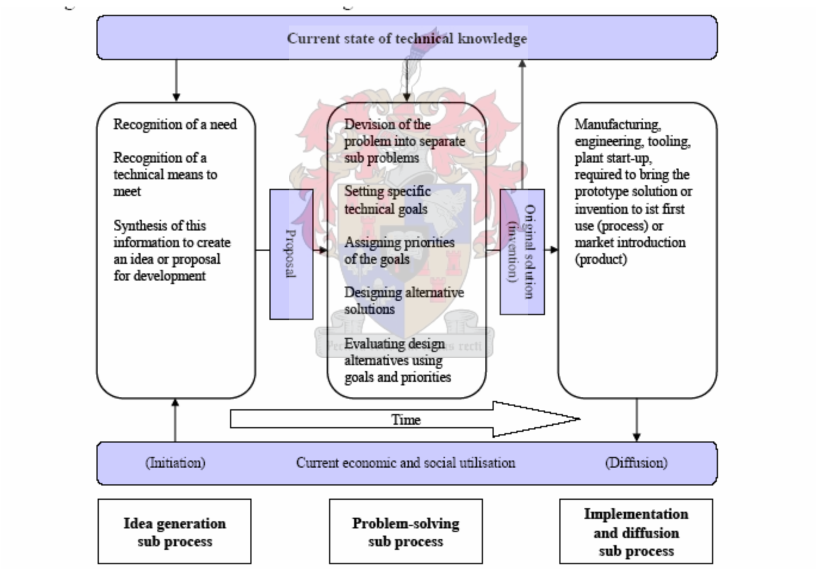

Figure 6: Utterback's Innovation Model (Utterback, 1994)

Dismukes' (2005) model of research and developments role in the innovation process is presented in Figure 7. Dismukes (2005) includes the innovation drivers of scientific push and market pull and describes the steps required to go from an innovation concept to the commercial application of that concept.

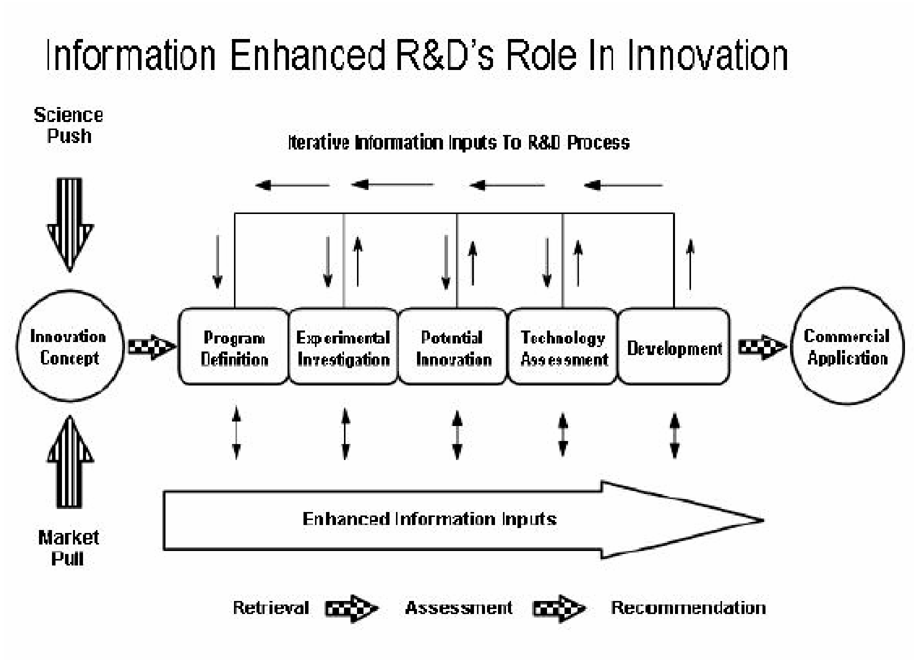

Figure 7: Dismukes' (2005) Innovation Model

Indutech's (Indutech 2006) Innovation Management Methodology describes a high-level process for the generation and implementation of innovations in a company environment. The overall structure of the process is presented in Figure 8.

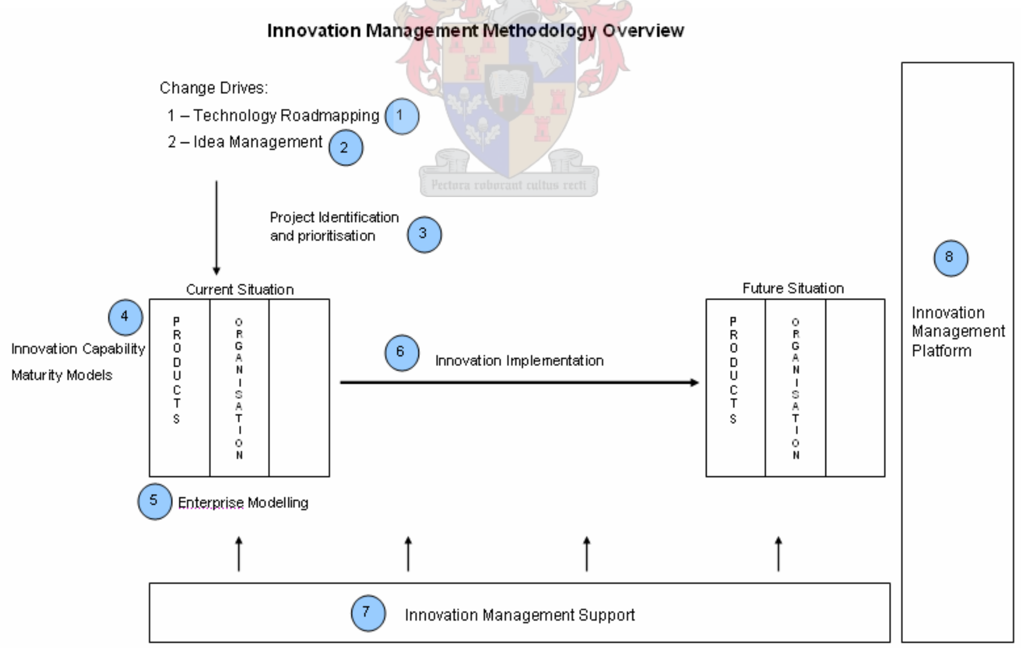

Figure 8: Indutech's Innovation Management Methodology

Each component of the methodology is briefly described:

- Technology Road-mapping: A change driver that involves mapping the future progress of technology and then developing innovations to take advantage of these new technologies.

- Idea Generation: An internal change driver, which encourages employees to generate innovative ideas and then filters ideas to determine which ones to implement.
- Project Prioritisation: The management of a portfolio of possible innovation projects.
- Innovation Capability Maturity Models: A way of auditing a company to determine where changes need to be made to improve the company's ability to innovate.
- Enterprise Modelling: To represent and understand the current (AS-IS) and future (TO-BE) states of a company.
- Innovation Implementation: The implementation of an innovation in the form of a project, using both project management techniques and techniques designed for managing a radical innovation project.
- Innovation Management Support: A range of concepts that support the innovation effort in a company. These include Knowledge Management, Road-mapping, Process modelling.
- Innovation Management Platforms: Software tools that support the innovation management effort in a company.

3.2 Operational Environment for Successful Innovation

What are the operational requirements for a company to successfully innovate? In other words, how should a company run its day-to-day operations so that innovations can be nurtured and add value to the company?

Martensen and Dahlgaard (1999) explain that excellence in innovation requires companies to react quickly to changes in their business environment, and to identify and take advantage of new possibilities through creative solution development.

This explains what a company should be doing, but do not answer the question of how a company should operate in order to achieve excellence in innovation.

Simon et al. (2003) highlight several important issues:

- Senior management passion and commitment: Senior management need to ensure that all levels of the company understand that innovation is important for achieving the company's long-term strategies and objectives. The correct level of funding should be made available for innovations. Patience and a long-term view are vital.
- Have the right people: A company that would like to foster a culture of innovation needs to hire the right types of people in positions that require

innovative thinking. These companies should be looking for people with long-range views who are solution finders, as opposed to problem solvers.

- Opportunity identification/Idea generation: A vibrant process of idea generation is required. This can often be hindered by a poor employee-manager relationship culture.

According to Neely et al. (2001) a company's capacity to innovate can also be determined by:

- the extent of their innovation culture,
- their capability to integrated internal processes (i.e. how well a company brings information and people from different areas together), and
- their capability to understand the larger market and technological environment.

Johannessen et al. (1999) asked the following research question, "Which management characteristics are necessary to manage innovation in the knowledge economy?"

Their research showed that, from a management perspective, a high-level of proactive behaviour and a willingness to take risks are required. Also, managers with integrity are more likely to be trusted during an innovation and will receive the required commitment from their staff. Finally, the management must have the ability to delegate tasks,, manage time and drive the change so that confidence in the overall mission can be achieved.

Hamel (2000) suggests five ways in which a company can develop innovation competency:

- Allow for fluid company boundaries. External resources may also be used for innovations. Partnerships should be developed and encouraged, so that the pool of talent for innovations is extended.
- Change the way strategic planning is conducted. The timing and people involved in strategic planning can be adapted to increase the innovation capacity of a company. Innovations should not be suppressed due to the highly scheduled nature of strategic planning. Bottom-up involvement should be encouraged in strategic planning.
- Create an open market for capital investment and rewards. The correct level of funding should be made available to sponsor innovations and to reward employees for strategic and innovative thinking.
- Manage the risks. Innovative ideas often do not pan out; a company should therefore increase its capability to innovate successfully by having a sufficiently varied strategy, and by investing small amounts in a number of innovations.

Initial experimentation is vital in selecting innovations that have a high probability of success. Companies should also learn from those that fail.

- Create a culture and structure that promotes innovation. Have fairly elastic definitions of the business function and encourage senior management to spend time looking for innovation opportunities. Deconstruct the main aspects that define the company. These include mission, market, products and services. Encourage innovative thinking amongst staff and communicate with customers, partners and suppliers so that they understand the company's ideas. Encourage cooperation between company divisions.

Baker suggests that companies need to develop efficient and effective systems and processes to handle the following:

- *Environmental scanning, identifying discontinuities, surveying customer needs, encouraging new ideas to be advanced by staff members,*
- *Other means of promoting knowledge absorption and sharing, such as the ability to communicate across organizational boundaries, communities of practice, enterprise level knowledge systems, and problem identification and problem solving processes,*
- *Sustained, innovative strategizing and strategy implementation,*
- *On-going classification, screening, and prioritisation of new ideas,*
- *Effective innovation project management,*
- *Effective change management, and*
- *Motivating, rewarding, and recognizing innovation (Baker 2002: pg 7).*

What is evident from the above literature review of operational requirements for successful innovation is that strategy management, senior management performance and conduct, company culture, financial investment and rewards, integration between company divisions and knowledge of the external and internal company environment all play a significant role in creating an innovation competency in a company.

3.3 Innovation and a Competitive Advantage

In the last decade there has been a dramatic increase in the popular press and academic literature perpetuating the idea of innovation providing companies with a competitive advantage (Johannessen et al. 2001). The logic behind this is that companies that are able to innovate more effectively and efficiently than their competitors, gain a competitive advantage through:

- Using new technologies to enhance their current product and service offering,
- Developing radically new products and services,

- Identifying and adapting disruptive technologies,
- Entering new markets and developing new distribution channels,
- Developing innovative pricing and other business models,
- Adapting to legislative changes,
- Reducing operational costs, and
- Forming cross-industry partnerships.

Research conducted by Neely et al. (2001) indicates that positive outcomes in innovations provides company with a significantly improved market share, significantly improved competitive position and a significant increase in customer value.

Cozijnsen et al. (2000: pg 150) states:

> *Standstill is simply no option for business and industry. Attention focuses primarily on how innovation projects can be carried out most successfully.*

Baker reports that in The Innovation Premium (1999) two top Arthur D. Little consultants conclude that:

> *Wall Street places a higher value on innovation than on any other approach to generating bottom- and top-line growth … more than a change in leadership, more than a merger or acquisition, more than a renewed commitment to cost reduction …. (Baker 2002: pg 10).*

Furthermore Baker (2002) reports that Fortune Magazine's rankings of the top innovation companies of the last 15 years correlates with returns to shareholders.

One of the strongest views on innovation's ability to drastically improve a company's competitiveness was expressed by Schumpeter (1943) when he wrote:

> *But in capitalist reality as distinguished from its textbook picture, it is not…(price) competition which counts but the competition from the new commodity, the new source of supply, the new type of organization…competition which commands a decisive cost or quality advantage and which strikes not at the margins of the profits … of the existing firms but at their very lives. This kind of competition is as much more effective than the other as a bombardment is in comparison with forcing a door (Schumpeter 1943).*

This is an economist's perspective on the power of innovation and alludes to the destructive force a discontinuous innovation can have on a company's competitors and on an industry.

In a survey conducted by Boston Consulting Group (BCG) and the Confederation of Indian Industry (CII), 70% of Indian companies surveyed stated that they were increasing their innovation spending in 2006, as they recognised the need for innovation in corporate India in order to gain a global competitive advantage (http://www.webindia123.com 2006).

The importance of innovation in the South African context has also been identified. In a case study on “Innovation Processes in South African Manufacturing and Services Industries” it was stated:

> *Economic growth is a prerequisite for global competitiveness as well as for a stable society. Technology utilisation and the innovative capability of a country are vital preconditions for economic growth; therefore, a strong National System of Innovation (NSI) is important (Denneman, Van Gool & Nooij 2001: pg 1).*

Further evidence for the need of companies to become innovation competent in order to stay ahead of the competition is provided in Figure 9. The figure illustrates how the penetration rate of innovative products has increased drastically over the past 150 years. This indicates that the speed at which a company can adapt to and take advantage of these innovations needs to increase accordingly.

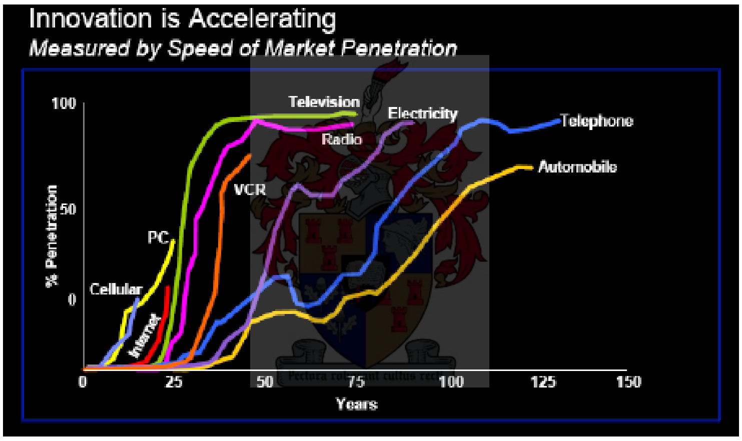

Figure 9: Innovation Acceleration (21st Century Working Group 2004)

3.4 Drivers of Innovation

In today’s world the drivers of innovation can be divided into two high-level categories:

- Firstly, globalisation, and
- Secondly, technological advances.

3.4.1 Globalisation

Several circumstances, introduced through globalisation, have increased the need for companies to be more innovative. These circumstances include:

- Less government protection for traditional industries due to world trade agreements,
- Accessibility of new markets throughout the world,
- New competitors in local markets,

- Increased concern from governments and customers regarding environmental issues, sustainability, corporate governance and accountability,
- New legislative a regulatory environments in certain industries (i.e. financial services) and
- New types of partnerships and networks.

In a survey conducted of Indian senior management, gaining a competitive advantage was identified as one of the main reasons for an increase in innovation spending. Seventy-six per cent of the survey participants believed that globalisation had an impact on how Indian companies conducted innovation (http://www.webindia123.com 2006).

Eskew (2005) quoted the Electronic Industry Alliance and stated that, "Globalization is causing a shift in the source of competitive pressure, and of competitive advantage, from excellence at the point of production— now more or less assumed— toward excellence in governing spatially dispersed networks of plants, affiliates, and suppliers".

3.4.2 Advances in Technology

As with globalisation, advances in technology are creating a new set of circumstances in which companies need to operate. Companies able to adapt to and take advantage of these new circumstances can gain a significant competitive advantage. These circumstances include:

- Both sustaining and discontinuous new technologies,
- New products,
- Shorter product life cycles,
- New processes,
- Better informed customers who expect products and services at a quicker pace with better quality and cheaper, and
- Improvements in communications and connectivity.

The importance of innovation with respect to advances in technology can be seen in Figure 10 (Peansupap 2004). The rate at which technology is changing is rapidly increasing and therefore in today's business environment companies are required to adapt rapidly along with the changes in technology.

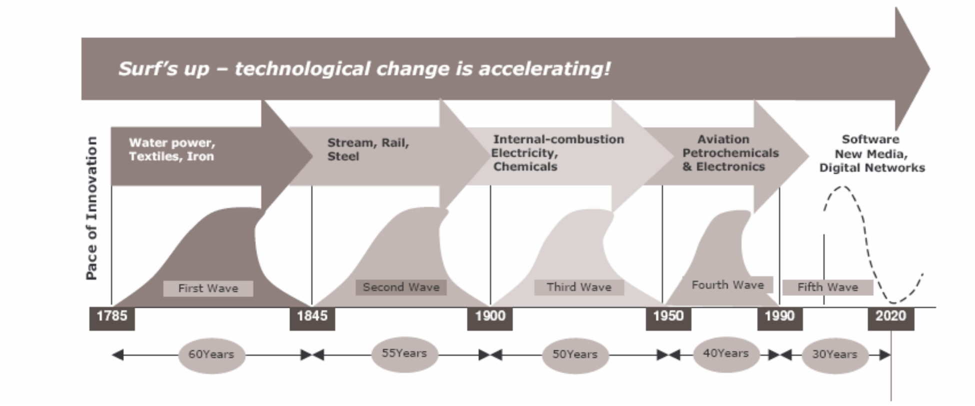

Figure 10: Technology Advancement (Peansupap 2004)

3.5 Barriers to Innovation

Barriers to innovation can be described as the aspects in a company environment that reduce or prevent the company and its employees from innovating. While many of the requirements for successful innovation (described in the previous section) may be a hindrance to innovation if they are not present, there are, however, several key barriers that can stifle a company's attempts at innovation.

Company structures and culture can be a major barrier to innovation as they entrench traditional company systems and processes and prevent new ideas from surfacing (Johannessen et al. 2001). A very rigid company structure and a culture of "us and them" between management and staff prevent bottom-up ideas from surfacing.

4. Project Management and Innovation

In this chapter the interrelationships between Project Management (PM) and Innovation are investigated. The chapter begins by defining PM, explaining the popular project management methodology, PMBOK, and categorising different project types. Next, reasons are given why PM is not sufficient in itself to manage a radical or disruptive innovation project. The chapter then concludes by explaining the balance required between PM and Innovation.

4.1 Defining a Project and Project Management

In the "Idiots Guide to Project Management", project management is defined as,

> *The combination of systems, techniques and people required to successfully complete a project on time and in budget" (Baker, Baker & Campbell 2003).*

For completeness sake the definition of "a project" is also included. A project is:

> *… a sequence of tasks with a beginning and an end that uses time and resources to produce a specific result. A project has a specific desired outcome, a deadline or target date when the project must be done, and a budget that limits the amount of people, supplies and money that can be used to complete the project (Baker, Baker & Campbell 2003: pg 4).*

A similar definition of project management is presented by Louw (2002: pg 1) as:

> *Project management means managing specified resources to accomplish timely objectives stated in terms of quantity and quality.*

Other references define a project as being a temporary activity aimed at creating a new product, service or result (Guide to PMBoK 2004). Project management is defined as

> *the application of knowledge, skills, tools and techniques to project activities to meet project requirements" (Guide to PMBoK 2004:section 1.3).*

Williams presents a concise definition for a project by writing,

> *Most definitions (of projects) refer to this combination of uniqueness, defined objectives, limited time-cycle, and three-fold constraints (cost, time, and quality)" (Williams 2005: pg 497)*

In the above definitions the aim of a project is to achieve a predefined objective and the role of project management is to ensure that the objective is achieved with the available resources and in the planned timeframe. The concepts of predefined objectives and planned timeframes will become more relevant as the investigation into the relationship between PM and Innovation is developed in later sections of this chapter.

4.2 *Project Management Body of Knowledge (PMBOK)*

Project management started to develop as a discipline and then as a profession from the 1950s onward. Several national and international institutes were formed and many of these started to document the “best practice” methods, tools and techniques required to manage projects. Two of the most widely known institutes are the Project Management Institute (PMI) and the International Project Management Association (IPMA). The PMI developed and support the Project Management Body of Knowledge (PMBoK), while another association, the UK Association of Project Management, defined a body of knowledge called the “Project Management Pathways”. (Williams 2005).

In this research the PMBoK has been selected as the body of knowledge that describes the general practices of project management (PM). The PMBoK was selected as it is one of the most widely known and understood bodies of knowledge and is commonly used in companies in South Africa. The PMBoK is also well documented in the third edition of the *Guide to the Project Management Body of Knowledge*, 2004.

The PMBoK is a key reference book covering several different aspects of what a project is, what projects consists of and how to manage a project. It is a guide to the latest “good practices” in the project management environment. The Guide to the PMBoK, 3rd Edition (2004: Preface) states that:

> *the knowledge and practices described (in the guide) are applicable to most projects, most of the time, and that there is wide spread consensus about their value and usefulness.*

4.2.1 PMBoK Overview

The Guide to the PMBoK identifies 44 project management processes that are used in a project and that make up the bulk of the project management activities. These processes are organised into nine Knowledge Areas and each process belongs to one of five process groups.

4.2.1.1 Knowledge Areas

The 44 project management processes are organised into nine Knowledge Areas. Even though the processes are clearly defined and distinguished in theory, they overlap and interact in practice. The processes within a certain Knowledge Area interact with each other, and also interact with processes from other Knowledge Areas. A brief description of each Knowledge Area, taken from the “The Guide to the PMBoK”, is presented below.

Project Integration Management:

This Knowledge Area consists of the processes needed to coordinate and integrate the processes of the other knowledge areas and within the process groups (Guide to the PMBoK 2004).

Project Scope Management:

This Knowledge Area consists of the processes needed to identify and define what is included and excluded in a project scope and to control any changes to the defined project scope (Guide to the PMBoK 2004).

Project Time Management:

This Knowledge Area consists of the processes needed to ensure that the project is finished in time (Guide to the PMBoK 2004).

Project Cost Management:

This Knowledge Area consists of the processes needed to ensure that the project does not exceed the approved budget (Guide to the PMBoK 2004).

Project Quality Management:

This Knowledge Area consists of the processes needed to ensure that the project fulfils all quality requirements and, *"satisfies the needs for which it was undertaken"* (Guide to the PMBoK 2004).

Project Human Resource Management:

This Knowledge Area consists of the processes needed to organize and manage the project team (Guide to the PMBoK 2004).

Project Communications Management:

This Knowledge Area consists of the processes needed to insure appropriate and complete communication of project information between all members of the project team and all stakeholders (Guide to the PMBoK 2004).

Project Risk Management:

This Knowledge Area consists of:

> *… the processes concerned with conducting risk management planning, identification, analysis, responses and monitoring and control on a project; most of these processes are updated throughout the project. The objectives of Project Risk Management are to increase the probability and impact of positive events and decrease the probability and impact of events adverse to the project (Guide to the PMBoK 2004: section 1.4.3).*

Project Procurement Management:

This Knowledge Area consists of the processes needed to procure and receive services, products or information from sources other than the project team in order to conduct a project (Guide to the PMBoK 2004).

Figure 11 presents all the PMBoK, project management processes, divided into the relevant Knowledge Areas.

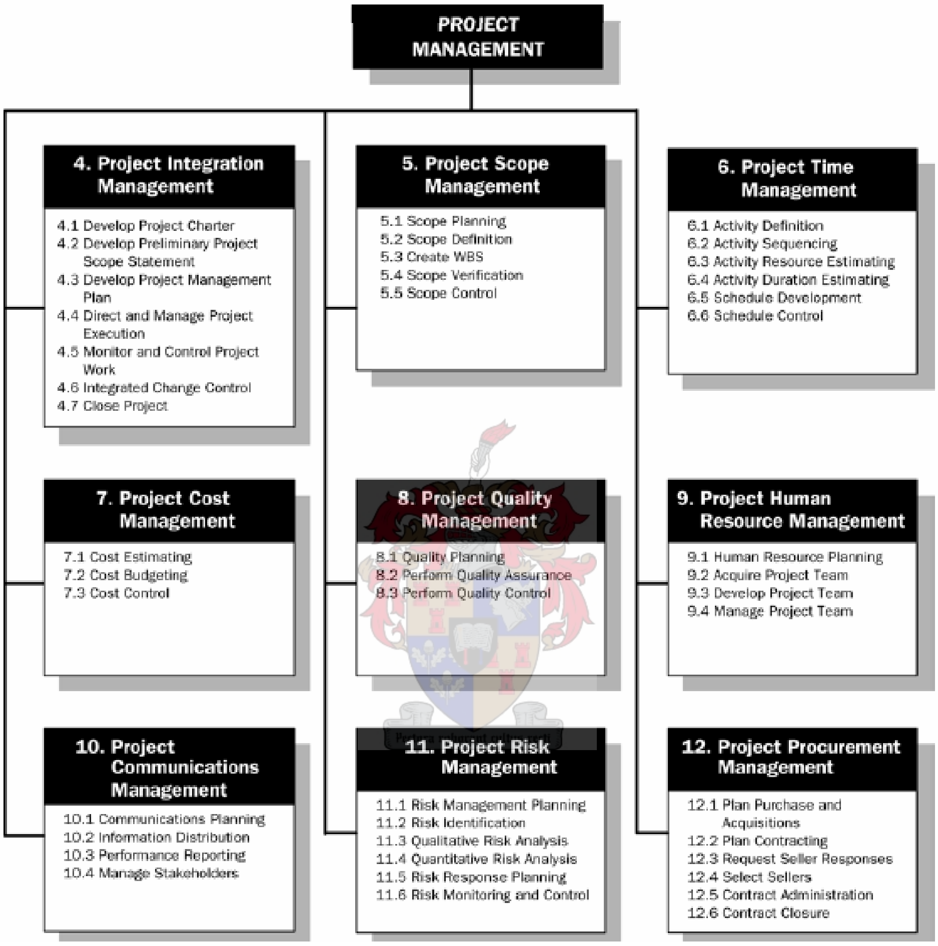

Figure 11: PMBoK Processes (Guide to the PMBoK 2004)

4.2.1.2 *Process Groups*

The five process groups are applied in the same order to every project, are dependent on each other and are revisited and reiterated throughout a project.

Initiating Process Group:

This Process Group contains those processes that define and formally authorise a new project or project phase; during this process the project manager is identified. The relevant processes are:

Develop Project Charter and Develop Preliminary Project Scope Statement (Guide to the PMBoK 2004).

Planning Process Group:

This Process Group contains those processes used to plan a project and facilitate the development of a project plan. The relevant processes are:

Develop Project Management Plan, Scope Planning, Scope Definition, Create WBS, Activity Definition, Activity Sequencing, Activity Resource Estimating, Activity Duration Estimating, Schedule Development, Cost Estimating, Cost Budgeting, Quality Planning, Human Resource Planning, Communications Planning, Risk Management Planning, Risk Identification, Qualitative Risk Analysis, Quantitative Risk Analysis, Risk Response Planning, Plan Purchases and Acquisitions and Plan Contracting (Guide to the PMBoK 2004).

Executing Process Group:

This Process Group contains those processes that enable the project management plan to be executed according to the project requirements by integrating people and other resources. The relevant processes are:

Direct and Manage Project Execution, Perform Quality Assurance, Acquire Project Team, Develop Project Team, Information Distribution, Request Seller Responses, Select Sellers (Guide to the PMBoK 2004).

Monitoring and Controlling Process Group:

This Process Group contains those processes used to ensure that potential problems are identified as early as possible, take preventive actions and control changes. The relevant processes are:

Monitor and Control Project Work, Integrated Change Control, Scope Verification, Scope Control, Schedule Control, Cost Control, Perform Quality Control, Manage Project Team, Performance Reporting, Manage Stakeholders, Risk Monitoring and Control and Contract Administration (Guide to the PMBoK 2004).

Closing Process Group:

This Process Group contains those processes that establish that the project or project phase is completed and brought to a controlled end. The relevant processes are:

Close Project and Contract Closure (Guide to the PMBoK 2004).

4.2.2 Mapping of Project Management Processes

Each of the processes is mapped into one of the nine Knowledge Areas and one of the five Process Groups. If a process is revisited or updated in a later process group, it remains the same process; and is mapped in the process group where most of the activity takes place. Table 4 is a matrix of the nine Knowledge Areas and the five Process Groups with the relevant processes mapped into the appropriate block in the matrix.

Table 4: Matrix of the PMBoK Process Groups (Guide to PMBoK 2004)

Knowledge Area Processes	Project Management Process Groups				
	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring & Controlling Process Group	Closing Process Group
4. Project Management Integration	Develop Project Charter 3.2.1.1 (4.1) Develop Preliminary Project Scope Statement 3.2.1.2 (4.2)	Develop Project Management Plan 3.2.2.1 (4.3)	Direct and Manage Project Execution 3.2.3.1 (4.4)	Monitor and Control Project Work 3.2.4.1 (4.5) Integrated Change Control 3.2.4.2 (4.6)	Close Project 3.2.5.1 (4.7)
5. Project Scope Management		Scope Planning 3.2.2.2 (5.1) Scope Definition 3.2.2.3 (5.2) Create WBS 3.2.2.4 (5.3)		Scope Verification 3.2.4.3 (5.4) Scope Control 3.2.4.4 (5.5)	
6. Project Time Management		Activity Definition 3.2.2.5 (6.1) Activity Sequencing 3.2.2.6 (6.2) Activity Resource Estimating 3.2.2.7 (6.3) Activity Duration Estimating 3.2.2.8 (6.4) Schedule Development 3.2.2.9 (6.5)		Schedule Control 3.2.4.5 (6.6)	
7. Project Cost Management		Cost Estimating 3.2.2.10 (7.1) Cost Budgeting 3.2.2.11 (7.2)		Cost Control 3.2.4.6 (7.3)	
8. Project Quality Management		Quality Planning 3.2.2.12 (8.1)	Perform Quality Assurance 3.2.3.2 (8.2)	Perform Quality Control 3.2.4.7 (8.3)	
9. Project Human Resource Management		Human Resource Planning 3.2.2.13 (9.1)	Acquire Project Team 3.2.3.3 (9.2) Develop Project Team 3.2.3.4 (9.3)	Manage Project Team 3.2.4.8 (9.4)	
10. Project Communications Management		Communications Planning 3.2.2.14 (10.1)	Information Distribution 3.2.3.5 (10.2)	Performance Reporting 3.2.4.9 (10.3) Manage Stakeholders 3.2.4.10 (10.4)	
11. Project Risk Management		Risk Management Planning 3.2.2.15 (11.1) Risk Identification 3.2.2.16 (11.2) Qualitative Risk Analysis 3.2.2.17 (11.3) Quantative Risk Analysis 3.2.2.18 (11.4) Risk Response Planning 3.2.2.19 (11.5)		Risk Monitoring and Control 3.2.4.11 (11.6)	
12. Project Procurement Management		Plan Purchases and Acquisitions 3.2.2.20 (12.1) Plan Contracting 3.2.2.21 (12.2)	Request Seller Responses 3.2.3.6 (12.3) Select Sellers 3.2.3.7 (12.4)	Contract Administration 3.2.4.12 (12.5)	Contract Closure 3.2.5.2 (12.6)

4.3 Project Categorisation

The concept of categorising projects has been widely researched and documented. It is believed that if similar types of projects, with similar characteristics or properties (Archibald 2005), can be identified and placed into the same category, then best practices and different project management techniques can be identified and used for a specific project category.

Williams (2005: pg 504) states that:

> *There have been a number of studies done to categorize projects or attempting a typology of projects with the aim of explaining behaviour or identifying different appropriate project management styles for different project types.*

The categorisation of projects often happens in an ad-hoc fashion. Companies categorise projects based on their organisational structure. Project management consultants tend to specialise in a certain type of project management, which then lends itself to the management of certain project types (Archibald 2005). This too is a form of project categorisation. Archibald believes that:

> *A systematic approach to this question (of project categorisation) is believed to be more desirable, since this will accelerate the progress and related improvements in the PM discipline, avoid duplicate efforts, and help to assure that all pertinent factors have been considered (Archibald 2005: pg 4).*

Archibald (2005) reports that Crawford et al. (2002, 2004) write that many different ways of categorising projects have been suggested and thus recommends that the purpose of the project categorisation and the method used are seen as being interrelated. Crawford et al., as reported by Archibald (2005), go on to suggest a variety of ways by which projects can be categorised. Table 5 presents the various attributes that can be used to categorise projects depending on the purpose of the categorisation.

Table 5: Attributes by Which Projects can be Categorised

Application area or product	Stage of life-cycle	Grouped or single
Strategic importance	Strategic driver	Geography
Scope	Timing	Uncertainty
Risk	Complexity	Customer
Ownership	Contractual	

As this research focuses on the relationship between Project Management (PM) and Innovation, only some of the attributes in Table 5 are relevant for the particular purpose of the project categorisation.

The purpose of this categorisation is to select the appropriate methods for managing a project based on the level of innovation. Uncertainty, linked to newness, project complexity and timing are three attributes in Table 5 that are relevant to this. Williams (2005: pg 503) states that:

> *we have identified the three factors which come together to cause extreme overruns when projects are managed conventionally: structural complexity; uncertainty, and a tight time-constraint.*

Uncertainty and complexity have also been identified as key attributes of projects that involve a high level of innovation and are therefore appropriate attributes to use when categorising projects in order to select the correct project management methods for managing innovations.

A project categorisation method develop by Boston Consulting (Figure 12) presents the attributes of market share and market growth in a matrix known as the Boston matrix (Archibald 2005).

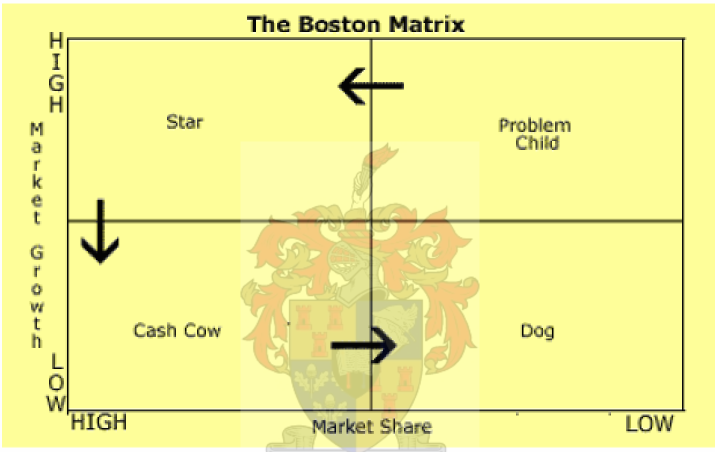

Figure 12: The Boston Matrix

Projects can be categorised into one of these four areas based on their contribution to market share and market growth.

In a similar way, projects can be categorised into four areas based on their levels of complexity and uncertainty. Figure 13 presents such a matrix. The descriptions of the four areas are based on the effect the project will have on a company and an industry.

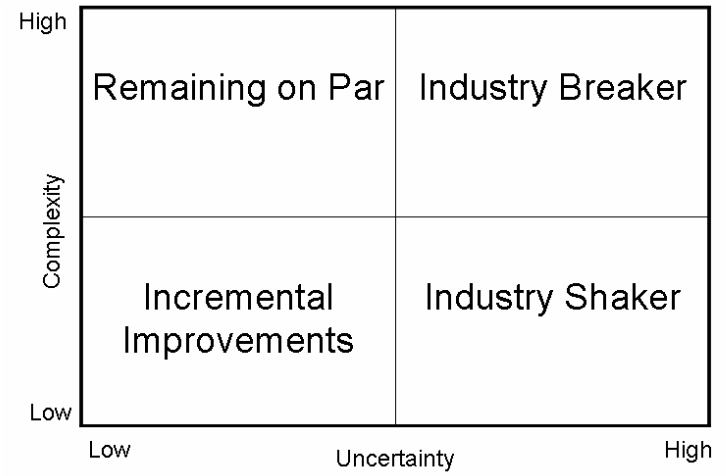

Figure 13: Project Categorisation Matrix

In Figure 13 four project categories have been defined:

The Industry Breakers are projects that totally change the industry landscape, leaving only a few companies able to compete. The high levels of complexity make it difficult for competitors to react quickly to the new environment and therefore such a project can destroy the competition within an industry.

The Industry Shakers are projects that shake up the industry, but due to their lower levels of complexity, competitors are more easily and quickly able to make up lost ground.

The Incremental Improvements are simple projects that merely improve contained sections in a company.

The Remaining-on-Par projects are those that allow companies to keep up with their competition by making complex changes to their company in order to maintain the status-quo.

4.3.1 Radical and Incremental Innovation Projects

Within the innovation environment two levels of innovation have been defined. These are radical and incremental innovation (as described in Section 1.2) and, in turn, give rise to two types of innovation projects - radical and incremental innovation projects. The key difference between the two is that a radical innovation project introduces something totally new, while an incremental innovation project enhances or improves something that already exists. In both cases the levels of uncertainty and complexity may vary, but it would be reasonable to assume that radical innovation projects have higher levels of uncertainty and thus may have higher levels of complexity. Simon, McKeough, Ayers, Rinehart and Alexia (2003) define a radical innovation project:

> *… as one with the potential to produce one or more of the following: An entirely new set of performance features, greater than five-fold improvements in known*

performance features, ·a significant reduction in cost (>30 percent) (Simon et al. 2003: pg 17).

Most radical innovation projects would fall into the top left category in Figure 12, Industry breakers, as by definition they are significantly new and uncertain and, in order to have such an impact as defined by Simon et al. (2003), they would involve significant changes throughout a company, thus leading to high-levels of complexity.

4.4 The Relationship between PM and Innovation

The question of whether PM alone is able to support radical innovation projects is central to the investigation as this research focuses on the relationship between PM and innovation. In this section the literature surrounding this question is presented.

On the website, *Innovation Tools*, Wycoff (2003) explains:

In most organizations, there is a relatively high level of competence in project management ... however, the understanding of how to manage an innovation project is not always as clear. It is important to understand the distinction between a regular project and an innovation project (Wycoff 2003).

Wycoff (2003) goes on to explain the distinctions between a non-innovation and an innovation project, saying that innovation projects:

- often start with loose, unclear objectives,
- require a more experimental approach,
- require more diverse teams who are not afraid of failure, and
- require higher levels of risk management and a philosophy of, "fail fast and fail smart.

Kotelnikov (2006) explains that traditional project management approaches do not fit radical innovation projects due to the increased levels of uncertainty, the multiple levels of the uncertainty and the way in which the uncertainties interact with each other. Kotelnikov goes on to explain that new competencies are required to manage radical innovation projects. These include:

- Motivating radical idea generation,
- Managing sporadic, nonlinear, stochastic, and context-dependent radical innovation projects,
- Engaging individual initiative – upper managers, project team, and key individual,
- Learning about and forecasting markets for radical innovation, and
- Reducing uncertainty in the business model (http://www.1000ventures.com/business_guide/innovation_ radical.html).

Cozijnsen et al. (2000: pg 150) state that:

> *Innovation projects require more systematic and professional efforts, as shown by the large percentage of organizations that fail to complete innovation projects successfully.*

And that:

> *The implementation phase is the essence of every innovation process and most failures can be expected to occur during this phase.*

The above information points to problems with the use of PM in implementing radical innovation projects. However, of all the research discovered during the literature research for this thesis, perhaps the most complete work in this area was completed by Williams (2005).

Williams (2005) asked the following questions. If so much money, research and effort has gone into the discipline of project management and into various project management bodies of knowledge:

- Why do so many projects still result in failure?
- What is wrong with PM theory?
- Are there new project discourses that can be used for certain types of projects that can improve the possibility of project successes?

The questions are answered by first identifying three underlying assumptions made by the theoretical base of conventional project management. These three assumptions are common to the most popular bodies of knowledge:

- Project management theory and the bodies of knowledge are rational and correct and that no justification is required.
- The facts of the situation can be observed and measured and reality can be described with a concrete view.
- Project scope can be managed by breaking down the overall activity into smaller and smaller tasks, and that these tasks are independent except for a sequential relationship between them.

Williams (2005) goes on to say that these three assumptions have led to the bodies of knowledge over emphasising the importance of planning.

This is clear when you look at the processes in PMBoK and see that the Planning Process Group has 21 processes, almost half of the total 44, while the Executing Process Group defines only seven processes.

Systematic project models, as developed by Williams (2005) and a team from Strathclyde University in the U.K, are used to describe the behaviour of complex projects. Using these systematic project models it is possible to do post-mortems on projects to provide explanations for project failures.

These models have revealed that interrelationships between various casual factors as opposed to single causes may be the reason behind *"runaway"* project failures. The models also revealed that these causal factors may result in positive feedback loops or vicious cycles which send projects spinning out of control. Furthermore, the work by the Strathclyde team found that the feedback loops were created and greatly enhanced by project managers following PM methods. The example given is when a time-constrained project experiences some kind of turbulence. The natural instinct of the project manager is to do what ever is possible to get back to the plan. These actions can further sustain a vicious cycle that then leads projects to failure.

The systematic models identified that these types of failures occurred in projects that were both complex in nature and that had high levels of uncertainty regarding project objectives and how to achieve those objectives (Williams 2005).

This, then, relates back to radical innovation projects, which are often complex in nature and by definition have very high levels of uncertainty. Therefore, it could be said that PM, advocated by the bodies of knowledge, could lead to the failure of radical innovation projects. As stated by Williams (2005: pg 502),

> *Even more so, conventional methods are unsuited to projects under high uncertainty.*

Also that:

> *Goal uncertainty is lacking in the conventional project management discourse, which assumes that there is a clear, unambiguous project goal.*

Goal ambiguity is one of the key characteristics of a radical innovation project.

5. Thesis Problem Definition

This thesis focuses on the planning and deployment of radical innovation projects. The identified problem is that project management concepts alone, captured in the various bodies of knowledge, are not alone able to successfully manage and deploy a radical innovation project.

5.1 Innovation Defined

In Chapter 1 the concept of innovation was defined and various ways of categorising innovation were presented.

For the purpose of this thesis, innovation is defined as the successful generation, development and implementation of new and novel ideas, which introduce new products, processes and/or strategies to a company or enhance current products, processes and/or strategies that lead to commercial success and possible market leadership thereby creating value for stakeholders, driving economic growth and improving standards of living.

Many different ways of categorising innovation were identified. For the purpose of this thesis innovation is categorised into innovation types and innovation levels. The innovation types are process, product/service and strategy innovation types. The innovation levels range from incremental to radical innovation for newness, and sustaining to discontinuous innovation for impact. As the focus of this thesis is on radical innovation projects, the level of innovation that is of interest is radical innovation, which could be either sustaining or discontinuous. The types of innovation that are of interest here are the process and strategy innovation types, with little focus on the product/service innovation type.

5.2 Innovation Landscape in Companies

Chapter 2 examined the full landscape of innovation in a company and the importance of innovation to company competitiveness was shown.

The innovation landscape in a company has a wide scope and involves many different concepts and issues. The operational environment, suited for innovation in a company, was explained. This thesis focuses on the implementation of a radical innovation and assumes that a suitable operational environment exists for innovation in a company. Therefore, issues such as company culture, remuneration and day-to-day management styles are not the main focus.

5.3 Project Management and Radical Innovation

Chapter 3 focused on the interrelationship between project management and radical innovation.

The concept of a project management body of knowledge was described and the PMBoK was selected to be the body of knowledge representative of project management.

A means of categorising a project was presented based on the attributes of uncertainty and complexity. A radical innovation project was defined as having a large component that is new, which in turn means high levels of uncertainty. Radical innovation projects are also often, but not always, highly complex.

In cases where radical innovation projects can be categorised as being highly uncertain and high levels of complexity exist, the work of Williams (2005) indicates that the concepts of project management alone, as captured in the bodies of knowledge, is not sufficiently effective in managing these radical innovation projects.

5.4 Thesis Problem Definition

The thesis problem definition is therefore:

Project management concepts alone, captured in the various bodies of knowledge, are not able alone to successfully manage and deploy radical innovation projects. Therefore, companies struggle to gain a competitive advantage through innovation, as the implementation of the radical innovation is seldom successful.

6. An Innovation Implementation Methodology (IIM)

In this chapter a methodology and framework, called the Innovation Implementation Methodology (IIM), is presented. This methodology is aimed at the full implementation of a radical innovation from the initiation to closure. The various components of the methodology, as well as each of the more detailed concepts, are explained. The benefits that each component and concept provide to a radical innovation project are also outlined.

6.1 Development of the Innovation Implementation Methodology (IIM)

The IIM was developed as part of the candidate's work at Indutech (Pty) Ltd. Indutech is a business engineering company which supports clients in enterprise-wide innovation management.

6.2 Innovation Implementation Methodology (IIM) Structure

The IIM structure is based on four high-level components and 11 more detailed concepts. Most of the concepts are related to a single high-level component but a few have a role in more than one component.

The four high-level components are:

- A Four-Layered Approach
- Ramp-up and Ramp-down project life cycle
- Project Structure
- Verification and Optimisation principles.

The four components are used in parallel, throughout a radical innovation project, as opposed to being used in series at different stages of a project. Each component provides a different view of the radical innovation project and has a different function in the project. The unification of the four components is presented later in this chapter in Section 6.7.

The 11 detailed concepts are:

- Governance principles and mandates
- Project integration
- Design Objectives
- Mock-ups and prototypes
- Roadmaps
- Knowledge transfer
- Knowledge management
- Measure and learn
- Management commitment
- Risk management

- Change management.

Each of the above concepts has a role to play in managing a radical innovation project and is part of one or more of the high-level components. Table 6 illustrates the relationships between the concepts and the four high-level components.

Table 6: Relationships between High-Level Components and Concepts in IIM

	Four-Layered Approach	Ramp-up and Ramp-down	Project Structure	Verification and Optimisation
1. Project Integration	X			
2. Knowledge transfer	X	X		
3. Governance principles & mandates		X	X	
4. Design Objectives		X	X	
5. Roadmaps			X	
6. Knowledge Management			X	
7. Management			X	
8. Mock-ups & prototypes				X
9. Measure and learn				X
10. Risk management				X
11. Change Management			X	

6.3 High-level Component 1: Four Layered Approach

The Four-Layered Approach provides a view of the different levels of detail required to be addressed during a radical innovation project. Figure 14 shows the four layers of detail that need to be addressed in graphic form.

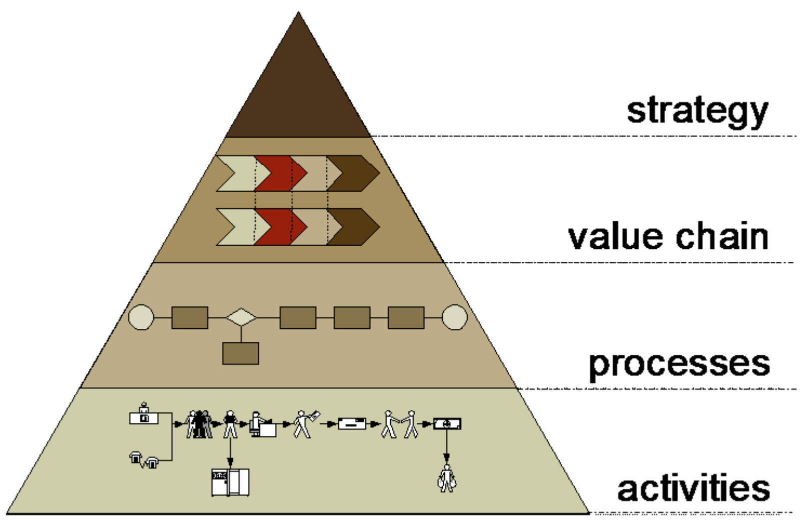

Figure 14: Four-Layered Approach

The Four-Layered Approach has the role of guiding the innovation teams through the different levels of detail as the radical innovation project unfolds. Ideally, a golden thread linking each of the different levels of detail should be identified and followed.

6.3.1 Strategy Layer

At first, only the high-level project objectives can be determined through an analysis and mapping of the company's strategy. Activities such as strategy mapping and strategy alignment from department to business unit to company group can be undertaken. The high-level project objectives are the main output of this layer of the Four-Layered Approach.

By aligning the objectives of the radical innovation project with the company's strategic objectives there is greater chance of fulfilling the strategic objectives through the radical innovation project. Hamel (1996) takes this concept to the extreme by suggesting that company strategy is the only way to drive innovation. Hamel writes:

> *You can either surrender the future to revolutionary challengers or revolutionize the way your company creates strategy. What is required is not a little tweak to the traditional planning process but a new philosophical foundation: strategy is revolution; everything else is tactics (Hamel 1996: pg 1).*

The objectives of the project are also made clear to all stakeholders and the benefits to the company are visible, which encourages buy-in to the radical innovation project.

Finally, the alignment with the strategic objectives, can also guide multi-project integration. Two different projects that are achieving the same strategic objective should have several touch points and offer possibilities for knowledge sharing. The concept of **project integration** is discussed in more detail in **Section 6.8.1**.

Most companies today do more planning than strategic goal setting. Company leaders look at where the company is today and plan a way forward based on the constraints of their internal environment and the industry boundaries. Strategic goals should rather be set by looking at the future and then working backwards to where the company is currently (Hamel 1996). If strategic objectives are developed in this way then radical innovation projects become the vehicles for implementing strategy. Hamel (1996) refers to this as, "strategy leading the revolution".

6.3.2 Value Chain Layer

The aim of analysing the value chain is to start to determine the scope of the radical innovation project. At the value chain level the scope is determined by ring fencing a section of the value chain and then listing all products, processes, personnel and systems that may be directly affected by the radical innovation project. By analysing the inputs and outputs of the ring-fenced section of the value chain, products, processes, personnel and systems that lie outside the area but that may be indirectly affected by the radical innovation project, can also be identified.

Identifying the radical innovation scope in relation to the company's value chain can also assist with project integration. There is a greater possible requirement for integration between projects that have the same or overlapping scopes. Therefore, integration can be assisted by identifying all projects that directly or indirectly affect a specific area of the value chain.

6.3.3 Process Layer

With in the process layer, in the Four-Layered Approach, there are also different levels of detail. The process modelling methodology and constructs may vary from company to company, but the benefits and purpose of business process modelling remain the same. These benefits include:

- Common understanding of the new process
- A clear representation of the current process.

Business process models may be more relevant for certain innovations than for others. Models of this kind are usually highly relevant for both process and strategy innovations, which are the main focus of this thesis.

Initially, high-level business process models may be developed to represent the initial ideas and concepts of the radical innovation. These processes can be used to achieve buy-in from the various stakeholders and to assist in developing the business case for the innovation.

At a later stage of the radical innovation project, during the design phase, more detailed business processes are developed. These are important to transfer knowledge from the innovation team to the operational team. This concept will be discussed in more detail, later in this chapter, in Section 6.8.2.

The business process models should also be developed to represent the current or "AS-IS" situation. Again, these can first be developed at a high-level and then details added at a later stage. The AS-IS view of the in-scope area of the company can be used by both the innovation team and later by the design teams to understand the impact the innovation will have on the company's current situation.

6.3.4 Activity layer

The activity layer is the most detailed in the Four-Layered Approach. At this layer detailed activities are modelled and/or simulated. Early on in the radical innovation project this kind of detail is required for the development of the business case when seeking project approval. In later phases of the project the activity layer represents the details of the innovation. This could include costs, roles and responsibilities, performance measures, performance targets and detailed system design.

6.3.5 How the Four-Layered Approach Supports Innovation

The Four-Layered Approach supports innovation in the following ways:

- Aligning radical innovation project objectives with company strategic objectives
- Integrating various projects based on similar objectives and scope, and
- Providing a common view of current and future processes.

6.4 High-Level Component 2: Ramp-up and Ramp-down

The Ramp-up and Ramp-down component in the IIM provides a view of the extent of involvement of the various role-players and their roles and responsibilities throughout the radical innovation project. Figure 15 illustrates the Ramp-up and Ramp-down component of the IIM in graph form.

The time axis represents the life of the radical innovation project and the responsibility axis represents the amount of responsibility or relative involvement of the various role-players. The two main categories of role-players are the innovation team and the operational team. The Ramp-up and Ramp-down component guides these two teams through the radical innovation project and explains when and to what extent they should be involved. This component also supports the very important knowledge transfer between the innovation and operational teams.

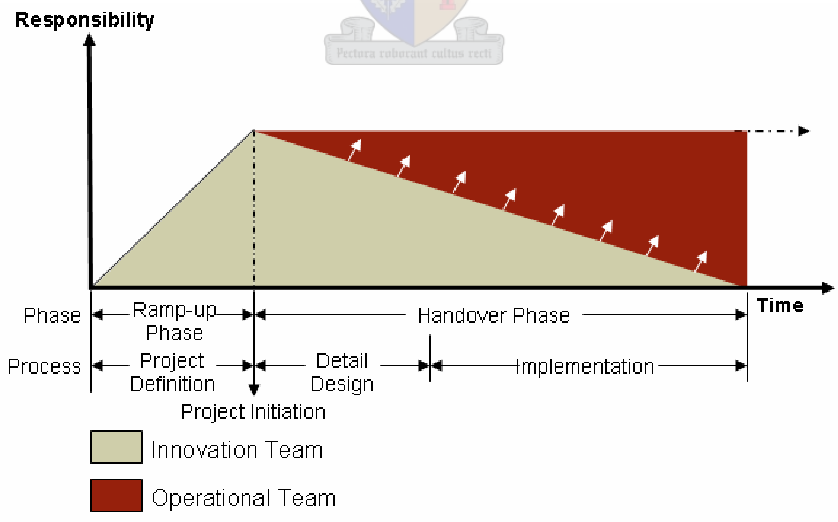

Figure 15: Ramp-up and Ramp-down

6.4.1 Ramp-up Phase

The main responsibility in the ramp-up phase lies with the innovation team. The innovation team should include the innovation champion and project owner, as well as individuals whose mindsets are not rooted in the current operational environment.

External consultants should also form part of the innovation team, as they view the company without the restrictions of fully understanding the limitations of the current operational environment. The contrast between a current operational environment and innovation is clearly described by Kotelnikov as:

> *Innovation is a learning process, the product of which is new applied knowledge. Operations are established processes driven by existing knowledge. Operations generate today's value, while innovation creates tomorrow's opportunities (Kotelnikov 2006).*

The Ramp-Up Phase involves initiating and defining the radical innovation. It is the period in the project where the innovation concept is initiated and developed. The objectives and scope of the innovation are defined at a high-level and several innovation scenarios are developed. The feasibility of each of the innovation scenarios is determined as best as possible.

The ramp-up phase ends with the validation and approval of the radical innovation concept. The following steps (Table 7) can be followed in the ramp-up phase. The main individuals involved are also presented.

Table 7: Steps in the Ramp-up Phase

Steps	Step Description	Involved
Objectives	Defining the project objectives and aligning with strategic objectives.	Innovation team
Scope	Defining the project scope - only to level of detail possible at this stage of a radical innovation project.	Innovation team
Scenarios	Development of high-level innovation scenarios. These scenarios should include high-level process maps and cost estimates where possible, as well as a description of the benefits of each scenario.	Innovation team
Validation	Validation of the various innovation scenarios can be done by a validation team. This team should consist of the innovation team members plus other individuals who are involved in the operational environment, but who still have an open mind to innovation. The validation team ensures that the scenarios developed by the innovation team are accurate.	Validation team
Approval	Project approvals are done in different ways in different companies. In this step the innovation team presents the validated innovation scenarios to an approval body and the approval body selects the scenario, which they feel is most appropriate for the company.	Innovation team Approval body

The steps in Table 7 are discussed in more detail in **Section 6.8.5** on **Roadmaps**.

6.4.2 Ramp-down Phase

In the ramp-down phase the operational team becomes more involved in the innovation. It is during this phase where hand-over of the innovation to the operational environment occurs.

The ramp-down phase begins once the approval body has selected a specific innovation scenario. At a high level the ramp-down phase consists of the detailed design and implementation of the radical innovation. After approval a governance team is formed. The governance team consists of the innovation team plus individuals from the operations area who have the ability to see beyond their current environment. This team will play a role in the rest of the radical innovation project but holds its major responsibilities at this point. A series of governance workshops are held. At theses workshops the governance team will accomplish the following:

- **Development of Governance Principles:** These are a set of high-level principles that will govern all important decisions for the life of the radical innovation project. The concept of governance principles is discussed in more detail in Section 6.8.3.
- **Selection of the Detail Design Team Personnel:** Selecting the correct personnel for the sub-project design teams is vital for the success of the radical innovation project. These personnel must have the correct attitude towards innovation and change; they must have a good knowledge of their operational area and they must have the necessary capacity to allow them to contribute to the project.
- **Development of Sub-project Mandates:** Depending on the innovation, a set of sub-projects may be defined. Each sub-project will be given a mandate by the governance team. This mandate defines the sub-projects role in the overall innovation project. It is vital for clear integration between the detail design sub-projects.
- **Development of Sub-project Design Objectives:** The governance team will develop detailed design objectives, including targets and key performance indicators, for each of the design sub-projects. These design objectives may be updated or even changed at a later stage, due to the uncertainty that still exists at this time. The governance team will be responsible for deciding when to change any of the design objectives. The concept of design objectives will be discussed in more detail in Section 6.8.4.

Once the governance team have held the governance workshops, the detailed design teams begin the detailed design. Throughout the detailed design, as the final innovation becomes clearer, the governance team will assist the design teams in ensuring the detailed design reflects the initial innovation team's ideas and adheres to the governance principles.

The implementation of the radical innovation will follow on from the detailed design and will involve the operational team to a large extent. This is a vital part of the innovation, as the operational team will have to manage the new environment based on the principles of the innovation and not on the principles of the old process. Figure 16 illustrates the difference between gradual handover and knowledge transfer as opposed to a sudden handover, with little knowledge transfer and little buy-in from the operational team. The concept of knowledge transfer and how it is used to support the radical innovation project in described in Section 6.8.2.

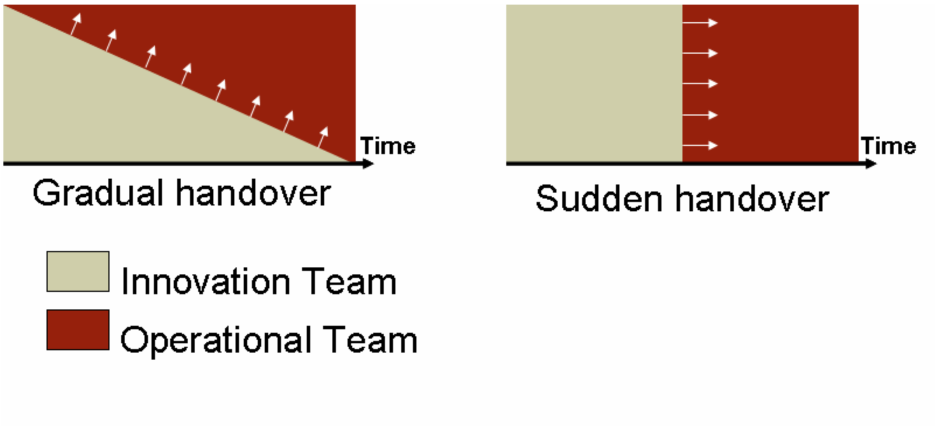

Figure 16: Gradual vs. Sudden Handover

Figure 17 illustrates a more detailed view of the Ramp-up and Ramp-down, including all the teams involved. The innovation team forms part of the validation and governance teams.

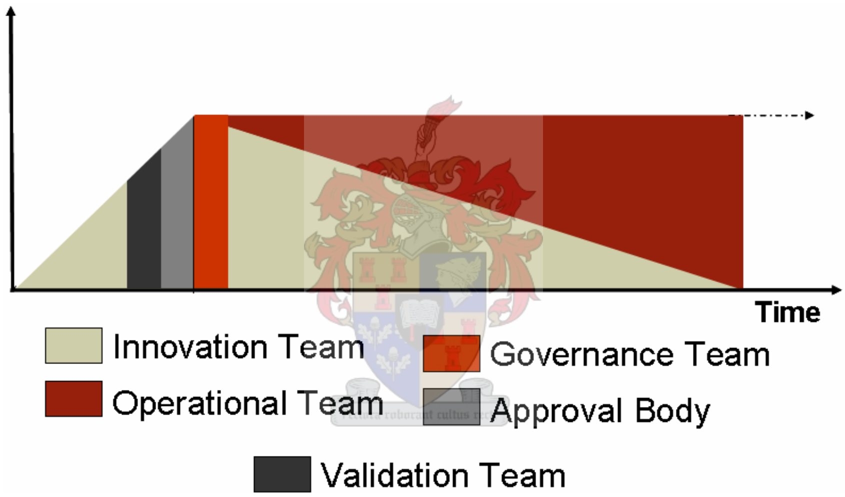

Figure 17: Teams involved in the Ramp-up and Ramp-down

6.4.3 How Ramp-up and Ramp-down Supports Innovation

Ramp-up and Ramp-down supports innovation in the following ways:

- By providing freedom for innovative thinkers: The innovation team are not restricted by an operational environment that may be opposed to change while developing the innovation scenarios.
- By validating the innovation: The validation of the innovation scenarios has three main advantages. Firstly, it allows a wider group of people, including operational people to understand and agree with the proposed innovation. This can improve the level of buy-in from the operational environment. Secondly, it ensures the accuracy and relevance of the innovation teams work. The knowledge that exists in the operational environment can be harnessed at this stage to benefit the innovation, as opposed to being

involved earlier and hindering the innovation. Thirdly, there is a greater chance of achieving approval for the innovation as people who are independent from the innovation team have validated it.

- By ensuring buy-in to the innovation from the approval body and the operational team: As described in the previous point, the validation of the innovation scenarios can achieve this buy-in. Another section that will also support buy-in to the innovation is the ramp-down. By slowly involving the operational team over the detailed design and implementation periods a greater level of buy-in can be achieved.

- By using operational knowledge to validate innovation during the detailed design and implementation of the radical innovation: By involving the operational team at the correct time, the innovation project benefits from the wealth of knowledge within the operational environment without stifling the innovation with the constraints of the current operational environment.

- By transferring knowledge from the innovation team to the operational team: The knowledge of the changed business environment needs to be transferred slowly to the operational team. The operational team are required to operate this new environment once the project is complete and to adapt their old approach towards the new approach defined in the governance principles.

6.5 High-level Component 3: The Project Structure

The Project Structure component of the IIM provides a view of the different project teams involved in the innovation and illustrates how these project teams interact in order to achieve the overall radical innovation project objectives. The Project Structure component is presented in Figure 18.

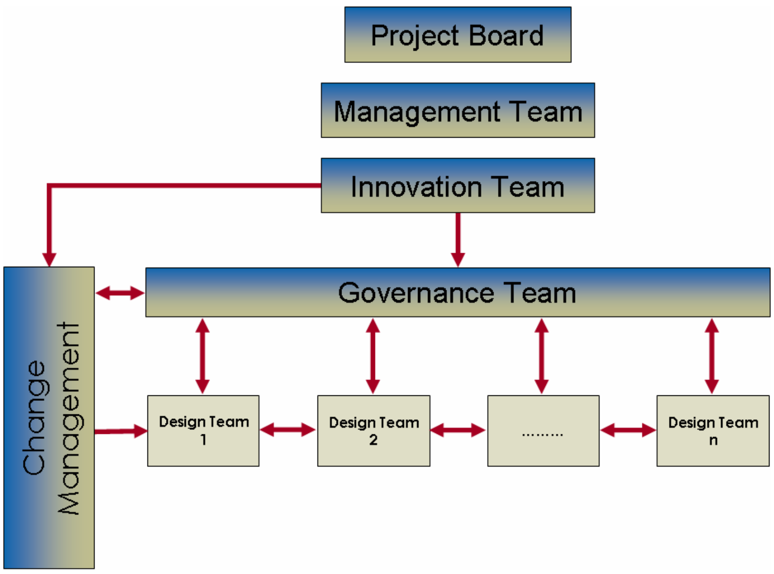

Figure 18: Radical Innovation Project Structure

Even though radical innovation projects vary greatly in their requirements and objectives several generic teams can be defined. Each team plays a specific role in the radical innovation and the team should therefore consist of individuals who are capable and willing to play their defined roles.

The generic radical innovation teams are:

- Innovation Team
- Project Board
- Management Team
- Governance Team
- Change Management or Transition Team
- One or several Detail Design Teams.

As part of the IIM, each team will plan and manage their way through the radical innovation project with the use of one or several roadmaps. The concept of **roadmaps and road-mapping** supporting a radical innovation project is described in **Section 6.8.5**. Roadmaps play an integral part in the knowledge management within the radical innovation project teams and support **integration** (**Section 6.8.1**) between the different project teams and between the radical innovation project and other projects. The concept of **knowledge management** and how it can be used to support a radical innovation project is described in **Section 6.8.6**.

A detailed description of each team is now provided. This includes the role of the team in the radical innovation project and the types of individuals required in the team.

6.5.1 Innovation Team

The innovation team is formed at the start of the innovation project. When the need for an innovation has been identified in a company, the project champion, on behalf of the project owner, will start to assemble the innovation team. The innovation team is responsible for creating the innovation. The team should understand the company's need and strategic objectives and then look beyond the company's current boundaries and the norms in the industry and develop a possible solution that has the potential to turn revolutionise the industry and provide the company with a true competitive advantage.

As part of the IIM, a roadmap, called the master plan, is used to guide the innovation team from the initiation of the innovation, through the definition of the high-level objectives and scope, to the development of a set of innovation scenarios until the approval and governance phases. A detailed description of the master plan **roadmap** is given in **Section 6.8.5**, which focuses on the concept of roadmaps.

The innovative thinking required at this stage of a radical innovation project is often difficult to achieve with internal personnel alone and the project champion therefore often requires assistance from outside companies. The Innovation Team should thus consist of the project champion, the project owner and external individuals with an innovative and broad point of view. Several internal individuals should also be included. If included, these individuals should understand the operational environment, but should be able to think laterally and beyond the confines of that environment. For a company to gain a competitive advantage through innovation, operational people should be identifying and generating opportunities for innovation on an ongoing basis. This is a challenge for most companies, as Oke discovered in his case study:

> *Achieving a shift in the organisation mindset was going to be difficult. Convincing staff that they had a key role to play in the development of the company was not going to be easy – particularly in a traditional insurance organisation where previously staff involvement in business development was limited (Oke 2004b: pg 2).*

The innovation team exists until the governance principles have been developed. At the end of the governance phase the members of the innovation team then form part of many of the other teams for the remainder of the project.

6.5.2 Project Board

The project board have a high-level advisory role in the radical innovation project. The board should be given regular overviews of the project progress and should provide advice and insight.

The board should consist of managers who are not involved in the day-to-day management of the radical innovation project, but who do have some stake in the success of the project. The champion and project owner should be part of the project board.

Regular reports from the various sub-project team managers should be presented to the project board so that the board members have an overview of the progress of the projects and are able to offer advice based on their untainted perspective and wider view of the business- and industry environment.

6.5.3 Management Team

The radical innovation project management team is the main high-level decision making body in the innovation project. The relevant sub-project teams present all important issues to the management team for decisions to be made. The types of issues that should be presented to the management team include:

- Financial issues
- Project direction issues (these generally come from the governance team)
- Integration issues (between different sub-projects)
- Resource prioritisation issues
- Issues relating to project positioning in the larger company environment.

The innovation management team should consist of high-level managers from all areas of the business that are directly or indirectly affected by the radical innovation project. Ideally, each sub-project would have an identified executive manager who is part of the innovation project management team.

Management commitment to the radical innovation project is vital for the success of the innovation. The concept of management commitment and its importance for the success of a radical innovation project is discussed in more detail in Section 6.8.7.

6.5.4 Governance Team

The Governance Team has two main roles in the radical innovation project. The first involves the execution of a series of governance workshops. These workshops take place directly after project approval has been given. The following four accomplishments are the outputs of these governance workshops:

- Development of Governance Principles
- Selection of the Detail Design Team Personnel
- Development of Sub-project Mandates
- Development of Sub-project Design Objectives.

These were described in detail earlier, in Section 6.4.

The second role of the governance team is ongoing throughout the life of the radical innovation project. This role is to ensure the various design teams adhere to the governance principles during their design, follow their mandates and achieve the required design objectives.

This second role is vital for a radical innovation project success, because the governance principles are only high-level guides for the design teams. Many decisions that are made throughout the project thus need to be tested against the original governance principles and this is performed by the governance team. Also, at the early stages of the innovation project it is not possible develop detailed design objectives due to the high-level of uncertainty. The governance team thus need to continue to refine the objectives for each design team throughout the design phase of the innovation project.

The governance team should consist of many of the members of the original innovation team, together with representatives from each of the design teams. In this way the governance team can also play an integration role between the different design teams.

6.5.5 Change Management Team

Change management has a major role to play in the successful completion of a radical innovation project. The concept of change management is discussed in more detail in **Section 6.8.11.**

The change management team should be formed at approximately the same time as the detailed design teams. The role of the change management team is to support the project owner, champion, design teams and operational managers and employees through the radical innovation project by implementing a change management process. The change management team focuses on preparing the company for change, managing the change and reinforcing the change (Hiatt & Creasey 2003). This involves the development and implementation of:

- Communication plans
- Training plans
- Resistance management plans
- Coaching plans.

The change management team is also responsible for the following:

- Culture change
- Identifying affected personnel
- Industrial Relations (IR) issues
- Job descriptions and roles and responsibilities.

The change management team is required to reduce the concern and anguish that can result from a radical innovation project. Peoples' fear of change is regarded as one of the leading causes of innovation failure. If not handled correctly, the resistance to change can result in a very rapid rejection and failure of the innovation. The change management team have to win the hearts and minds of the company in order for the innovation to be accepted.

6.5.6 Detailed Design Teams

The types of design teams vary from one radical innovation project to another. However the generic role of a design team is to take the initial concept and TO-BE situation, as defined by the innovation team and within the constraints of the governance principles, mandates and design objectives, and to design the details of the process or strategic change to the company.

The detailed design teams interact with the other project teams in a variety of ways. Any issues relating to the governance principles or design objectives are discussed by the design team's representative at the governance team meetings. Any major issues relating to finances or resource prioritisation are taken to the management team.

Two generic positions can be defined for all design teams. The first is a high-level executive manager, who is responsible and accountable for the design team's performance. This manager represents the design team on the innovation project management team. The second position is a project manager, whose role involves integrating the timelines and deliverables of the design team with those of other design teams and managing the available resources.

6.5.7 How the Project Structure Supports Innovation

The project structure component of the IIM supports innovation in the following ways.

- Provides a decision-making structure for the radical innovation project
- Facilitates knowledge management and sub-project integration through the use of roadmaps
- Guides executive management involvement, ownership and commitment
- Facilitates high-level project guidance through the project board.

6.6 High-level Component 4: Verification and Optimisation

The verification and optimisation component of the IIM provides a scientific and experimental view of the radical innovation project.

Due to the high levels of uncertainty in a radical innovation project, the IIM uses a range of tools and techniques to reduce the uncertainty from the beginning of the project to well into the execution. This is the verification segment of this component. Verification involves identifying a question in the radical innovation project about which there is high uncertainty and then determining through a formal scientific or experimental approach the answer to the question.

The optimisation component usually appears late in the radical innovation project, once the implementation is well under way. The optimisation component is vital for ensuring that the new operational environment performs as it was designed, and that the innovation delivers the benefits on which the business case is based.

The concept of **measure and learn** is a central focus in this IIM component. Both the verification and optimisation segments of this IIM component rely on strong management information systems. These systems are used to measure and feedback results so that lessons can be learnt and uncertainties made clearer. The concept of **measure and learn** is discussed in more detail in **Section 6.8.9**.

6.6.1 Verification Tools and Techniques

Several verification tools and techniques can be employed from the start of a radical innovation project. These include:

- Simulation modelling
- Financial modelling
- Pilot projects
- Mock-ups and prototypes
- Management information systems (MIS)
- Forecasting.

Simulation models are an excellent technique to use to represent a future situation and to run what-if scenarios during all phases of a radical innovation project. A project team can often "kill two birds with one stone" with a simulation model. Many of the top simulation software packages allow both the detailed statistical calculations to be done and represent the simulation in an easy-to-follow graphical format. The simulation model can thus be used at a detailed level as well as at a high level to present the future scenario to a management team or company board.

Financial modelling is critical at the start of the radical innovation project in order to achieve buy-in and approval for the project. However, the financial modelling should continue throughout the detailed design and implementation. As issues in the radical innovation project become clearer or circumstances change, the models need to be updated to better reflect the situation.

From an early stage in the radical innovation project, management information systems should be developed. They can start by being very crude, even requiring manual intervention, but they should develop into a user-friendly way of measuring the performance of the innovation and identifying problems and risks.

The concept of mock-ups and prototyping is discussed in more detail in Section 5.8.8.

6.6.2 Optimisation Method

The optimisation activities are very closely tied to the concept of measure and learn (see Section 6.8.9). As with verification, optimisation relies heavily on strong management information as a starting point. However, optimisation also has an emphasis on implementation. Optimisation involves identifying a problem through measuring and then implementing a solution in order to optimise the innovation. The optimisation process includes measuring, analysing, identifying problems, developing solutions and then implementing the solutions. Figure 19 illustrates this process.

Figure 19: Optimisation Process

6.6.3 How Verification and Optimisation Support Innovation

The verification and optimisation component of the IIM supports innovation in the following ways:

- It reduces uncertainty in the innovation.
- It assists in proving the benefits of the innovation and thus facilitates project buy-in.
- It ensures many of the innovation benefits are delivered.
- It facilitates learning throughout the innovation project.
- If allows the project team to fail quickly and fail cheaply.

6.7 Unification of the High-level IIM Components

The aim of the unification of the four high-level components of the IIM is to illustrate how the four components act in parallel during a radical innovation project. Figure 19 presents the four components running parallel to each other. The red oval indicates how sections of the high-level components are interrelated.

The section highlighted in Figure 20 is the strategic and project objectives section. The ramp-up and ramp-down component provides a view of who should be involved with the development of the innovation project objectives. The four-layered approach component provides a view of the level of detail and how the project objectives should be aligned with strategic objectives of the company. The project structure component provides the roadmap view, where the relevant steps of the Revised Master Plan are used to capture the strategic and innovation project objectives.

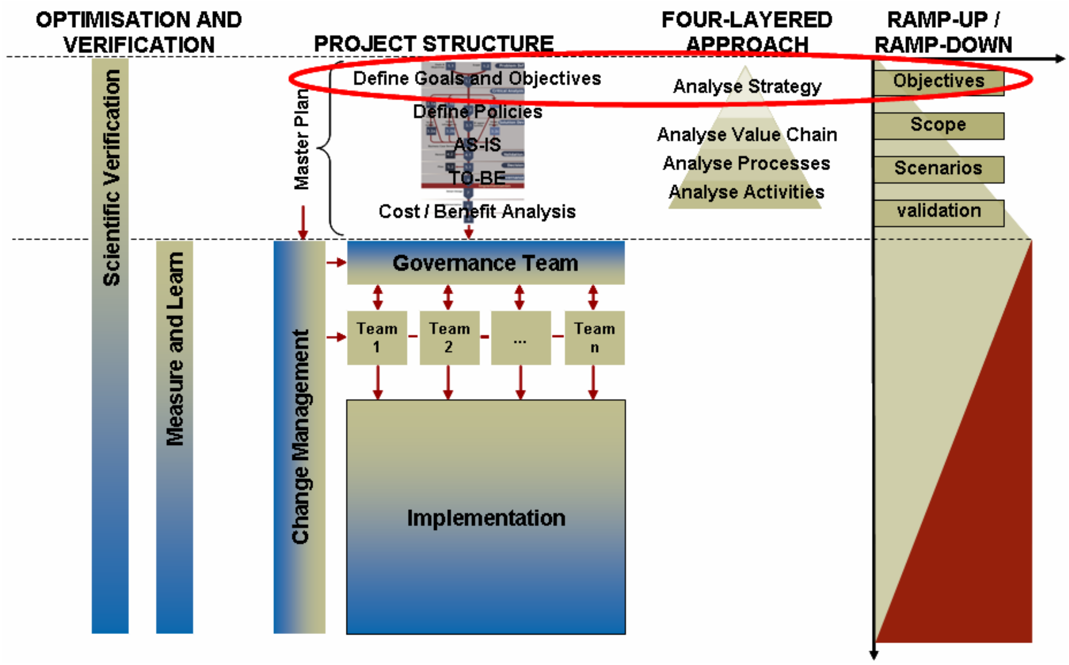

Figure 20: Unification of IIM High-level Components

6.8 Innovation Concepts

In this section the 11 detailed innovation concepts are presented. The way in which they support innovation is described and the link to one or several of the four high-level components is explained.

6.8.1 Concept 1: Project Integration

The ability of a company to integrate various innovation projects has an affect on the company's ability to implement radical innovation projects. True integration of a range of innovation projects allows a company:

- To share knowledge and experience between project teams thereby reducing re-work and time
- To understand the impact of one project on another
- To plan for and balance resources across projects
- To ensure the portfolio of projects are achieving the company's strategic goals.

Therefore project integration can improve the efficiency and effectiveness of a radical innovation project in a company.

The concept of Project Integration is achieved in the Four-Layered Approach. Both the strategy layer and the value chain layer assist in integrating various projects by identifying projects that achieve the same or similar strategic objectives and have an affect on overlapping areas in the value chain. These projects may require some level of integration.

This integration could take the form of shared resources, shared tasks and shared knowledge and experience. Careful analysis of each projects' benefits should be completed, as two projects may be trying to achieve the same benefits or the benefits achieved by the one project may cancelled out or reduce the benefits of another.

6.8.2 Concept 2: Knowledge Transfer

The concept of knowledge transfer relates to the transfer of knowledge from a radical innovation project team to an operational team. The IIM suggests that an innovation team is involved in the initial design of the innovation and that the operational team is only involved at a later stage. The operational team can start to be involved during the validation of the scenarios and their involvement grows by participating in several of the detailed design teams. Finally, the operational team become fully involved during the implementation of the innovation.

During this gradual involvement process, knowledge relating to the technical aspects, as well as the general principles of the innovation, is transferred to the operational team. This approach has the following benefits:

- Operational constraints do not stifle the initial innovation process.
- Operational team buy-in is slowly achieved.
- Operation knowledge can be used during the validation and detailed design.

The concept of knowledge transfer is achieved in the Four-Layered Approach, specifically in the process layer, and in the ramp-up and ramp-down IIM component. During the ramp-down phase of this component, the operational team's involvement and responsibilities increase.

6.8.3 Concept 3: Governance Principles

The governance principles are a set of high-level principles by which the radical innovation project is managed. They are developed by the governance team and govern all major decisions during the radical innovation project. Whenever an important decision is to be taken, the governance team need to determine if the decision is in line with the governance principles. If not, then the decision is reconsidered, or an understanding is reached between the team members as to why the governance principles were not adhered to in this situation.

The governance principles play an important role in carrying through the ideas and concepts developed by the innovation team to the detailed design teams. As radical innovation projects, by definition, are highly uncertain, it is not possible for the innovation team or the governance team to provide the detailed design teams with detailed requirements. The governance principles are therefore used as a vehicle to transfer the concepts and goals of the innovation to the detailed design teams.

The governance team constantly monitors the progress of the detailed design teams in relation to the governance principles.

The concept of governance principles is one of the key methods used by the IIM to allow a detailed design team to continue to design and learn without a detailed scope or set of requirements.

"A simple set of guiding principles for making decisions should be shared by everyone in the organization. They should be lived first and then enforced." (Kotelnikov 2006).

6.8.4 Concept 4: Design Objectives

Design objectives are used in a radical innovation project and in the IIM in a similar way as in non-innovative projects. Each design objectives should have a performance indicator, a measure and a target.

In radical innovation projects the level of detail of the design objectives and the flexibility of the objectives differs from non-innovative projects. In the early stages there are very few design objectives set and the objectives that are set are at a very high-level. As the innovation becomes more certain, the design objectives' performance indicator, measure and even target may change. As described by Wycoff (2003) on the Innovation Tools Website, "Innovation projects tend to start with loosely defined; sometimes even ambiguous objectives that become clearer as the project proceeds".

It is the role of the governance team, in coordination with the detailed design teams, to adjust the design objectives. It is vital for the success of the radical innovation project that any changes to the design objectives be properly communicated to all relevant stakeholders.

In a survey of service companies, Oke (2004a) identified the "lack of good measures of innovation performance" as being one of the key inhibitors of innovation. Therefore, carefully managing the design objectives and their measures throughout the radical innovation project can improve the chances of success.

6.8.5 Concept 5: Roadmaps

The concepts of roadmaps and road-mapping play a vital role in the IIM and in successful innovations.

A roadmap can be defined as a path guiding a project team through the high-level steps required to successfully implement a project. Road-mapping is the process by which a team develop a common roadmap to guide their progress and to place information generated in context. Roadmaps and road-mapping are important in the context of a radical innovation project, for the following reasons:

- They provide a common, high-level view of the required radical innovation path.
- They places individual team members' work in context with the overall project.
- They allow for knowledge capturing and sharing in context.
- They integrate the work of different sub-projects and of different stakeholders.

Kotelnikov reports:

> Road-mapping leads to effective project portfolio development and management. … Road-mapping tools provide also a common language for innovation and building bridges between technologists and business managers within your corporation, and with your major suppliers and customers (Kotelnikov 2006).

As described in Section 6.5, on the project structure, roadmaps are used by the various radical innovation teams for the reasons described earlier. Each detailed design team may develop its own roadmap, appropriate for its detailed design sub-project. A generic roadmap, called the Revised Master Plan, has been developed to assist the innovation team in the initial stages of the radical innovation project. This roadmap is a revised version of the Master Plan roadmap developed by Ted Williams at the Purdue University, Indiana, USA. The Revised Master Plan roadmap is now described in more detail.

6.8.5.1 Revised Master Plan Roadmap

The Revised Master Plan consists of six phases, namely the Problem definition, Critical analysis, Solution development, Validation, Decision and Governance phases.

The Revised Master Plan is illustrated in Figure 21.

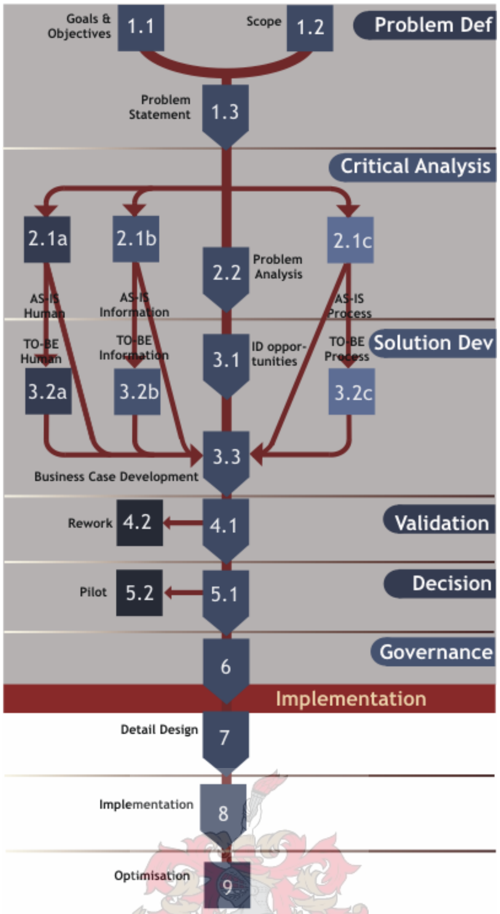

Figure 21: The Revised Master Plan

Phase 1: Problem Definition

Step 1.1 Objectives

In this step the objectives, goals and critical success factors must be documented so that the rest of the Master Plan is aligned with these basic business principles.

From the project objectives, an objective map is developed. The aim of the objective map is to link the defined project objectives with the business unit strategic objectives and the strategic objectives of the company. This will make achieving project buy-in easier in the later phases.

The viability and therefore success of the project is determined by the setting of achievable and realistic goals.

Step 1.2: Scope

The following step in the problem definition phase is to define the scope of the project. This is accomplished by defining the value chain of the company and then identifying which areas of the value chain will be directly and indirectly affected by the radical innovation project.

The Enterprise Business Entity must be specified and defined up to the level where it can be seen as a black box with inputs and outputs, an object within the company that can function completely on its own. This includes specifying the importance of the Enterprise Business Entity to the company, and the boundaries that the Enterprise Business Entity has as constraints to its physical and functional nature.

Step 1.2: Problem Statement

In the problem definition phase of the Revised Master Plan, the innovation team develop a problem statement. The problem statement will outline the needs of the company and give direction for the future phases.

Phase 2: Critical Analysis

Step 2.1: Define AS-IS state

The critical analysis phase begins with an intense information gathering exercise.

An AS-IS state (current state) of the in-scope areas is developed from the gathered information. The AS-IS state is presented from several different views. These include a process view, a personnel view, a systems view, an information flow view and a cost view.

Step 2.2: Problem Analysis

The problem analysis step in the critical analysis phase involves a critical look at the AS-IS state and the detailed definition of problems.

Phase 3: Solution Development

Step 3.1: Identify Opportunities

The solution development phase begins with an intense research effort into the identified problem areas. The innovation team will re-evaluate all aspects of the current enterprise (known as the AS-IS organisation) to identify new opportunities. Benchmarking and technology scanning are possible activities undertaken at this point, in order to generate possible opportunities

Step 3.2: Define TO-BE states

Once one or several solutions have been identified the innovation team can define each of these solutions in detail, using similar views used in the AS-IS analysis (process view, a personnel view, a systems view, an information flow view and a cost view). In this way several TO-BE states (future states) of the in-scope areas are developed.

Step 3.3: Business Case Development

Next, a business case with cost benefit analyses for each of the TO-BE states is developed. The business case includes the project costs, capital expenses, return on investment and future operational costs and savings for each of the proposed TO-BE states. Projects with the most chance of success and greatest economic benefits are rated in order of priority with respect to critical success factors, business activities and cost improvements.

Phase 4: Validation

A validation team of between 10 and 15 people is formed from the directly and indirectly affected areas of the business. The innovation team facilitates a series of validation workshops, in which the proposed innovations and business cases are presented. The validation team then validates the data and highlights any problems they foresee in the proposed innovations and the business case. It is also important that the risks involved in implementing the TO-BE scenarios have been assessed and the associated costs have been tallied.

This is an important step in the process as it ensures the solutions are accurate and viable and gets buy-in from the company's operational environment.

Phase 5: Decision

Step 5.1: Solution Presentation

The decision process varies from company to company and between different project types. The first step would be to present the proposed and validated innovation options to a decision body. The aim of this presentation would be for the decision body to decide on the preferred innovation.

Step 5.2: Possible Pilot Project

Unless there is total agreement and support for a particular solution, a pilot project is implemented, where the favoured solution is demonstrated in prototype format. This also allows for a more detailed validation of one of the proposed innovations.

Once the pilot project is complete and shows positive results, the particular innovation is again presented to the same or a different decision body along with the findings from the pilot. When final approval for the solution is given, the project can move into the governance phase.

Phase 6: Governance

Step 6.1: Governance Workshops

The governance phase usually lasts a couple of weeks and involves a series of governance workshops. At these workshops, a governance team decide on the sub-project teams that will be tasked with the detailed design of the selected innovation. The outputs of the governance workshops are explained in detail in Section 6.4.

6.8.6 Concept 6: Knowledge Management

The concept of Knowledge Management is an extremely wide field of study and cannot therefore be covered in detail in this thesis. However, the relationship between knowledge management and the management of radical innovation projects should be explored.

Knowledge management supports innovation in the following ways:

- By providing a common view of the current company environment
- By providing a view of the industry environment and client requirements
- By providing a view of the latest in technological developments
- By speeding up innovation by assisting with project integration and knowledge sharing between projects.

Carneiro (2000) explains that the innovation process is about the generation of new knowledge and that companies that wish to gain a competitive advantage through innovation also need to have the correct systems, processes and culture to manage knowledge.

Carneiro says:

> *In what concerns dynamic organizations, KM (knowledge management) is a valuable strategic tool, because it can be a key resource for decision making, mainly for the formulation of alternative strategies. KM should be able to combine innovation efforts, updated IT, and knowledge development in order to achieve a set of capabilities to increase competitiveness (Carneiro 2000: pg 91).*

Figure 22 illustrates the relationship between knowledge management, innovation and competitiveness.

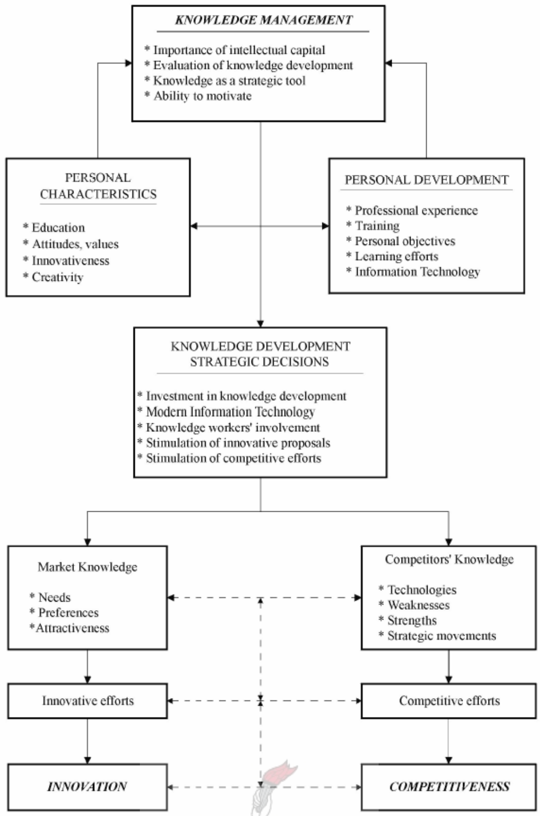

Figure 22: Carneiro's (2000) KM Structure for Innovation and Competitiveness

6.8.7 Concept 7: Management Commitment

In much of the discussions around the optimal company environment for innovation (see **Section 2.2**) management commitment to the innovation was highlighted as one of the key requirements for successful innovation. This is again evident in research by Oke (2004a), which revealed that companies whose management were committed to the innovation had superior innovation performance over companies whose management lacked commitment. This commitment takes the form of both making resources available as well as practically being involved in the innovation. Top managers who play an active role in an innovation have fewer problems motivating others to accept the innovation.

Simon (2003: pg 18) clearly explains the importance of top management commitment by writing:

> *Senior management must be passionate. The support, involvement, commitment, and championing of the CEO and senior management is perhaps the most critical success factor.*

6.8.8 Concept 8: Mock-ups & Prototypes

The concept of mock-ups and prototypes is central to the management of a radical innovation project. Because of the high-levels of uncertainty in a radical innovation project, it is important for the innovation team and the detailed design teams to test ideas and theories in a quick, cost effective manner. Mock-ups and prototypes provide a formal method for this testing.

The difference between a mock-up and a prototype is that a mock-up is a scaled down version of the final product or process, whereas a prototype may look very different from the final version but is used to prove a concept or solve a specific problem.

To achieve optimal results from a mock-up or prototype, a formal method should be followed in the development and execution of the mock-up or prototype. Alexander (2002) suggests that:

Application of the scientific method and statistical design of experiments can be used to formalise an uncertain research and development project. In the same way a formal process for mock-ups and prototypes can reduce the uncertainty of a radical innovation process.

Alexander (2002) presents the common experimental method illustrated in Figure 23.

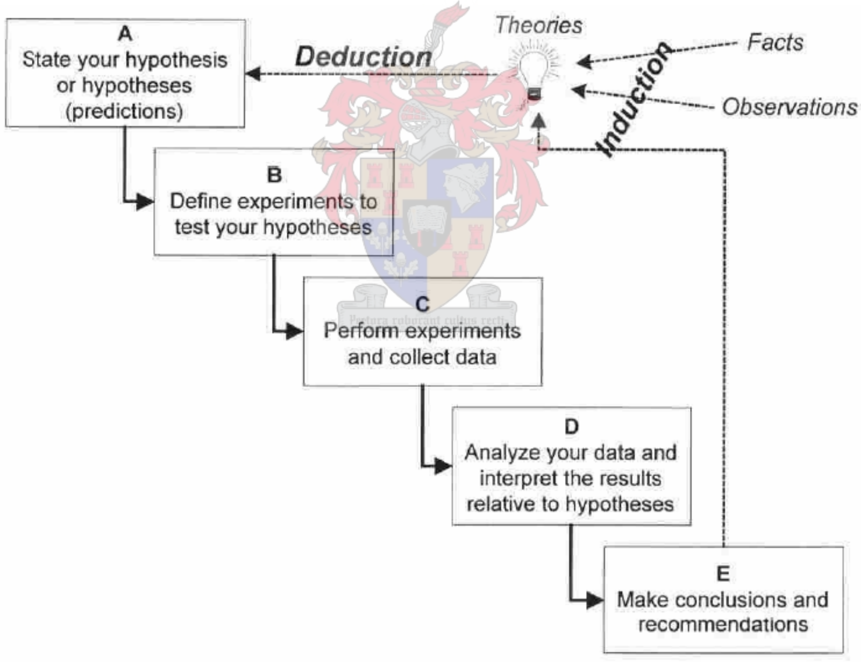

Figure 23: Alexander's (2002) Experimental Method

The purpose of all mock-ups and prototypes should be clearly defined and the correct processes and systems put in place so that the desired results of the mock-up and prototype can be measured. The importance of measuring and learning is discussed in **Section 6.8.9**.

Mock-ups and prototypes support the management of a radical innovation project by quickly providing answers to difficult questions and reducing the levels of uncertainty in the project as early as possible.

6.8.9 Concept 9: Measure and Learn

The concept of measure and learn can be seen as one of the most important concepts in the management of a radical innovation project and therefore in the IIM as well. The reason for this is that it lies at the heart of the idea behind managing innovation.

By definition, radical innovation projects have high levels of uncertainty. When the project team embarks on such a project, the scope, objectives and deliverables are often unclear. Through formal measuring and learning these key components of managing a project can be defined with greater certainty as the innovation evolves.

The concept of measure and learn supports both the verification and optimisation activities as discussed in Section 6.6.

On the verification side, the results of mock-ups, prototypes, simulation models and pilot projects are measured and the learning is built into the final innovation. When it comes to the optimisation of the innovation, the measuring is accomplished through management information systems. The lessons learned are the identified problems and risks that can then be addressed.

Knowledge management, as discussed in Section 6.8.6, plays an integral role in the measuring and learning process as lessons learnt need to be captured and shared with team members of the current innovation project, team members of future projects and the operational team.

6.8.10 Concept 10: Risk Management

The Guide to the PMBoK, 3rd edition, defines risk management as the processes concerned with the planning, identifying, analysing and monitoring and control of risks. The aim of risk management is to reduce the probability and impact of identified risks on the project.

The increased uncertainty in radical innovation projects not only increases the importance of risk management, but also makes the identification and analysis of risks far harder. The management of risks in a radical innovation project should be handled in the same manner as many of the other activities. In the early stages of the project, only high-level risks can be identified. As the project evolves and the levels of uncertainty reduce, these risks (as well as new ones) can be identified and analysed in more detail.

Wycoff (2003) explains that due to the higher probability of a radical innovation project failure, project teams should be more actively involved in continuously identifying and mitigating risk factors. Wycoff (2003) suggests that radical innovation project teams should learn to, “fail fast and fail smart in order to move on to more attractive options”.

Prototypes and mock-ups, as described in Section 6.8.8, are an excellent way of testing risks and of failing quickly and cheaply.

Baker (2002) agrees with this principle and suggests that a company's strategy should be to fund a number of ideas and through *"low-risk experimentation"* select the appropriate innovation.

6.8.11 Concept 11: Change Management

The simplest definition of change management is presented by Carey (2002: pg 2):

> *Making change in a planned and managed fashion*

The *datasegmentation.com* online dictionary defines change management as*:*

> *a set of techniques that aid in evolution, composition and policy management of the design and implementation of an object or system.*

Hiatt and Creasey (2003) define the following (Figure 24) seven principles of change management, which concisely explain the key issues involved in managing change.

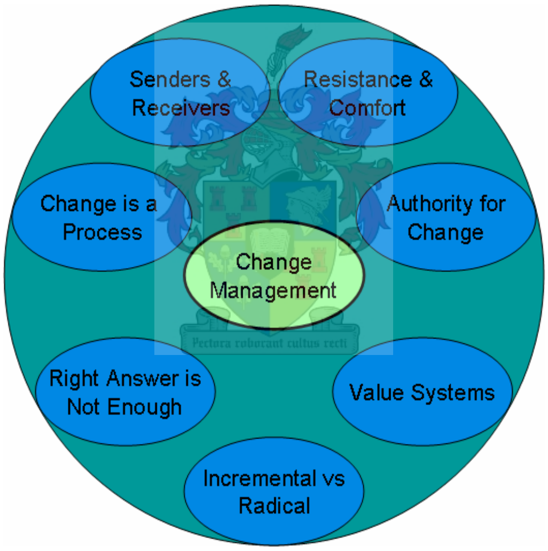

Figure 24: Seven Principles of Managing Change

Hiatt and Creasey's (2003) seven principles are explained in more detail:

- Senders and receivers: Different aspects of the change should be communicated by different senders. Issues regarding the personal effect the change will have on an employee should be communicated by their supervisor, while issues regarding the company's need to change should be communicated by top management.
- Resistance and comfort: In general, people are comfortable with the AS-IS state and therefore resist any change. The greater the comfort of the current

state, the greater the levels of resistance. Actively managing resistance is an essential part of a change management process.

- Authority for change: *"Visible and active"* (Hiatt & Creasey 2003) top management involvement is viewed as one of the key success factors of change.
- Value systems: Values of *"empowerment, accountability and continuous improvement"* (Hiatt & Creasey 2003) are vital in driving a culture of change in a company.
- Incremental vs. radical: The level of change management activities should fit the level and pace of change. Radical changes require a high level of change management activities, while incremental changes allow personnel to slowly adjust to the new environment.
- The right answer is not enough: A correct solution to a business problem will not always get the assumed support from employees. Change management I still required to achieve buy-in.
- Change is a process: The management of change can be divided into discrete steps. Figure 25 illustrates Hiatt and Creasey's (2003) Change Management Process for company change.

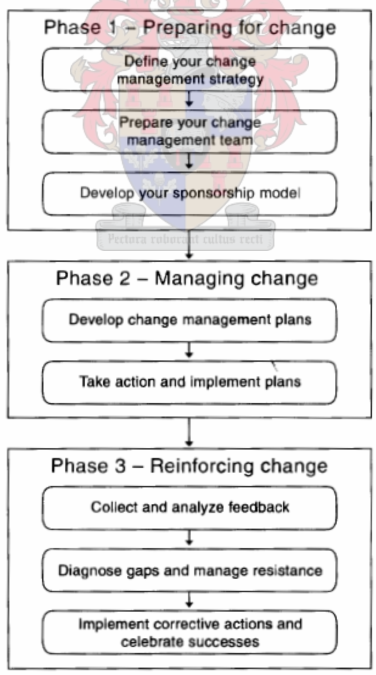

Figure 25: Change Management Process (Hiatt & Creasey 2003)

6.9 Summary of Benefits

Table 8 presents a summary of the benefits gained by applying each of the IIM high-level components and concepts when managing a radical innovation project.

Table 8: Table of Benefits Gained by Using IIM

Benefits	Strategic Alignment	Integration between sub-projects & Projects	Common View	Free Innovative Thinking	Innovation Validation	Project Buy-in	Operational Knowledge	Knowledge Transfer	Decision support	Project Ownership	Realisation of benefits	Ongoing learning	Reduced uncertainty
IIM Components													
Four Layered Approach	X	X	X										
Ramp-up & Ramp-down				X	X	X	X	X					
Project Structure		X							X	X			
Verification and Optimisation				X		X					X	X	X
IIM Concepts													
Project integration		X	X										
Knowledge transfer							X	X				X	
Gov. principles & mandates	X		X										
Design objectives	X	X	X						X		X		
Roadmaps		X	X			X		X				X	
Knowledge management		X	X				X	X	X			X	
Management commitment	X					X				X			
Mock-ups & prototypes				X		X		X				X	X
Measure and learn						X		X				X	X
Risk management									X		X		X
Change management						X				X			

7. Thesis Hypothesis

The following problem was defined in **Chapter 5**:

"*Project management concepts alone, captured in the various bodies of knowledge, are not sufficient enough to successfully manage and deploy radical innovation projects. Therefore, companies struggle to gain a competitive advantage through innovation, as the implementation of the radical innovation is seldom successful*."

The aim of this thesis is to develop an innovation implementation methodology (IIM) and a method of integrating this IIM with PMBoK in order to better manage radical innovation projects. The extent of the integration will be determined by the innovativeness of the project.

The thesis hypothesis is therefore:

The correct integration of IIM components and PMBoK processes, based on the innovativeness of the project, can successfully support the management of a radical innovation project.

8. Integration of IIM with the PMBoK

This chapter deals with the integration of the components and concepts of the IIM, as described in **Chapter 6**, with the PMBoK processes, described in **Chapter 4**. The suggested process for achieving this integration is explained in detail and a generic example of the integration is presented for each of the high-level phases of a project.

8.1 The Integration Process

The process of integrating the IIM with PMBoK is illustrated in Figure 26. The process begins with the identification of a new project.

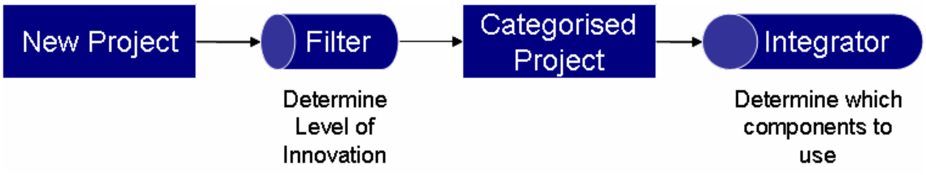

Figure 26: The Integration Process

Before the integration of the two methodologies can happen, it is important to determine the innovativeness of the project, or the level of innovation required to achieve the objectives of the new project. In order to do this a filter has been developed to help categorise a project on a scale from radically innovative to totally repetitive.

Once a project has been placed in a specific category, with respect to the required level of innovation, the correct balance between the IIM and PMBoK can be achieved. This is done in the integrator step of the process. In the integrator step it is decided which IIM components and concepts and which PMBoK processes should be used at the different high-level phases of the project. These decisions are based on the categorisation of the project that was done using the filter. Figure 27 illustrates the concept of an integrator.

The final outcome of the integration process is therefore a list of IIM components and concepts and PMBoK processes required for each of the phases of the project, based on how much innovation the project requires.

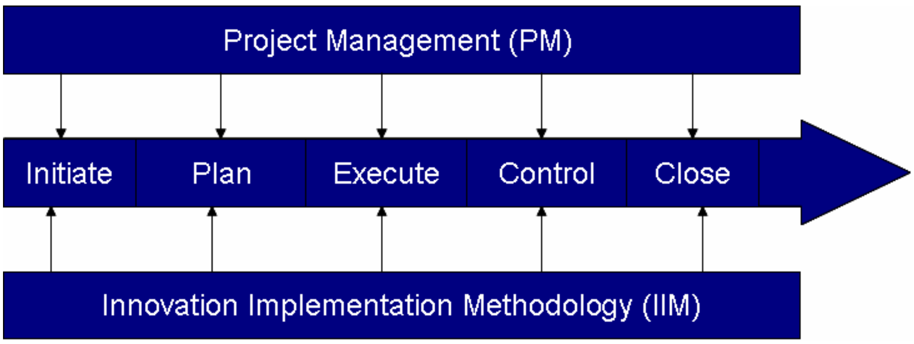

Figure 27: Integration of the PM and IIM Components

8.2 *The Innovation Filter*

The innovation filter is used to categorise a new project into a specific level of innovativeness. The filter has a set of criteria on which a new project can be measured. A rating for each criterion is given and the final score is used to determine the innovation category of the project. These criteria are divided into three high-level types. These types are:

- Internal innovation criteria
- External innovation criteria
- Complexity criteria.

The need for the first two sets of criteria is perhaps obvious, but the need for the complexity criteria may not be that clear. Both the IIM and PMBoK become less relevant and less important to the success of a project as the levels of complexity of the project decrease. Therefore there is little need to integrate the two methodologies for a project that is low in complexity.

For the filter to be used in a standardised and consistent manner, each criterion requires a set of guidelines, used for rating a new project in that criterion. As an example, the criterion may be that the project is a first. The guidelines would then specify the following:

- World first (10 point rating)
- Industry first (7 point rating)
- Company first (5 point rating)
- Been done in the company before (0 point rating)

8.2.1 Internal Innovation Criteria

The internal innovation criteria are based mainly on the definition of a radical innovation as described by Simon (2003).

The internal innovation criteria, along with each criterion's guidelines, and relevance for innovation are presented in Table 9.

Table 9: Internal Innovation Criteria and Rating Guidelines

Criterion	Ratings Guidelines		Explanation
New performance measures	World first New to industry New to company No new performance measure	(10 point rating) (7 point rating) (5 point rating) (0 point rating)	Relating to the concept of newness with respect to innovation.
Change in known performance measures	Greater than 5 fold change 3 to 5 fold change Less than 2 fold change No change	(10 point rating) (7 point rating) (5 point rating) (0 point rating)	A large change in a current performance measure will require a significant change to current practices and therefore a significant innovation.
Totally new knowledge area	No experience Limited experience Moderate experience Extensive experience	(10 point rating) (7 point rating) (5 point rating) (0 point rating)	The less the experience in a knowledge area, the more innovation is required.
Reduction in cost/increase in revenue/increase in market share	By 25% By 15% By 10% By 5% or less	(10 point rating) (7 point rating) (5 point rating) (0 point rating)	Similar to known performance measures above, but specific for key business drivers.

8.2.2 External Innovation Criteria

The external innovation criteria, along with each criterion's guideline, and relevance for innovation are presented in Table 10.

Table 10: External Innovation Criteria and Rating Guidelines

Criterion	Ratings Guidelines		Explanation
Introduces new concept or approach	World first New to industry New to company Not new	(10 point rating) (7 point rating) (5 point rating) (0 point rating)	Defines the level of shake-up there will be in the industry due to the innovation.
Has potential to provide true competitive advantage	Long-term comp. adv. Medium-term comp. adv. Short-term comp. adv. No comp. adv.	(10 point rating) (7 point rating) (5 point rating) (0 point rating)	Defines the level of competitive advantage the company may gain from the innovation.
Potential to become industry benchmark	Definite potential Moderate potential Limited potential No potential	(10 point rating) (7 point rating) (5 point rating) (0 point rating)	Defines how keen the company's competitors will be to follow the company's lead.

8.2.3 Complexity Criteria

The complexity criteria, along with each criterion's guidelines, and relevance for innovation are presented in Table 11.

Table 11: Complexity Criteria and Rating Guidelines

Criterion	Ratings Guidelines		Explanation
Overall programme and Sub-projects	Numerous (>6) sub-projects Several (4-6) sub-projects Few (2-3) sub-projects No sub-projects	(10 point rating) (7 point rating) (5 point rating) (0 point rating)	The larger the number of sub-projects the harder the integration and the more complex the overall programme.
Multi-disciplinary teams	Numerous disciplines Several disciplines Few disciplines Only one discipline	(10 point rating) (7 point rating) (5 point rating) (0 point rating)	The interaction between many different disciplines adds complexity to a project.
Integration across company silos	Numerous silos involved Several silos involved Few silos involved Only one silo involved	(10 point rating) (7 point rating) (5 point rating) (0 point rating)	Company silos often prevent collaboration. The more silos involved the greater the affects of company politics and the more complex the project.
Wide geographical location	Multiple international sites Multiple national sites Multiple local sites Single site	(10 point rating) (7 point rating) (5 point rating) (0 point rating)	Communication over a wide geographical distribution adds to the complexity of a project.

8.2.4 Filter Calculations

The final score for a new project is determined by multiplying the rating for a given criterion by a pre-determined weighting for that criterion and then summing these scores to achieve an overall innovation score for the project. This score will be between zero and ten.

The weighting of the criteria should be company specific. Depending on the industry and the company circumstances, some criterion may be more relevant than others. The same criterion weighting should be used for measuring every new project. Therefore once the set of criteria have been weighted initially, these weighting become the company standard.

Table 12 illustrates an example of the filter with weightings, criterion ratings and a final score for the example project.

Table 12: Example of Innovation Filter

Criterion	Ratings Guidelines	Weighting	Rating	Score
Internal Innovation Criteria				
New performance measures	World first (10 point rating) New to industry (7 point rating) New to company (5 point rating) No new performance measure (0 point rating)	10%	7	0.7
Change in known performance measures	Greater than 5 fold change (10 point rating) 3 to 5 fold change (7 point rating) Less than 2 fold change (5 point rating) No change (0 point rating)	10%	10	1
Totally new knowledge area	No experience (10 point rating) Limited experience (7 point rating) Moderate experience (5 point rating) Extensive experience (0 point rating)	15%	7	1.05
Reduction in cost/increase in	By 25% (10 point rating)	10%	7	0.7

revenue/increase in market share	By 15% By 10% By 5% or less	(7 point rating) (5 point rating) (0 point rating)			
External Innovation Criteria					
Introduces new concept or approach	World first New to industry New to company Not new	(10 point rating) (7 point rating) (5 point rating) (0 point rating)	15%	10	1.5
Has potential to provide true competitive advantage	Long-term comp. adv. Medium-term comp. adv. Short-term comp. adv. No comp. adv.	(10 point rating) (7 point rating) (5 point rating) (0 point rating)	10%	7	0.7
Potential to become industry benchmark	Definite potential Moderate potential Limited potential No potential	(10 point rating) (7 point rating) (5 point rating) (0 point rating)	5%	7	0.35
Complexity Criteria					
Overall programme and Sub-projects	Numerous (>6) sub-projects Several (4-6) sub-projects Few (2-3) sub-projects No sub-projects	(10 point rating) (7 point rating) (5 point rating) (0 point rating)	5%	10	0.5
Multi-disciplinary teams	Numerous disciplines Several disciplines Few disciplines Only one discipline	(10 point rating) (7 point rating) (5 point rating) (0 point rating)	10%	10	1
Integration across company	Numerous silos involved Several silos involved	(10 point rating) (7 point rating)	5%	5	0.25

silos	Few silos involved (5 point rating) Only one silo involved (0 point rating)			
Wide geographical location	Multiple international sites (10 point rating) Multiple national sites (7 point rating) Multiple local sites (5 point rating) Single site (0 point rating)	5%	7	0.35
		Final Score		8.1

The final score for the above example is 8.1. Therefore the new project scores 8.1 out of ten for the required levels of innovation, with ten being a radical innovation project and zero being a project that the company has executed many times in the past.

8.2.5 Project Categories

Based on the filter, presented previously, several project categories can be determined with respect to innovation. The following categories are suggested:

- Radical innovation — Filter scores of 8 – 10
- Partially innovative — Filter scores of 5 - 8
- Replication — Filter scores of 0 – 5

These project categories should be classified in more detail, but the time constraints of this thesis prohibited the inclusion of this work. It should be seen as the next step of research on this topic.

The project categories are to be used in defining the integration between PMBoK and IIM. Each of the categories requires a different type of integration.

Figure 28 illustrates how for each of the three defined project categories the levels of innovation may change as the project progresses over time. The X-axis is time and the Y-axis is the required level of innovation from zero to ten, as defined by the innovation filter.

This approach is used to integrate PMBoK with IIM. More IIM components are used at the start of a radical and partial innovation project, while the role of the PMBoK processes is more significant towards the end.

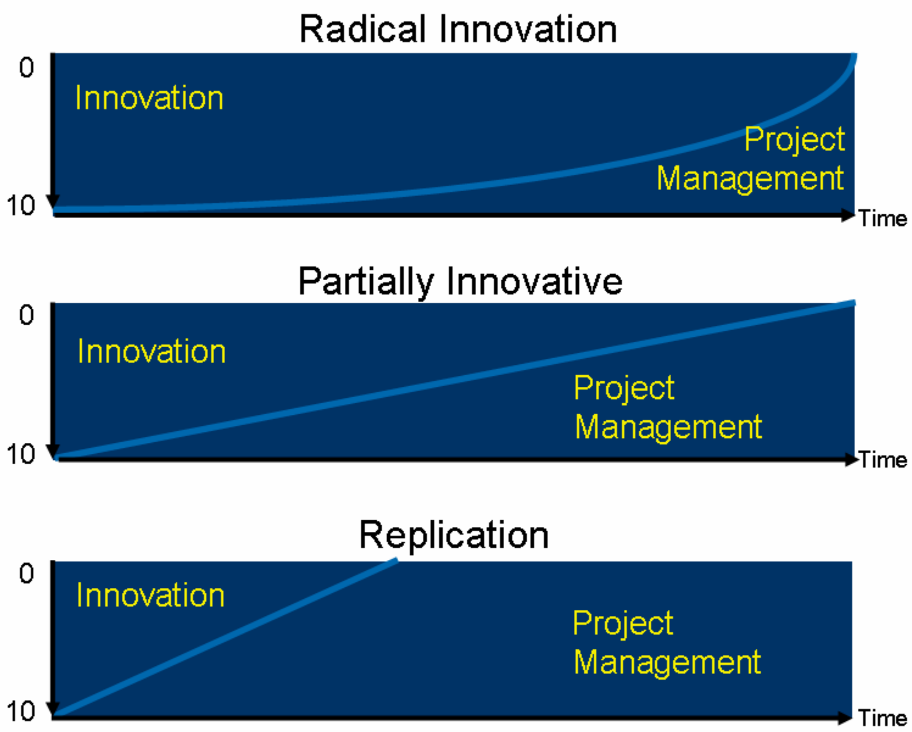

Figure 28: Level of Innovation Change Over Time

8.3 The Innovation Integrator

The aim of the integrator is to identify which IIM components and concepts and which PMBoK processes should be used, in combination, at the various high-level steps of a project. The integration of the IIM and PMBoK will vary depending on the project and in which innovation category the project falls.

Williams (2005: pg 504) agrees with the basic principle behind this approach and he writes:

> *Projects with lower technological uncertainty were managed in a formal style; where this was higher, management had to employ a more flexible attitude and tolerance for change and trade-off between project requirements.*

8.3.1 The Integration of IIM and PMBoK

The high-level phases of IIM and PMBoK are not one-to-one aligned. Figure 29 maps the phases of the IIM onto the process groups of PMBoK so that the PMBoK process groups can be used in the innovation integrator matrix.

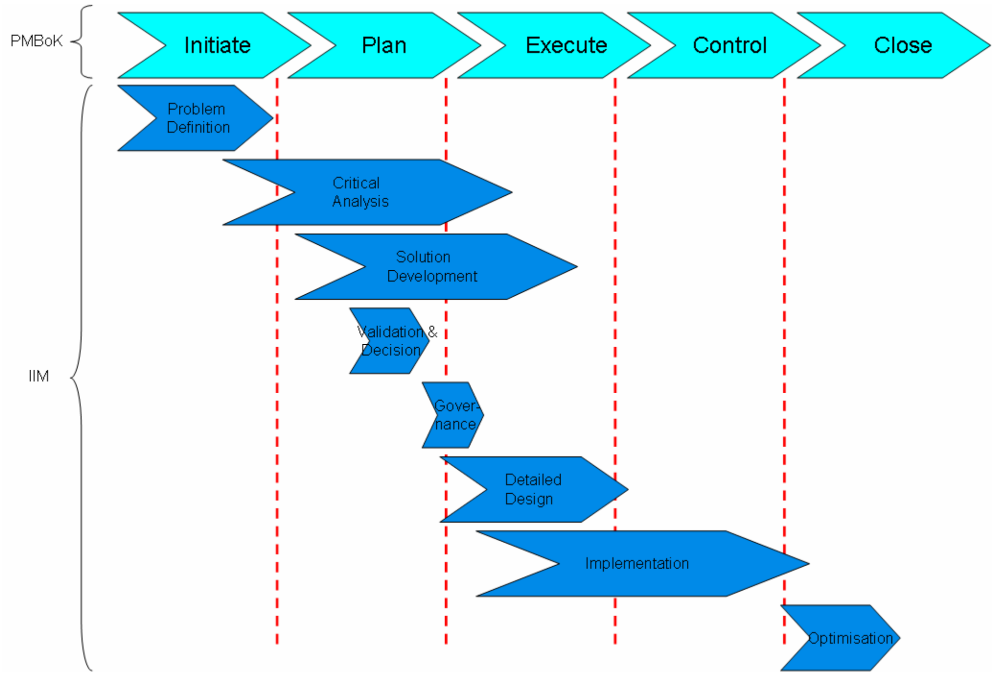

Figure 29: IIM Phase Mapped onto the PMBoK Process Groups

8.3.2 Developing an Innovation Integrator Matrix

The innovation integrator matrix can be developed for a specific company or industry. The way in which IIM and PMBoK are integrated depends greatly on the types of projects involved, the culture of the company and the preferences of the project champions.

The integrator is represented as a matrix. Table 13 illustrates this matrix with the three categories of innovation projects on the Y-axis and the high-level, PMBoK project process groups on the X-axis. The details inside the matrix are the appropriate IIM components and PMBoK processes for that specific matrix cell.

Table 13: Innovation Integrator Matrix

	Initiate	Plan	Execute	Control	Close
Radical Innovation	**IIM Component 1** **IIM Component 2** **PMBoK Process 5**				
Partially Innovative	**IIM Component 1** **PMBoK Process 3** **PMBoK Process 5** **PMBoK Process 6**				
Replication	**IIM Component 1** **PMBoK Process 1** **PMBoK Process 3** **PMBoK Process 4** **PMBoK Process 5** **PMBoK Process 6**				

Once the criteria in the innovation filter have been weighted and the IIM components and PMBoK processes assigned to the various cells in the innovation integrator matrix, a project manager has a tool which can be used to achieve a balance between managing an innovation and project management.

Table 14 presents a detailed example of the integration of IIM and PMBoK for a radical innovation project, using the innovation integrator matrix. This is only an example, but can be used by a company as a starting point for developing their own innovation integrator matrix.

For each cell in the matrix, an explanation is given for the suggested specific IIM components and concepts and PMBoK processes.

Table 14: Innovation Integrator Matrix for Radical Innovation Project

Initiate	Plan	Execute	Control	Close
PM 4.1 Project Charter: Provides good starting point for project but cannot be completed in full at this stage. Will have to be added to and/or amended later in the radical innovation project. **PM 4.2 Project Scope Statement:** Useful for identifying the boundaries of the project but not possible at this stage to document the detailed assumptions, constraints, milestone schedule and deliverables. **IIM Component 1: Four Layered Approach:** Aligning company strategic objectives with radical innovation	**PM 4.3 Develop Project Management Plan:** High-level project management plan is developed. Cannot be fully completed at this stage but should be updated as project progresses. **PM 6.1, 6.2, 6.3 Activity Planning:** Programme manager develops high-level activity plan. Project managers from each sub-project develop more detailed activity plans to fit in with overall programme. **PM 11.1, 11.2 Risk management Planning and Risk identification:** High-level risks should be identified at this early stage and a	**PM 8.2 Perform Quality Assurance:** As the project evolves the correct levels of quality should be determined and monitored. **IIM Component 1: Four Layered Approach:** Monitor execution and add details to objectives and scope. Add details to TO-BE process maps. **IIM Component 2: Ramp-up and Ramp-down:** Governance team monitor progress and adherence of the detailed design teams as the detailed design teams develop the selected innovation scenario.	**PM 4.6 Integrated Change Control:** Due to the high-levels of uncertainty, change control is important. The scope, objectives, deliverables and timelines will defiantly be expressed in more detail as the project evolves and may even change. **PM 5.5 Scope Control:** The scope is defined at a high-level at the start of the project and therefore as the details become clearer, the control of the scope is vital to ensure the project comes in on time an in budget. **PM 6.6 Schedule Control:** The overall programme plan	**PM 4.7 Close Project:** The project should be closed in a formal manner. **IIM Component 2: Ramp-up and Ramp-down:** The governance team needs to ensure that all governance principles have been adhered to and that all design objectives have been achieved. **IIM Component 4: Scientific Verification and Optimisation:**

objectives and defining the scope based on the company value chain. Identify possible integration with other projects. High-level value chain modelling if required. **IIM Component 2: Ramp-up and Ramp-down:** Innovation team the only team involved. **IIM Component 3: Project Structure:** Project owner and champion agree on internal and external personnel for innovation team. Phase 1 of the revised Master Plan is used. **IIM Component 4: Scientific Verification and Optimisation:** Strategy mapping and conceptual frameworks used to align company strategy with objectives of radical	management plan put in place to identify, monitor and mitigate the risks. **IIM Component 1: Four Layered Approach:** Process models of the AS-IS situation and high-level TO-BE innovation scenarios are developed and the detailed activities are identified where possible. **IIM Component 2: Ramp-up and Ramp-down:** The innovation team are involved in the critical analysis and the initial solution development. Innovation scenarios are presented to the validation team and, once approval has been given by the approval body, the governance team develop the governance principles, mandates for the design teams and design objectives.	Operational team can become more involved in the detailed design. **IIM Component 3: Project Structure:** Each detailed design team develops and uses their own roadmap during the detailed design and execution of the innovation. **IIM Component 4: Scientific Verification and optimisation:** Simulation models and financial models updated as the detailed design becomes clearer.	and sub-project project plans will be expanded as the project evolves. The control of these plans and the control of the overall timing of the project is therefore important. **PM 7.3 Cost Control:** Project cost control on the project expenditure is important to monitor. **PM 8.3 Quality Control:** The level of quality of the outputs should be monitored. **PM 11.6 Risk Monitoring and Control:** The identified risks should be monitored and processes developed to mitigate the risks as they develop. The identification of new risks and the planning of counter measures is an	From early in the implementation to after the project has closed the innovation is to be optimised. The optimisation at this stage of the project will be the responsibility of the operational team with assistance from the remaining members of the innovation team

innovation project.	**<u>IIM Component 3: Project Structure:</u>** Project owner and champion agree on validation and governance team members. Governance team decides on the number and types of detailed design teams and selects the team members. Phases 2 to 6 of the revised Master Plan are used. **<u>IIM Component 4: Scientific Verification and Optimisation:</u>** Simulation models may be developed to represent the innovation scenarios. Financial modelling and mock-ups or prototypes may be used to achieve buy-in and project approval.		ongoing control activity. **<u>IIM Component 2: Ramp-up and Ramp-down:</u>** Governance team control the innovation by making sure the design teams adhere to the governance principles the design team mandates and are working towards achieving the design objectives.	

The Innovation Matrix can also be represented graphically. Figure 30 illustrates the interaction between the IIM concepts and the PMBoK processes for a radical innovation project, for each of the PMBoK process groups.

The interaction is represented in three ways. Firstly, the lines between IIM concepts and PMBoK processes indicate there is a degree of overlap between the connected IIM activity and PMBoK activity. The position of the coloured squares on each line identify to which PMBoK process group the activity belongs, while the colours illustrate the degree of the overlap of the activities. A yellow square represents a partial overlap, while a green square represents a complete overlap. Finally, the PMBoK processes highlighted in green are highly relevant to a radical innovation project, while the processes highlighted in yellow are only partially relevant. The relevance of a PMBoK processes is based on the experiences of a particular type of radical innovation project in a particular industry and may therefore vary for other project types and in other industries.

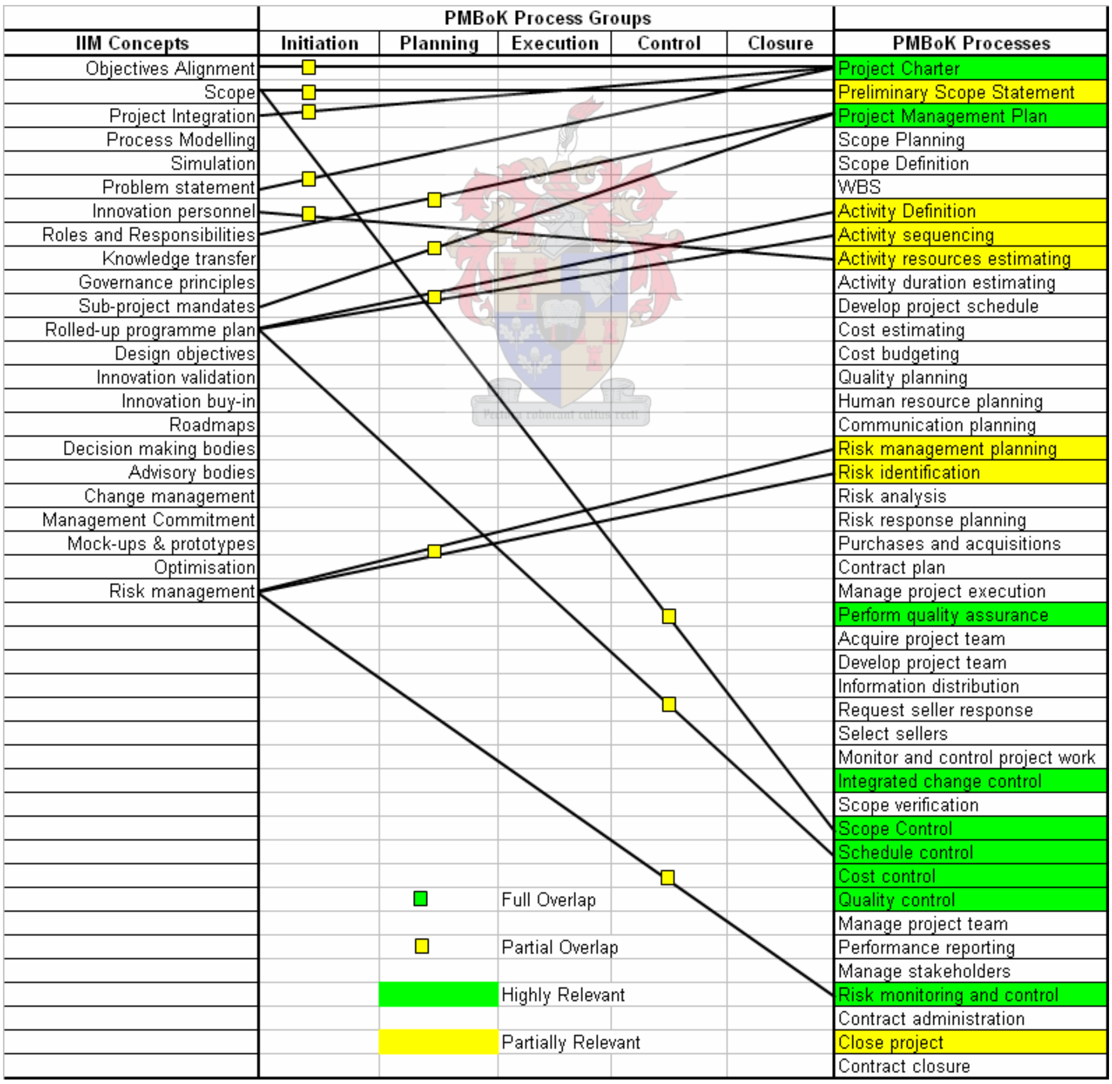

Figure 30: IIM Concepts Interacting with PMBoK Processes

9. Case Study in the Financial Services Industry

In this section, a case study of an improvement project in the financial services industry is presented. The case study focuses on the way in which the IIM components and concepts and PM processes were used and integrated during the project. The successes and shortcomings of the integration in this project are examined and recommendations are made as to how the integration of IIM and PM could be improved.

The project is described based on the phases of the IIM and PMBOK, as described in Figure 28 and in terms of the components and concepts of the IIM and PM processes.

9.1 Project Background

In August 2003, the management of one of South Africa's four largest Insurance Companies identified a need and an opportunity to improve their business. Through successfully implementing its strategic goals, over the years, the company had a large market share of the South African lower- to middle-income market.

All insurance companies have a department called "New Business" (NB) in one form or another. This department is responsible for capturing the client and policy details of new clients and policies. The "New Business" (NB) department works closely with the company's sales force to bring in new business in the most effective and efficient manner possible.

The company's management and outside stakeholders had identified that the new business processes and systems were over-complex and too expensive for the lower- and middle-income business, as this type of business has high lapse rates and low recurring premiums.

At the time, analysts of a major South African bank wrote about the company, "New business profitability remains a major concern: as the value added by the massive new business infrastructure remains negligible."

Therefore, in October 2003 the business unit CEO (project owner) and a member of his executive committee (project champion) launched a project that became known as the Business Enhancement Initiative (BEI). At this stage they asked Indutech (Pty) Ltd, the developers and implementers of the IIM, to assist them with the BEI project.

The initial innovation team comprised of the project owner, the project champion, three of Indutech's business engineers and two non-operational but internal company personnel. Once this innovation team was formed the project was initiated.

Project Description

In this section a high-level overview of the project is presented. This is important for understanding the way in which the IIM was implemented and the integration between the IIM components and PM processes.

The project started in October 2003 and is currently (at September 2006) nearing the end of the full implementation. A project timeline is presented in Figure 31.

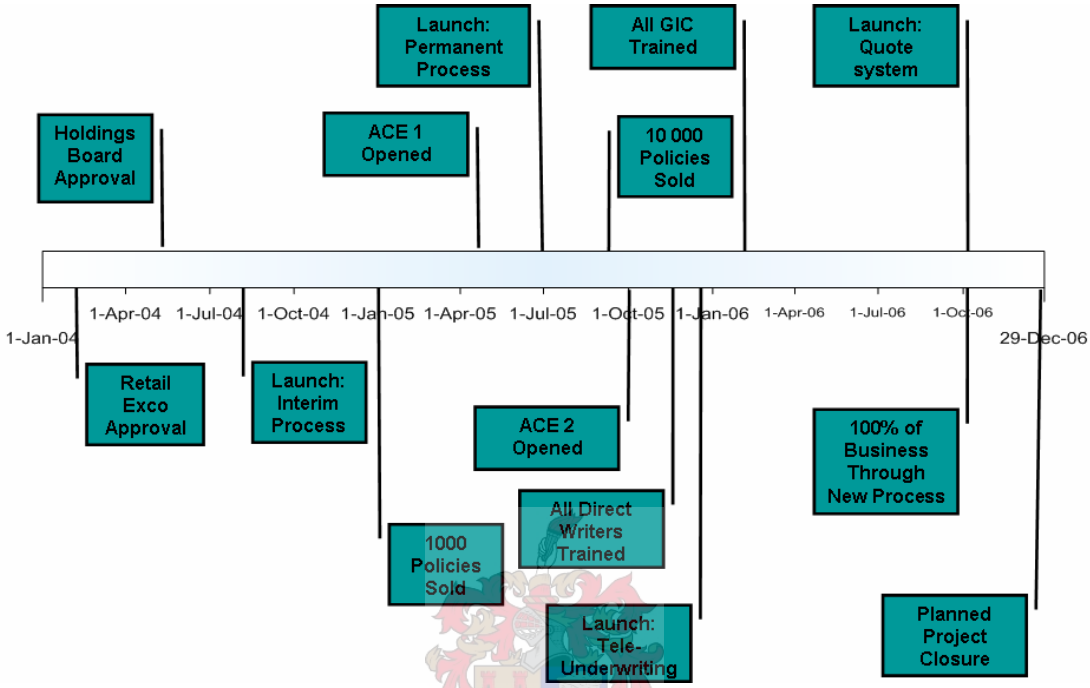

Figure 31: BEI Project Timeline

The objective of the BEI project was to reduce the complexity and cost of the new business process, thus making the process simpler and more user-friendly for the insurance sales staff (also known as intermediaries) and clients, while reducing the insurance company's operating costs at the same time. Therefore, the high-level objectives were:

- To reduce the overall cost of the new business process
- To reduce the time to issue a policy
- To reduce the administrative burden on the intermediaries and clients.

The BEI project has been a significant initiative for the insurance company. It has involved several different company departments including; New Business, Distribution, Policy Administration, Product Development, Underwriting, Marketing Administration, Business Intelligence and Claims. The entire executive management team of the affected business unit has been involved on a weekly basis.

In total, approximately 70 internal company employees and 15 external consultants have worked on the project. Over 5000 documents have been created, many of which are managed in roadmaps in the EDEN Software Environment, which is developed and supported by Indutech (Pty) Ltd.

The company's holdings board receives quarterly reports regarding the progress of the project and on several occasions the project owner has presented the progress of the project to the holding's board.

A high-level description of the old and new processes is now provided.

The old process involved the intermediary visiting a client to understand the client's financial needs. Next, the intermediary would go to the regional office to draw several quotes. The intermediary would then return to the client and, once the client accepted one of the quotes, the intermediary and the client would complete a lengthy paper application form. The intermediary would then take this paper application back to the regional office where it was checked for missing data. If data were missing, as was true in many cases, the intermediary would have to return to the client. Once all the data was collected, an administration clerk in the region would capture the policy information into the new business capturing system and also courier, at a high cost, the paper application to the company's head office. Once the paper application arrived at head-office another clerk would check if the data in the system reflected what was on the paper application. If there were discrepancies in the data (as there often were) the application would be couriered back to the regional office. Once all the data in the system matched the data on the paper application form, head office would wait for the intermediary to send in all other outstanding documentation. The policy was only issued once all the required documentation was received at head office.

The old process was time consuming due to the errors in data collection and capturing and expensive due to the number of checks involved and the couriering of large amounts of paper.

In the new process, which was developed and implemented through the BEI project, the intermediary still visits the client and then draws and presents a quote as before. The major difference with the new process arises when, in the past the paper application was completed, now the intermediary phones a purpose-built call centre, which captures the client and policy information directly into the head office system over the phone. The client confirms the information over the phone, and this confirmation is used as the client's voice signature. The intermediary is still obligated to fax any other outstanding documents to the head office but, once this is done, the policy can be issued.

The new process drastically reduces the time-to-issue for policies. It also reduces the administration burden on the intermediary and cuts down on courier costs. The collection of the client and policy data is also more efficient and there is less need for the many checks that were required with the old process.

9.2 BEI Project Initiation

As can be seen in Figure 29 the project initiation consists of the problem definition phase and an initial section of the critical analysis phase of the IIM. In the BEI project the activities for each of the IIM components and PMBoK processes are now explained.

9.2.1 Project Initiation: IIM Component 1 – Four-Layered Approach

- The strategic objectives of the business unit were aligned with the company's strategic objectives and the initial objectives of the BEI project were developed and mapped to the strategic objectives of the business unit. In this way the BEI project was shown to be aligned with the strategic objectives of the business unit and the company. The BEI project objectives of cost reduction and intermediary and client satisfaction were directly mapped onto similar strategic objectives of the business unit and the company, thus creating a hierarchical network of strategic objectives.

- The high-level scope of the BEI project was developed by modelling the business unit's value chain and then ring-fencing the areas that would be directly affected by the BEI project. A more detailed scope was developed later in the project by the governance team. The high-level initial project scope can be seen in light blue in Figure 31.

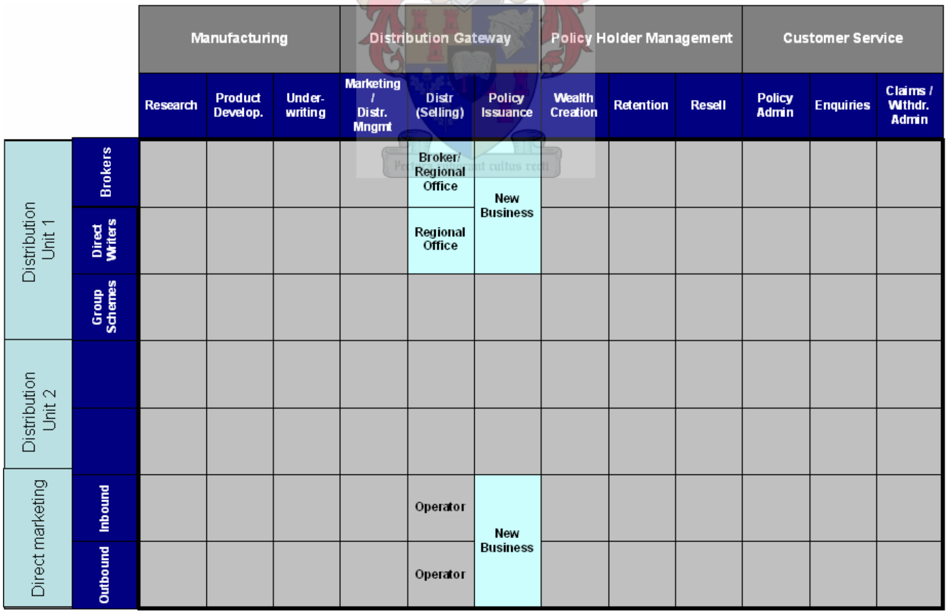

Figure 32: Initial Project Scope Mapped on the Value-chain

- The problem definition or statement was documented after an initial critical analysis of the current process. The problem statement included the high costs of the new business process, the complexity of the process for the intermediary and the client and the lengthy time to issue a policy.

9.2.2 Project Initiation: IIM Component 2 - Ramp-up and Ramp-down

- At this stage the innovation team was the only team involved in the BEI project. The project was not discussed outside the innovation team until the high-level objectives and scope were determined.

9.2.3 Project Initiation: IIM Component 3 - Project Structure

- The innovation team started to use the Master Plan roadmap to guide the progress of the BEI project. During the initiation of the project steps 1.1, 1.2 and 1.3 were used. Step 1.1 was used for documenting the strategic and project objectives, step 1.2 was used to document the high-level scope and step 1.3 was used to document the overall problem statement.

9.2.4 Project Initiation: IIM Component 4 - Scientific Verification and Optimisation

- The company and business unit strategic objectives were mapped to the project objectives using a mapping technique and mapping software. The objectives, performance indicators and targets were captured in the database and queries on the database were run to ensure the strategic objectives and project objectives were aligned.

9.2.5 Project Initiation: PM 4.1 Project Charter

- A project charter was developed. This charter contained high-level cost and time estimates as well as a description of the project method, problem statement, objectives and high-level scope.

9.2.6 Project Initiation: PM 4.2 Project Scope Statement

- The project scope statement formed part of the project charter and was formulated at a high-level based on the business unit's value-chain. Details were added to the scope statement by the governance team later in the project.

9.2.7 Project Initiation: Successes and Shortcomings

The initiation of the BEI project was for the most part successful, but with hindsight there are several important lessons that should be learnt.

9.2.7.1 Objectives

The strategic mapping was an interesting exercise as it revealed several strategic objectives that were misaligned between the company and the specific business unit. It also revealed that the objectives of the proposed BEI project were aligned with both the company's and business unit's strategic direction and that a successful implementation of the BEI objectives would lead to the achievement of some of these strategic objectives. This definitely assisted in achieving project buy-in at a later stage and approval for the project by the company's board.

9.2.7.2 Scope

At the time, the defined scope provided a good platform on which to start the project. However, if the final scope of the project is compared with the initial scope it can be seen that large changes in the scope occurred during the project. This could have been expected due to the high levels of uncertainty that existed during the project initiation. The change in the scope led to uncertainty later in the project and this had an effect on the project timeline. The control of the scope and the updating of the scope statement should have been managed in a more formal manner. This will be discussed in more detail when investigating the project control in Section 8.6.

9.2.7.3 Problem Statement

The problem statement section of the project initiation was successful. This success was mainly due to the fact that the project owner and champion were clear about what they believed the problems to be and the objectives of the project could be clearly mapped.

9.3 BEI Project Planning

As can be seen in Figure 29 the project planning consists of the critical analysis phase, the solution development phase, the validation phase, the decision phase and the governance phase of the IIM. In the BEI project, the activities for each of the IIM components and PMBoK processes are now explained.

9.3.1 Project Planning: IIM Component 1 - Four Layered Approach

- The critical analysis continued with the more detailed modelling of the old AS-IS processes and activities. The length of time and cost involved in the processes and activities were determined. This information would be required for the business case.
- For the solution development high-level TO-BE process, maps were developed. Three different innovation scenarios were developed and process models were required for each of them.

9.3.2 Project Planning: IIM Component 2 - Ramp-up and Ramp-down

- The innovation team was still the main driver of the project during the critical analysis and solution development phases, but some operational personnel were involved in developing the AS-IS models.

- Due to the high-levels of uncertainty at the start of the project, which possibly indicated a high-level of innovation, the innovation filter could only be fully completed around about the validation phase of the project. The final filter score for the BEI project was 8.55 out of 10. This places the BEI project firmly in the radical innovation project category. The innovation filter, as described in section 7.2, for the BEI project is presented and explained in Table 15.

Table 15: Innovation Filter for the BEI Project

Criterion	Weighting	Rating	Score	Explanation
Internal Innovation Criteria				
New performance measures	10%	7	0.7	Most of the performance indicators were not entirely new to the industry, or even the company, as the company has had experience managing customer service call centres. There was however one totally new performance indicator. This was the call-back time - the time the call centre took to call an intermediary back once the intermediary had made a missed call with his cell phone.
Change in known performance measures	10%	10	1	The BEI project aimed at reducing the issuance time for a policy by more than 5 fold.
Totally new knowledge area	15%	10	1.5	The company had some knowledge in managing call centres but no knowledge of policy capturing over the phone or tele-underwriting.
Reduction in cost/increase in revenue/increase in market share	10%	7	0.7	The BEI project aimed to considerably reduce the cost of capturing new business.
External				

Innovation Criteria				
Introduces new concept or approach	15%	10	1.5	Although components of this new process had been used in other countries. The way in which this new process combined these components was a world first.
Has potential to provide true competitive advantage	10%	7	0.7	The company's competitors have been aware of the progress of the BEI project and are possibly investigating similar processes. It will, however, take them some time to reach the required competitive level and the company thus has a competitive advantage in the medium-term.
Has the potential to become industry benchmark	5%	7	0.35	As the company is the first in its market to explore this very unique way of capturing new business, there is a good chance it will become the benchmark for other companies to try and achieve.
Complexity Criteria				
Overall programme and Sub-projects	5%	10	0.5	The BEI project has five sub-projects and a governance team. The enabling technology sub-project has further been divided into technology related sub-projects. The required control and integration of many sub-projects adds complexity to the overall programme.
Multi-disciplinary	10%	10	1	The BEI project involved a range of different disciplines

teams				including operational, legal, financial, technical expertise and HR.
Integration across company silos	5%	5	0.25	As can be seen from the scope description the project was limited to the New Business department. However other silos were involved as the project had far reaching affects.
Wide geographical location	5%	7	0.35	The project had a major impact on the company's sales force. This sales force is widely distributed throughout South Africa and this added to the complexity of the project.
	Final Score		8.55	

- Once the high-level process models and business cases for the three innovation scenarios were developed, the innovation team presented the scenarios to a selected validation team. The validation team consisted of 15 internal personnel from all the affected operational areas. Several validation workshops were held and the validation team identified the inaccuracies and problems with the three innovation scenarios.

- The approval process started with a full-day presentation to the business unit's executive committee. The committee unanimously agreed that the most radical innovation scenario was the best of the three. However the committee could not give approval for this scenario and asked the innovation team to implement a proof of concept prototype. This prototype is explained in more detail in Section 8.4.4.

- Once the information from the prototype was available, the innovation team presented the chosen innovation scenario to the company's board, where approval was given.

- The governance team was formed shortly after the project was approved. The team consisted of the innovation team plus some of the members of the validation team. The governance team decided on the required design teams and selected personnel for each design team. The governance team developed mandates and high-level design objectives for each design team. Seven BEI governance principles were also developed. These principles govern all decisions made in the project. If a decision is made that contradicts one of these principles, the decision is either reversed or the governance team decides that such a decision is allowed and then the reason for breaking the principle is made clear to all involved. The seven governance principles are:

- Customer and intermediary focused
- Trust and verify
- Simple process for intermediaries & clients
- Sole product issue process
- Build for the norm not the exception
- Business accepted in real time
- Reduce the cost of doing business.

9.3.3 Project Planning: IIM Component 3 - Project Structure

- The full project structure was determined at this stage of the project. The governance team selected four detailed design teams and a change management team. The four detailed design teams are:
    - Call centre team
    - Intermediary team
    - Enabling technology team
    - Risk product team.
- A management team and project board was also formed at this stage.
- The project planning documentation was captured in phases two to six of the Master Plan.

9.3.4 Project Planning: IIM Component 4 - Scientific Verification and Optimisation

- A detailed simulation model of the old current process and new processes were developed. These models illustrated how the new process would reduce the effort of the intermediary and simplify the business. The simulation model was used at the validation workshops and the full-day presentation was made to the business unit's executive committee and to the company's board.

- A financial model of the old current process and the new process was built. From this model it was possible to calculate the estimated savings for each of the innovation scenarios. The results of the financial model were presented to the business unit's executive committee and played a major role in the committee selecting the most radical innovation scenario.

- A prototype was developed and implemented in order to prove the concept of the most radical innovation scenario. The prototype system was developed in less than a week and it was possible to have the process running in a highly cost-effective manner. The results of the prototype presented to the company's board and approval for the BEI project was given.

9.3.5 Project Planning: PM 6.1, 6.2, 6.3 Activity Planning

- A high-level programme plan was develop at this stage of the project. Once the sub-project teams were selected, each sub-project leader was required to develop a project plan that aligned with the overall programme plan. The overall programme plan identified the dependencies of tasks and estimated the time requirements.

9.3.6 Project Planning: PM 11.1, 11.2 Risk Management Planning and Risk Identification

- Even though there were discussions around project risks, no formal risk planning and identification took place.

9.3.7 Project Planning: Successes and Shortcomings

- The project planning had both successes and shortcomings. The shortcomings have only become evident as the project has progressed. In general there was a culture of, "don't plan, just do" at this stage of the project. While this allowed for a highly innovative successful process to be developed, it has also caused some problems in completing the project on time.

9.3.7.1 High-level Process Modelling

The high-level process modelling proved highly successful in creating the initial innovation scenarios and allowing the validation team and the approval bodies to quickly understand the innovation scenarios. They were also useful in the development of the simulation models.

9.3.7.2 Validation

The validation team provided a great deal of credibility to the innovation scenarios and the approval process was significantly easier because of the validation teams' input. Several inaccuracies in the innovation scenarios were identified and rectified.

It was clear from the validation workshops that operational personnel found it extremely difficult to look at the operational environment from a different perspective. It was a challenge for the innovation team to keep the validation team on the innovation path, as opposed to going back to the old way of operating. This proved the theory that the innovation team should consist of very few operational personnel.

9.3.7.3 *Approval Process*

The approval process had few shortcomings. The fact that the innovation team had to go back and implement a prototype did take up valuable project time, but definitely helped in gaining approval from the company's board.

9.3.7.4 *Governance Principles*

The governance principles were one of the main successes of the BEI project. These principles are still being discussed and debated and are used on an almost daily basis for decision making purposes. Several times decisions taken contradicted the governance principles, but the reasons for this were understood and the project teams moved onto the next challenge.

9.3.7.5 *Detailed Design Teams*

The detailed design teams were given team mandates and design objectives by the governance team. As the project progressed, it was often unclear where certain responsibilities lay. The design team mandates should have been updated on a regular basis. As the details of the project became clearer, the mandates should have had details added to them.

The design objectives were updated, from simple high-level objectives at the start of the project to detailed performance measures and targets, which could be built into a management information system.

9.3.7.6 *Simulation Models*

The simulation models proved highly successful. They were used for detailed calculations of cost and process times, as well as to present the processes to the company's board in graphs. The initial simulation models were updated later in the project and used in the detailed design.

9.3.7.7 *Financial Models*

The financial models were important in developing and presenting the business case for each of the innovation scenarios to the validation team and the executive committee. They were also adapted later in the project to reflect the changes to the final process.

9.3.7.8 *Prototypes*

The successful part of the prototype was that it was developed in a short time and without much cost. This meant that the concept could be proven to the company's board and the design teams had a starting point from which to design and a prototype on which to test future ideas.

9.3.7.9 *Activity Planning*

The lack of formal activity planning was a shortcoming of the project. Having an overall high-level activity plan and then several sub-project activity plans was a good idea. The execution, however, was a problem. The main reason for this was that the team leaders of the sub-projects were selected for their knowledge of their discipline. Many of them had never managed a project. Each sub-project team should have had a dedicated project manager. The two teams that had a dedicated project manager were far more successful in their execution then the other sub-project teams.

9.3.7.10 Risk Planning

Formal risk planning and identification is essential from early on in a radical innovation project. Without a formal framework, risks often go undetected until it is too late.

9.4 BEI Project Execution

As can be seen in Figure 29 the project execution consists of the solution development phase, detailed design phase and implementation phase of the IIM. In the BEI project the activities for each of the IIM components and PMBoK processes are now explained.

9.4.1 Project Execution: IIM Component 1 – Four-Layered Approach

- The TO-BE process models were developed in detail in the detailed design phase and then updated as changes occurred in the implementation phase.

9.4.2 Project Execution: IIM Component 2 - Ramp-up and Ramp-down

- The governance team added details to the design objectives

9.4.3 Project Execution: IIM Component 3 - Project Structure

- The detailed design teams developed and used roadmaps to manage their progress through the detailed design and implementation.

9.4.4 Project Execution: IIM Component 4 - Scientific Verification and Optimisation

- The simulation models were developed in more detail and other simulation models were built to assist the detailed design. These new models included a call-centre capacity model, a call-centre shift model and a business-volumes prediction model.

9.4.5 Project Execution: Successes and Shortcomings

Some of the shortcomings of the project execution were the consequence of the project planning; others, like the process models, were related to the company's operational environment.

9.4.5.1 Process Models

Whereas the process models were a great success in the early part of the project, during the project execution they were a serious problem. The models had been originally developed to represent and communicate the new processes. Once the project entered the detailed design and implementation phases, no formal process-model management was in place to mange changes to the TO-BE models. Therefore, these models were soon out of date and of little use to the detailed design teams. The company lacked any formal methodology for managing the models and the BEI project never put in place this methodology.

9.4.5.2 Governance Team

While the governance team successfully managed the adherence to the governance principles and updated the design objectives through the detailed design and implementation phases, the team failed to update the team mandates and therefore confusion arose about responsibility for certain tasks. The governance team is required to keep tighter controls on the mandates of the detailed design teams. Should these mandates evolve or change during the radical innovation project, the governance team has the responsibility of communicating the changes to all relevant stakeholders.

9.4.5.3 Design Team Roadmaps

Several of the teams developed and used their detailed design roadmaps successfully. However some teams had to have their roadmaps developed for them and this prevented buy-in to the concept and understanding of the roadmaps. These teams failed to document their information in the context of the bigger project and hence failed to manage their team's knowledge.

9.4.5.4 Simulation Models

The new simulation models developed during the detailed design and implementation phases were once again highly successful. They assisted with the detailed design and in communicating the design to a wide variety of stakeholders.

9.5 BEI Project Control

As can be seen in Figure 29 the project control consists of the implementation phase of the IIM. In the BEI project the activities for each of the IIM components and PMBoK processes are now explained.

Due to the high-levels of uncertainty inherent in a radical innovation project, the control processes of PMBoK should be widely used. In a less-innovative project the control processes are used to update the well-defined scope, schedule, costs, quality and risks. In a radical innovation project these are not as well defined at the start of the project and the formal control processes are thus important for the continued development of these items as the project evolves.

9.5.1 Project Execution: IIM Component 2 - Ramp-up and Ramp-down

- The governance team played a major role in controlling the innovation component of BEI project. Earlier in the BEI project the governance team set the governance principles, sub-project team mandates and the high-level design objectives. The governance team then actively controlled these by ensuring that the principles were adhered to, and by adding detail and changing the team mandates and design objectives.

9.5.2 Project Control: PM 4.6 Integrated Change Control

- An integrated change control process was not used in the BEI project until the detailed design teams were established. A change control process was then set-up for some of the sub-project teams and a less formal process was used at the programme level.
- Due to the uncertainty and the required speed at which change had to occur during the early stages of the project, formal change control processes would have hindered the progress of the project.

9.5.3 Project Control: PM 5.5 Scope Control

- The scope of the BEI project was first defined at a high level during the problem definition phase of the IIM, using the company value chain. This assisted the governance team to develop the governance principles and team mandates, which became a more detailed scope for the sub-project teams. Any changes to the governance principles or team mandates had to be agreed to by the governance team. This was the scope control mechanism used in the BEI project.

9.5.4 Project Control: PM 6.6 Schedule Control

- The programme manager developed the overall programme schedule. This contained high-level tasks and milestones for the BEI project. The project managers of the sub-projects develop their individual schedules to integrate with the high-level programme milestones. The sub-project managers negotiated with the programme manager if they required a high-level milestone to be changed. The programme manger had to either reduce the output required from the sub-project or adjust the milestone.
- When a milestone had to be adjusted the programme manger ensured that the new date integrated with the other sub-projects and that all project managers were aware of the change.

9.5.5 Project Control: PM 7.3 Cost Control

- The costs of the BEI project were monitored closely from two perspectives, the first being the capital expenditure of the project, and the second being the operational costs of the new environment.
- The capital expenditure of the project was monitored using a separate cost centre for each sub-project.
- The operational costs of the new process were also monitored closely. The project was involved in the development of the new operational area's first budget. The expenditure was monitored on a monthly basis and compared with the yearly budget.

9.5.6 Project Control: PM 11.6 Risk Monitoring and Control

- Due to the lack of formal risk planning, the monitoring and control of risks were conducted in an informal manner.

9.5.7 Project Control: Successes and Shortcomings

9.5.7.1 Governance Principles

The governance principles were successful in controlling the adherence of the sub-project teams to the spirit and initial concepts of the innovation.

9.5.7.2 Team Mandates

The team mandates provided a good starting point for the sub-project teams, but due to a lack of formal change control, the mandates were soon outdated and lacked the required detail to guide the sub-project team to the end of the detailed design. The mandates should have been reviewed and updated regularly. They were originally developed at a high-level, due to uncertainty at the time, and details should have been added later.

9.5.7.3 Design Objectives

Unlike the team mandates, the design objectives were updated regularly as and when more detail was available. Many of the design objectives were converted into operational measures and built into the company's management information system.

9.5.7.4 Change Control

The innovation and governance teams were able to successfully complete the phases leading to the detailed design phase without a formal change control process. It is evident from their success that formal change control is not essential in the initial phases of a radical innovation project. A more formal approach to change control, at the programme level, should have been implemented at some point during the detailed design.

Some of the sub-project teams maintained excellent change control processes throughout the detailed design and implementation. Other sub-project teams had a less formal approach to change control and this had a negative affect on the project progress.

9.5.7.5 Schedule Control

The control of the high-level schedule worked well during the initial phases of the project and during the detailed design. The control of the schedules of the sub-project teams varied from team to team. The teams with experienced project managers controlled their schedules better then the other sub-project teams. These schedules were also kept in line with the overall programme plan for much of the project.

9.6 BEI Project Closure

As can be seen in Figure 29 (p.94) the project closure consists of the optimisation phase of the IIM.

The BEI project is currently nearing the end of the implementation phase but has not yet reached project closure. However, there are several activities underway to optimise the process and to plan for the closure.

9.6.1 Project Execution: IIM Component 2 - Ramp-up and Ramp-down

- The governance team have already started to review the design objectives to determine their state of completeness. The team is communicating with the sub-project teams to discuss all outstanding issues.

9.6.2 Project Execution: IIM Component 4 - Scientific Verification and Optimisation

- The optimisation of the new innovative process is underway. The team tasked with the optimisation of the process comprises members of the original innovation team and personnel from the new operational area. The innovation team members are measuring the performance of the operational team, identifying problems with the new operational environment and suggesting solutions. The operational team assists the innovation team to measure the environment and plays a major role in the implementation of the suggested improvements.

9.7 Overall Results and Important Lessons Learned

The BEI project was a test for the approach of integrating IIM components with project management processes. The project was managed as a radical innovation project and therefore many of the project management processes, especially in the early phases of the project, were replaced by IIM components. Thus, the overall performance of the BEI project and the lessons learned are important indicators for the success of the IIM and the technique of integrating IIM with project management.

9.7.1 Overall Results

The success of the integration of IIM and project management in managing a radical innovation project should be determined by the overall success of the BEI project. The success of the BEI project can be determined by answering two questions:

Question 1: Is the developed solution innovative and will it give the company a competitive advantage?

Question 2: Was the project executed efficiently, on time and in budget and were all the project objectives achieved?

9.7.1.1 Question 1

The processes and systems developed and implemented in the BEI project are considered by the company, external consultants and the media to be highly innovative and a major change to the "New Business" model in the South African insurance industry.

Peter Maynard, of the UK based insurance consultancy, SelectX, wrote the following, "This company has done what very few other financial services companies anywhere in the world could have done: carried out such a thorough overhaul of a part of its business that it amounts to a reinvention" (Maynard 2006).

It was also reported that this company is the first life insurance company in South Africa, and the first traditional life insurer in the world, to move its primary distribution to telephone processing and to offer its customers instant life insurance cover.

It can thus be deduced that the BEI project introduced something completely new to the industry and therefore the innovation characteristic of "newness" was definitely achieved. The level of newness also indicates that the project was indeed a radical innovation project.

The BEI project transformed an inventive idea into a workable solution, but is the solution commercially viable and will it provide the company with a true competitive advantage?

The new process is now fully operational and is being operated as an independent operational cost centre; it can therefore be classified as being commercially viable. Also, just before the completion of this thesis, the company's half-year results were released. These results showed a 34% increase in the affected business unit's contribution to group profits. At least some of these profits can be attributed to the BEI project.

It may still be too early to determine the extent of the true competitive advantage the company will achieve through the BEI project. Only once the competitive advantage is fully realised can the BEI project be classified as a truly successful radical innovation project.

9.7.1.2 Question 2

The detailed design and development of the process and systems ran on schedule for most of the project and were delivered in accordance with the high-level programme plan. The roll-out of the new process to the entire sales force has experienced fairly lengthy delays. Consequently, almost half the sales force has been using the completed process and systems for almost ten months, but the other half are yet to convert from the old process to the new. This has meant that the BEI project is running over schedule.

Despite the schedule overruns the project champion has said that the approach taken in the BEI project has meant the solution was developed in approximately 40% less time and with a far more innovative outcome then if traditional approaches had been used.

The budget is also still reasonably aligned with the original business case despite the schedule overruns, and the project should come in on budget.

As far as the project objectives are concerned, several of the performance measures are still above the required targets. However, ongoing optimisation has seen them decrease over recent months. There is still confidence that the optimisation activities will help achieve the majority of the project objectives.

9.7.2 Lessons Learnt

The following list highlights the 15 key lessons learned in the BEI project that need to be taken into account for the management of radical innovation projects in the future.

1. Linking project objectives to company strategic objectives assists with multi-project integration and project buy-in.

2. The value chain provides a good starting point for identifying the radical innovation project scope, however, formal scope management is required as the project evolves.

3. Process modelling enables the innovation concept to be developed and communicated to the detailed design teams.

4. A formal process modelling management methodology is required to keep the process models updated through the design and implementation phases of the project and into the operational environment.
5. A respected validation team can highlight problems with the innovation concept early in its development, and once they have validated the innovation, it is easier to obtain a wider buy-in.
6. Governance principles are an excellent way of ensuring that the initial innovation concept is respected through the detailed design and achieved after implementation.
7. The detailed design team mandates are first defined at a high-level and need to be regularly reviewed and updated as the project evolves.
8. Simulation models effectively serve two important functions. They allow for detailed what-if-scenario calculations and provide a high-level, graphic representation of the what-if-scenarios for a company's board.
9. Prototypes and mock-ups are a cost affective way of testing innovative concepts and gathering information in order to make important decisions.
10. An overall programme plan can be rolled down into more detailed sub-project plans, but a project manager is required to manage the execution of the plans.
11. Formal risk identification, analysis and planning are required to mitigate risks.
12. Roadmaps are an excellent way of supporting innovation teams, but it is important for the team members to agree on the roadmap structure and to take ownership of the roadmap from the start.
13. Design objectives are required to be measured from the start of the radical innovation project. As the objectives evolve with the project, they should be automated to allow for quick and accurate optimisation of the innovation.
14. Due to the fact that many of the project management concepts are only defined at a high-level at the start of the radical innovation project, strong change control processes are required in order to add details to these concepts as the project evolves.
15. Management commitment is a key factor in the successful completion of a radical innovation project.

10. Summary

Based on an analysis of the innovation management and project management literature the following problem was defined:

Project management concepts alone, captured in the various bodies of knowledge, are not adequate for successfully and comprehensively managing radical innovation projects. Companies thus struggle to gain a competitive advantage through innovation, as the implementation of the radical innovation is seldom successful.

The Innovation Implementation Methodology (IIM) consists of four high-level components and 11 detailed concepts. The aim of the methodology is to support the initial development of an innovation and the detailed design and implementation of a radical innovation project.

Once this methodology had been explained, the following hypothesis was developed:

The correct integration of IIM components and PMBoK processes, based on the innovativeness of the project, can successfully support the management of a radical innovation project.

The aim of the thesis was to show that the above hypothesis is reasonable. This was achieved in two steps.

Firstly, a generic technique for integrating the IIM with project management processes was developed. This technique included an innovation filter, which is used to determine the level of innovation in a new project. Based on this level of innovation, the required IIM components and concepts can be combined with the required project management processes.

Secondly, a case study was presented. A project in the financial service industry, called the Business Enhancement Initiative (BEI), was managed using the integrated IIM components and project management processes. The innovation filter was applied to this project and it was determined that it was a highly innovative project. In order for the hypothesis to be substantiated, the success of the project had to be determined. The success was based on two conditions:

1. The innovativeness of the final solution
2. The successful completion of the project, on time, in budget and at the correct level of quality.

Based on the opinion of the majority of the BEI project stakeholders, the output of the project was indeed a highly innovative process and therefore the conclusion was reached that the first condition had been met.

The result of the second condition has been harder to determine. The project is now in the final stages of the implementation. Although the budget and quality conditions of the project have been met, the rollout was delayed. Consequently, the project is behind schedule. Many of the shortcomings identified and the lessons learned in the case study are related to this second condition. In future, this aspect of a radical innovation project could be improved by applying the lessons learned.

The successes, shortcomings, lessons learned and overall conclusions are now presented:

10.1 Successes

1. The alignment of project objectives with strategic objectives.
2. The scope was defined in line with the company value chain.
3. Buy-in was achieved through the validation team.
4. Governance principles ensured adherence to initial innovation concept.
5. Simulation models provided knowledge transfer and buy-in.
6. Prototypes ensured the quick and cheap testing of concepts.
7. Roadmaps supported some teams.

10.2 Shortcomings

1. There was no formal change control of the scope, mandates, schedules and risk plans.
2. A lack of project management skills at the sub-project level affected the schedule roll-down from programme level.
3. There was no formal risk planning.
4. There was no formal change management of the process models.
5. Some teams did not buy-in or take ownership of the roadmaps.

10.3 Lessons Learnt

1. IIM can assist in achieving project buy-in.
2. Initial high-level scope, objectives, mandates, schedules and risk plans are adequate, but formal processes are required to add detail to these as the project evolves and the uncertainty decreases.
3. A formal process modelling management methodology is required to keep the process models updated throughout the design and implementation phases of the project and into the operational environment.

4. Governance principles are an excellent way of ensuring that the initial innovation concept is respected through the detailed design phase and that it is achieved after implementation.
5. Prototypes and mock-ups are a cost affective way of testing innovative concepts and gathering information in order to make important decisions.
6. An overall programme plan can be rolled down into more detailed sub-project plans, but a project manager is required to manage the execution of the plans.
7. Roadmaps are an excellent way of supporting innovation teams, but it is important that the team members agree on the roadmap structure and take ownership of the roadmap from the start.
8. Management commitment is a key factor in the successful completion of a radical innovation project.

10.4 Conclusions

1. Innovation management is vital for a company to develop and sustain a competitive advantage.
2. Project management processes alone cannot support radical innovation projects.
3. The correct integration of IIM components and concepts and project management processes is required to successfully support a radical innovation project, and the level of integration should be determined by the level of innovation of the project.
4. The IIM can be used to develop a highly innovative concept.
5. Project management processes should not be introduced too late into the project and the formal project management control should assist in evolving the scope, objectives, mandates, schedules and risk plans as the levels of uncertainty decrease.

Although it is not possible at this stage to fully substantiate the hypothesis, there seems to be enough evidence to show that, by incorporating the lessons learned into future radical innovation projects, the IIM and the integration of the methodology with project management processes can successfully support a radical innovation project.

10.5 Future Research

Through this thesis the following future research topics have been identified:

1. A detailed categorisation of projects into different levels of innovation for a variety of generic project types (e.g. process improvements, system implementations, product development) should be undertaken.
2. A study could be made to establish the integration of IIM components and PMBoK processes for each of the project types and levels of innovation.
3. Several cases studies of projects being supported by the IIM, integrated with project management processes should be conducted in order to establish a more generic reference base for the IIM.

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