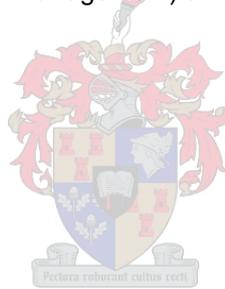


Role of Access to 'real-time' Information in the Survival of Enterprises

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Declaration

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

Signature:

Date:

Abstract

The rise of the network economy had a resounding impact on the world economy. Business remains transfixed between choosing between hierarchical organizational structures suited to a control and command mindset or transforming to an organizational structure intent on sensing and responding. Flexible and adaptive enterprises are more suitable to an increasingly volatile business environment. Current business trends worldwide seem to point in this direction. This may be an indication of the way in which organizations strive to avoid running the risk of business insignificance. Driven by business volatility, organizational structures are turning increasingly to naturally occurring 'organizations' to construct their own malleable versions. The redesign of an organizational structure is as important as reviewing information flows, optimizing technology and most importantly, finding the right type of employee to set the wheels of a real-time enterprise (RTE) in motion. Any discussion pertaining to real-time will touch on time. A reflection on hierarchical organizations highlights their stability, but also their inflexibility and sufficing information practices. It then becomes clear that the new business direction in an intensely competitive environment will have little tolerance for any measure of organizational rigidity. But how driven and fast can information really be processed and still enhance the value of an enterprise? The RTE is not a fully automated enterprise. Its employees may be less involved in its everyday tasks, but remain part of its decision-making process. To what degree does the RTE business model then facilitate value-adding information processing by both automation and manual interventions? Do limits exist where speed and time wastage in business are concerned? Is speed at all costs the only concern of the RTE?

The aim of this paper is to answer these questions conceptually. Cognizance was taken of the impact of the volatile business environment on organizational structures influencing the current understanding. The highlighted business trends are based on recently published global and authoritative industry papers, business analyses and academic interpretations. Some of the best material was sourced from professional journals discussing the infinite angles of real-time information. Castells's work on the network society proved to be extremely valuable to gain a holistic understanding. The latest developments were obtained from well-established research companies. During the investigative phase of this paper, the author encountered one thesis on real-time information focusing on information technology. It was evident that more research is required to answer the questions posed.

The eventual findings were in line with the complexity and scope of the subject. The current demands of a global network economy necessitate agile and adaptive networked enterprises, not hierarchies. Roles are becoming more important than positions in the organizational transition phase to a networked, flat structure. A failure to start with such a transformation programme will result in a failure to survive in a fiercely competitive global business environment. It was clear that the RTE is dependent on the establishment of a balance struck between business entities in their interactions with one another as parts of a whole, replete with conditions and requirements. It is only in this sense that access to real-time information could be seen as a differentiating factor in global business.

Opsomming

Die ontstaan van die netwerk-ekonomie het 'n beduidende invloed op wêreldhandel gehad. Besigheid het nog nie uitsluitel verkry tussen twee soorte organisatoriese strukture nie, naamlik, 'n hiërargiese organisasiestruktuur wat pas by 'n beheer-en-regeer denkwysse en die ander, 'n veranderende organisatoriese struktuur wat aanvoeling en reaksie belangriker ag. Buigsame, aanpasbare organisasies is uitstekend aangepas by 'n toenemend onsekere besigheidsomgewing. Dit wil voorkom of organisasies tans in hierdie rigting neig om die risiko van onbeduidenheid in die hedendaagse sakewêreld op dié manier te sistap. Onsekerheid in besigheid noop organisatoriese strukture om hul toenemend te wend na organisasiestrukture wat natuurlik voorkom, ten einde 'n eiesoortige buigsame weergawe daarvan te skep. Organisatoriese herstrukturering is ewe belangrik as die hersiening van inligtingsvloei, die optimisering van tegnologie en bowenal, die soektog na die regte soort werknemer wat dryfkrag aan die 'real-time enterprise' of RTE sal verleen. 'Real-time' besprekings sluit noodwendig die tydskwessie in, terwyl enige nabetragting oor hiërargiese organisasies sal fokus op stabiliteit, maar ook op onbuigsamheid en ontoereikende inligtingspraktyke. Die nuwe besigheidsrigting in 'n uiters mededingende omgewing laat min ruimte vir enige mate van organisatoriese onbuigsamheid. Die vraag ontstaan egter hoe vinnig en gedrewe inligting verwerk kan word ten einde besigheidswaarde te vermeerder? RTE's is nie volledig geoutomatiseerde organisasies nie. Hoewel werknemers nie ten volle betrek word by alledaagse werk nie, is hulle steeds deel van die besluitnemingsproses. Maar vergemaklik die RTE-besigheidsmodel inderdaad die verwerking van inligting deur gedeeltelike outomatisering? Hoe word spoed en tydsvermorsing in organisasies hanteer? Sou spoed byvoorbeeld ten alle koste die enigste belang wees van die RTE?

Die doel van hierdie proefskrif is om hierdie vrae in beginsel te beantwoord. Die invloed van besigheidsonsekerheid op organisatoriese strukture wat die huidige denkwysse beïnvloed, word erken. Die aanduiding oor organisatoriese ontwikkeling is gebaseer op internasionale, gesaghebbende spesialisgeskrifte, besigheidsontledings, sowel as akademiese vertolkings. Voortreflike literatuur is bekom in professionele joernale oor die ontelbare nuanses van 'real-time' inligting. Castells se werk oor die netwerkgemeenskap was van onskatbare waarde vir 'n oorsigtelike insig, terwyl die jongste ontwikkelinge verkry is uit artikels afkomstig van gevestigde navorsingsinstansies. Die skrywer het gedurende die navorsingsfase slegs een proefskrif teengekom oor 'real-time' inligting met inligtingstegnologie as die hoofokus. Dit is duidelik dat toenemende navorsing steeds ontbreek. Die uiteindelijke bevindings het ooreengestem met die ingewikkeldheid en omvang van die onderwerp. Die eise van 'n internasionale netwerk kan slegs beantwoord word deur ratse en aanpasbare netwerk organisasies, allermens deur hiërargieë. 'n Rol, pleks van 'n aanstelling, raak van toenemende belang in die organisatoriese oorgangsfase na 'n plat struktuur wat deel is van 'n netwerk. Versuim om te begin met so 'n oorgangsprogram sal mislukking tot gevolg hê in die geweldig mededingende besigheidsomgewing wat dwarsoor die wêreld heers. Die RTE is afhanklik van die daarstelling van 'n balans tussen besighede as dele van 'n geheel in hul omgang met mekaar wat die nodige voorwaardes en vereistes insluit. Dis slegs binne hierdie raamwerk dat toegang tot 'real-time' inligting beskou kan word as 'n unieke faktor wat aan besigheidsorganisasies wêreldwyd gebied word.

Dedication

I dedicate this work to my parents, Tom and Ria van Biljon who used every possible moment to encourage me and to lighten the mood, especially at times when the natural inclination was to take a break. To my dear friend of many years, Ina Venter and my brother, Deon van Biljon, all my friends and family, thank you for your sincere interest, encouragement, limitless patience and your unwavering belief in me. I love you all.

Without a constant appeal for grace from the Highest, this work could never have seen the light of day.

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Chapter 1

Introduction

Business environments shape the enterprises operating in them. Over the past couple of years, the rise of a particular type of enterprise that processes information in real time has been observed. Dubbed the real-time enterprise or RTE, it was identified as a new trend in global business. Yet its underlying principles were hardly new. Real-time operations have been known to various industries and applied to a wide range of businesses, including government agencies, long before the advent of new information technologies. Based on business as its driver, it pre-empted the global pervasiveness of technology in the world of business. Currently, the process-centric approach of the real-time enterprise (RTE) seems focused on the use and optimization of technology to the point where its value may finally be understood by business.

The RTE cannot be understood as a business enterprise only. It is also an organization that revolves around structure. In broad terms, it may be seen as the way in which parts are arranged to constitute a whole or as the interrelated parts of a complex entity. RTEs are flexible and adapt quickly to their competitive environment. They combine processes and functions, resources and decision-making nodes to facilitate a responsiveness or agility to its environment, creating a 'malleable arrangement' for working and delivering in an enterprise (Ambrose & Morello, 2004).

Starting in the 1990's, several factors combined in the competitive business environment to transform organizational work processes. Imminent among them were the pervasive diffusion of network, computer and Internet technologies across the globe. During this period, competition intensified, driven by a global trade capability enabled by computer networks that almost forced fundamental changes on enterprises. This saw a move away from hierarchical to networked enterprises that were flexible and adaptive to their environments. It is in this context, that the potential of technology was finally understood (Castells, 2000:257). Technology freed the human intellect from having to accomplish simple, repetitive tasks by automating them. As more time could be bestowed on the application of the human intellect to technology in enterprises, it caused the inevitable and even relentless acceleration of every aspect of activity of humankind (Castells, 2000:464).

To date, an emphasis on technology has never been notably discernable in any worthy discourse on RTEs. Instead, the earliest definitions of the RTE dating back to October of 2002 emphasized its business side. The RTE was seen at that time as a competitive enterprise using updated information to remove delays to the management and execution of critical business processes, but in a progressive way (Raskino, 2003). A significant omission in such definitions was the mention of technology. The focus was clearly on the business value and business purpose of the RTE as enabled by technology (Raskino, 2003). By March 2004, Gartner for example, revised their definition to read, 'The RTE monitors, captures and analyzes root-cause and overt events that are critical to its success the instant those events occur, to identify new opportunities, avoid mishaps and minimize

delays in core business processes. The focus is on integrating information flows, not technological applications. This information will be exploited to remove delays in the management and execution of its critical business processes in a progressive way.' The new revision included the prevention of business surprises while the mention of a business-orientation was left intact (McGee, 2004). The focus shifted from planning, to responding quickly and anticipating surprise. This marked a change in business thinking to align with strategic knowledge thinking, which accepted that the future could never be predicted (Malhotra, 2000:6). Significantly, still, no mention was made of technology (McGee, 2004).

Certain principles in business remain valid over time, irrespective of the introduction of new technologies. This statement applies equally to the provision of real-time information. The reduction and elimination of time wastage or latency in business processes is still valid in support of the flow of pre-selected, vitally important information to the enterprise. The RTE focus remains singly focused on the business itself. In its organizational guise, it also draws on natural laws such as complexity theory by combining chaos and order in its structure. It draws on the strengths exhibited by disciplines in industries as diverse as aviation, engineering and the military where real-time processing of information has been part of these businesses for years. The RTE ropes in such proven expertise of many years' standing to complement real-time business principles applied in an organizational context.

Transforming a business as fundamentally as it would to turn it into an RTE, involves taking a strategic decision. It comes at great cost, exacts high risk and demands considerable patience to deal with a slow, progressive enterprise-wide business evolution that will take years to complete with no end date in sight. The outcome of such evolutionary transformation is a real-time *competency*. Significantly, the RTE transformation programme should not be seen as a process. It consists of a series of projects that transforms the network enterprise by pre-selecting a few vitally important business processes whose information flows are integrated. In time this will increase the ability of the enterprise to be both flexible and adaptive in an intensely competitive environment. Such simplistic descriptions however, belie the very complexity of any RTE transformation programme. Embarking on the RTE path entails taking a fresh look at the provision of real-time information. Its scale and scope may render it a challenging task to many enterprises. It requires scrutinizing the entire enterprise from top to bottom, delving down to the very back-end functions at the root of the enterprise to streamline and tighten all of its various vertical and horizontal business layers. Ultimately, it amounts to the reduction and preferably, the elimination of any existing time gaps wherever these may be found in the business enterprise (Dobrik, Flint & Raskino, 2003).

Given the intensity and rapid pace of deployment of the competitive business environment on a global scale, it seems as if this is the major direction taken by businesses currently, irrespective of global location. RTEs especially, are mirroring these changes in terms of their prime characteristics, namely flexibility and adaptability. The question is raised whether RTE employees are able to stay the pace,

not only in adapting to these changes, but in dealing with the everyday working environment of a flexible and adaptive enterprise model in practice. It is a working environment where time, as a fundamental part of the human pace of life, has assumed a new meaning. It becomes a valuable resource not to be wasted. Customers and potential customers of the enterprise demand fast response times, forcing some enterprises (intent on survival) to accommodate speed in their customer retention and attraction strategies. In addition, the intensely competitive environment currently in a predominantly First World business setting seems to endure only those who are able to adapt with rapidity and ingenuity. But will employees be able to expedite such rapid external demands placed on the enterprise that employs them? Bearing in mind that the human intellect and emotions took thousands of years to evolve, one of the questions raised is whether humans will be able to add value to the enterprise by processing real-time information in commensurate real-time? Although humans are critically important in the RTE, a broader look at the RTE model is necessary to answer any questions related to value. The RTE business model is a combination of manual and automated operations. Both elements play a role in the survival of the enterprise. A simple question demanding a complex answer is one that posits, 'Will the sheer virtue of having access to information in real-time, be of benefit to an enterprise?' Although manual intervention is greatly curbed in the RTE, it is not possible to automate decision-making. So, in what way does the RTE take the human factor into account in its model, if at all? How does it achieve the fine balance between humans and technology? The fundamental question that needs to be answered is whether RTE employees will necessarily be *able* to improve the chances of survival of such an enterprise when they *can* access information for processing in real-time? It will be clear during the course of this thesis how vitally important human intellectual input really is to the RTE. Human beings remain the sources and creators of knowledge, as well as the innovators in the knowledge cycle. Innovation is after all a precondition for survival in a competitive environment (Castells, 2000:420). Within the RTE paradigm, humans and not technology are of paramount importance. Human intellect is applied to technology to optimize the enablement of the enterprise. As such, humans are of *pivotal importance* to a successful RTE. This is borne out by the precondition for a suitable RTE paradigm. It requires vision, leadership and employees with the right skills to match real-time operations. Otherwise, the overall transformation would prove to be too challenging, costly and risky to consider. A clear indication of the measure of complexity involved in constituting the RTE is the insightful fact that by the end of 2003, a fully functional RTE had still not been realized.

Chapter 2

Does the global Network Economy affect Enterprise Business Performance?

2.1 Networked global Environment

The scale of technology pervasiveness changed the centuries-old world economy to the point of its usurpation by a new global economy by the close of the 20th century. The distinction between the two lies in the capacity of the new economy to work as a unit in real-time - regardless of time and geographical reach. This networked internationalization of production accelerated from the 1990's onwards when three trends converged:

- Telecommunications network digitization;
- Broad band transmission development;
- Exponential increase in computer performance when connected to the global network (Castells, 2000:467; Lang, 2001:540).

The 'network enterprise', sometimes referred to as the digital enterprise (Laudon & Laudon, 2002: 6), evolved as the new type of enterprise face of similarly new economic activities (Castells, 2000:467; Lang, 2001:540), activities that relied on speed, interconnectivity and intangibles to deal with the volatility of its business world environment (Rupp & Smith, 2003:162).

Business entities used this opportunity to embark on the strategic implementation of a long-nurtured goal to sell across the world by direct means or through networks. Geographical boundaries started to crumble before the onslaught of this global 'cooperative computing', leaving a trail of:

- great complexity;
- decreased service levels;
- increased management costs (that offset business benefits such as low entry costs, flexibility and fast deployment) (Scott & Bittman, 2003).

Nonetheless, distributed computing or networking became the very basis of competition between enterprises in the new global economic environment (Castells, 2002:101,115-116, 186).

2.1.1 Business Ecosystem

Businesses no longer operate as members of single industries, but as members belonging to an overarching business ecological unit or interconnected business process. Enterprises are thought to be better positioned to participate in the new business environment only if they transcend the boundaries of business (Ciotto & Youssef, 2003:394). The driving force behind such an evolution

spanning across multiple industries in a complex ecosystem is not only competition any more, but lately, also co-evolution (Ash & Burn, 2000:152). Customers, enterprises and employees all work competitively and collaboratively on new product and services development in this ecosystem. The customer in particular is a consumer, but has become a co-creator, too. The enterprise itself evolved from a mechanism to an organism and a 'socio-cultural co-shaper' in a holistic environment. Workers are a part of a system endowed with purpose that in turn, also forms part of a larger whole, the society, similarly imbued with a purpose. Its common bonds are knowledge and interaction. If viewed systemically, the enterprise exists in a larger environment of which it *is* a part and *in* which, as part of a larger whole, it also plays a part (Dreyfuss, 2002, Leibold [*et al.*], 2002:133-134, 140-141; Prahalad & Ramaswamy, 2003:12-13). In some ecosystems, business activity is evolved right to the edge of chaos where the highest potential for innovation and creativity resides (Leibold [*et al.*], 2002:135). Although connectivity and cooperation may be the beneficial key features of an agile networked enterprise, (McCarthy & Tsinoopoulos, 2001:106) it also exposes them to severe time constraints, influences and knowledge impacts. In the business ecosystem for example, enterprises have to choose one appropriate strategy from three generic ones to achieve a long-term competitive advantage in a particular industry, namely cost leadership or focus or a differentiation strategy (Applegate [*et al.*], 1999:65). But, even here, the strategic boundaries are beginning to blur (Rupp & Smith, 2003:160).

2.1.2 Creation of competitive Advantages

Managers are forced to review their enterprise capabilities to counter competitive challenges. This is due to the intensity of the current competitive environment known for its relentless and highly erratic nature (Brewis, 2004:584). Competitive advantages¹ have to change constantly to be relevant (Reddy & Reddy, 2002:7). In a world where time is a knowledge-based competitive factor (Ciroto & Youssef, 2003: 390; Lang, 2001:540), the combination of knowledge creation and technology as a means of innovation is key to the competitiveness of enterprises. Managers are under pressure to create value for their enterprises as the need for innovation is currently growing exponentially (Prahalad & Ramaswamy, 2003:12). In the past, enterprises could challenge competitors by utilizing their value chains. This became ineffective in the face of cost pressures exercised by global competitors with access to favourable labour costs. Competing on price alone is simply no longer a competitive advantage. The fluidity of markets requires an ever increasing rapidity of response from enterprises to manage the challenges posed by new products, services, competitors and partners, increased quality and shorter times to market on a global scale. Between 1983 and 1995 for example, foreign direct investment grew ten times faster than world trade. In 1998, a fifty per cent rise was recorded in the number of mergers worldwide in a *single year alone*.

Competition intensifies on a daily basis, as it resides in the activities undertaken by competitors. Enterprises will forge ahead, opting for revolutionary change, forcing their competitors to follow suit.

¹ Competitive advantage is the management of 'what' enters and leaves the organization and how well 'it' is managed (Malhotra, 2000:42).

But survival in a competitive environment far outweighs cost considerations, at least when judged by the few who manage to integrate their business processes successfully and who will readily have rivals for company (Hayward, 2003). What is at stake for countries, multi-nationals and domestic enterprises alike, is the attainment and strengthening of their market position in an ever-expanding global market (Castells, 2000:98-99, 124).

Globalization served to expose the weaknesses of enterprises. They were vulnerable to the information processing and innovation capabilities demonstrated by much smaller enterprises. This type of competition on a smaller scale obliged larger enterprises to apply their technology for competitive reasons. (Reddy & Reddy, 2002: 5-6). If a competitive advantage(s) were to be sustained, it had to be derived from managing what entered and what left the enterprise (environmental advantage) in combination with its organizational intelligence to enable it to deal with its internal and external environments (Jain, Marshall & Meadows, 2000, 41-42). When information systems were designed to incorporate flexibility into the enterprise they became a competitive necessity because they enabled it to respond to future competitive needs. Enterprise leadership and information systems management however, had to interact closely to achieve this. Notwithstanding such efforts, competitors could still easily imitate competitive advantages in a competitive market, but not unless all the various capabilities of the enterprise were synergized through a careful integration of the value chain activities founded on knowledge (Ash & Burn, 2000:156-157).

Integration proved to be extraordinarily difficult in view of the global reach of an enterprise with its incumbent processes and systems. Even Enterprise Resource Systems (ERP) with a single database at its core failed largely in its provision of required levels of flexibility (Reddy & Reddy, 2002: 5, 7). It became clear over time that technology on its own could not provide an enterprise with a competitive advantage (Castells, 2002: 5,147,256; Reddy & Reddy, 2002:6).

2.2 Qualifying Impact of Technology on Business Performance

Before the close of the 20th century, a 'technological revolution' capped the pervasiveness of communication and information processing technologies in all spheres of human activity across the globe. The new technological paradigm was organized around a nucleus of information technology that sparked technological breakthroughs, which in turn, soon digitized the whole world Castells (2002:29-30). Curiously, the technological revolution was *not* characterized by the centrality of technology, neither by information nor knowledge. Instead, the revolutionary aspect was centered on the application of information and knowledge to the creation of new knowledge and information processing or communication tools in a continuous cycle between innovation and the use of innovation. This cyclical movement lay at the very heart of this technological 'revolution' (Castells, 2002:31).

It may seem as if technology has become less important over time. Contrary to this perception, its application use actually served to increase its importance to the extent that it became a prerequisite for successful business modeling in business-driven enterprises. Quite simply, if technology is deficient, business will fail (Perrey [*et al.*], 2004:143). The findings of the study below need to be understood in this vein.

2.2.1 Could Technology alone drive digital Transformation?

A study of European and US enterprises laid bare no fewer than ten drivers of enterprise transformation from the traditional² hierarchical to the modern flat-structured enterprise by the use of new information technologies. These are:

- ability to deliver electronically (on-line delivery of products and services);
- intensity of information (leveraging varying levels of information content inherent in a product or service);
- customization (individual customers needs and preferences are addressed);
- aggregation (different combinations of products and services ensure customer convenience);
- search costs (web-enabled search costs are low);
- real-time interface (instant user access to volatile information such as stock price fluctuations on demand);
- risk management (risk variance depending on type of product or service such as cars or books);
- network effects (utility of a product or service increases if users increase);
- standardization (enterprise synchronization and standardization of certain processes lead to enhanced efficiencies and customer satisfaction);
- lack of competencies (outsourcing stops the competency gaps).

At first glance, these drivers seem to push customer connectivity and exhibit the power to transform industries, let alone enterprises. It is only when the sheer complexity of relating technology applications to business optimization is grasped, that the paradigm of technology application can be understood fully. New technology may be easily copied and only serve to level the playing field in competition, unlike the human resources of an enterprise, which are hardly imitable. Any rapid advance in technology will increase the critical importance of human resources considerably. The management of human resources is therefore regarded to be of crucial importance to superior business performance in the enterprise (Smith & Rupp 2003:158).

² A traditional enterprise is centralized, hierarchical with a structured tier of specialists who operate along Standard Operating Procedures (SOP) to deliver mass produced products and services (Laudon & Laudon, 2002:6).

Workers have to regard technology not as superficial application layers, but as embryonic processes waiting to be developed by the human mind as a direct force of production (Castells, 2002:31). Marchand and Castells both contend (each to a different degree), that isolated technology practices do not account for enhanced business performance (Kettinger, Marchand & Rollins, 2000:12; Castells, 2002:31). Guided by the enterprise strategy, technology has to support the business in such close alignment that the business needs are reflected in the technological adaptation to the business market (Perrey [*et al.*], 2004:142). Nonetheless, the design of business models optimized by new information technologies pose a real challenge to both new and established enterprises alike (Andal-Ancion Cartwright & Yip, 2003:35-37, 41).

2.2.2 Combined human Intellect and Technology Paradigm

For the very first time in the history of humankind, the mind acts as a direct force of production using technology and communication systems as an extension of the intellect (Castells 2002:31, 256). The technological paradigm or basic set of beliefs that were identified at the close of the 20th century consists of five main components:

- technologies act on information;
- all spheres of human activity are pervaded by technology;
- networking logic of systems arise from increased complexity in predictable and unpredictable computing interactions;
- paradigm foundation provides for flexibility processes and reconfigurable enterprises that can be retooled and reprogrammed without destroying the enterprise, but changing its rules;
- specific technologies converge into tightly integrated systems (Castells, 2002:70-72).

Information technology (IT) remains a vital ingredient of the work process for various reasons, one of which is its ability to provide the production process with an infrastructure to create flexibility and adaptability - two crucially important components in the world of real-time information and data processing. A Gartner survey magnified the ability of role-based, flat-structured enterprises to adapt themselves flexibly and at will almost, to the presiding volatility of the business environment. By 2003, it enabled forty percent of flat-structured networked IT enterprises in the USA to reorganize annually, while twenty-three percent did so bi-annually and five percent could reorganize four times annually (Bell & Gerrard, 2004).

Information technology also plays a determinant role in the innovation capability of workers. Lastly, information technology facilitates error correction and feedback generation in production processes. The more automation increases, the more it serves to magnify the importance of human intellectual input into the work process. The three tenets below highlight such interaction between technology, information and workers:

- As organizations shape the decision premises of decision-makers and not the decision itself, technology may be used to reinforce existing decision premises in the enterprise.
- Technology may change the way users perceive the accessibility, media richness and ability to reduce equivocality and uncertainty. This serves to change the notion that information delivered by computers is not as rich as face-to-face communication, regarded as the richest form of information due to its instant feedback capability.
- Technology may change enterprise structures to coordinate economic activity by:
 - Transferring information to create a communication effect;
 - A broker effect referring to the connections established between suppliers and buyers;
 - Integration effect to connect processes that use and create information.

Technology may *augment* the information processing capability of the enterprise to:

- reduce uncertainty by delivering information to where it is required, fast and efficiently;
- process increased amounts of information by filtering, routing and organizing information better;
- manage complexity by means of decision-support systems;
- increase job decision-autonomy;
- increase a free flow of information;
- reduce equivocal information inputs from the external environment by computer-based communication systems to augment face-to-face information (Choo, 1991; Ciroto & Youssef, 2003:394).

The relationship between technology, enterprise change and productivity was investigated in a study undertaken in 1997 by Brynjolfsson at 600 US enterprises. The findings were clear. The most productive users of technology worked in synergy with a customer-focused business strategy in decentralized enterprise structures. Information technologies required well-informed workers equipped to operate without constraint to deliver to the best of their abilities (Castells, 2002:31,90,256, 259). Two theories illustrating the importance of human contribution to business performance by means of technology application are those of information orientation and the information technology productivity paradox.

2.2.2.1 IT Productivity Paradox

Many enterprises that made considerable technological investments never received the business benefits they associated with the corresponding expenditure. One reason for this, according to the IT productivity paradox theory, may possibly reside in fast technological growth that simply outpaced the ability of enterprises to understand it well enough to optimize its use (Laudon & Laudon, 2002:25). The dissonance between (substantial) technological investments and good business results is amply illustrated by the one trillion dollar annual expenditure on information technology worldwide over the

past thirty years, which did not stop the sharp fall in productivity growth among the world's seven wealthiest nations. Any economic growth that did occur was ascribed to an increase in trade, production capacity and employment.

The networked enterprise of the new economy required a review of popular technological versus business investment theories. Decades earlier, technology growth overshadowed the value of the contribution of information practices to business performance (Van Winkle, 1998). Information technology in the new network economy was applied for the express purpose of creating value for the enterprise by enabling the transformation of its internal and external relationships in the value chain (Roberts, 2002). It served to increase business speed to spur on business growth and so present the enterprise with additional growth opportunities (Bittman & Scott, 2003). In the network enterprise, which is almost completely reliant on a technological infrastructure, information technology is sometimes regarded as 'the core of business itself' (Laudon & Laudon, 2002:6). Viewed succinctly, it is possible that information technology and business may rather have become inextricably linked in a relationship where the business purpose and business value of the business framework is enabled by technology (Dobrik, Flint & Raskino, 2003).

The networked enterprise is a unique combination of technology (speed and accuracy) and good business initiatives (Roberts, 2002). This finding is borne out by two studies. Brynjolfsson's 1997 study (referred to earlier) concluded that the overall relationship between technological investment and higher productivity was dependant on the management practices of an enterprise (Castells, 2002:90). The other survey undertaken by CIO magazine in 2003, established that good management was as *important* as technology in creating an enterprise that was responsive to events (Alter, 2003:60). Management practices such as taking decisions on culture were seen to be of critical importance to business process integration (Hayward 2003). Brynjolfsson's study found that management practices ranging from culture to sourcing decisions were the differentiating factor determining higher productivity through technological investments in enterprises. Although the networked enterprise is not synonymous with and defined by technology, it also has neither business purpose nor business value without it. It has to find a balance between the two to optimize its performance.

2.2.2.2 Information Orientation

Business success does not lie in an alignment between technology and information. Simply grafting new technology onto old structures or trying to enliven old structures with new technology is an altogether fruitless exercise (Castells, 2000:90). It is the care and attention paid to the *way in which* users use information by sensing, collecting, organizing, processing and maintaining it that proved to be the essential missing element in the blend of technology and business that would support business performance in information-orientated enterprises. It is therefore the human information practices in enterprises that create information and much-needed knowledge that shape the differentiating factor for superior business performance (Kettinger, Marchand & Rollins, 2000:10; Reddy & Reddy, 2002:5).

2.3. Speed as a conceptual Logic in Enterprise Transformation

Societal changes come about as a result of the interaction of many factors including the liberalization of investment and trade, deregulation policies, technology and others. In the new global economic environment, conditions prevail where:

- unpredictable demand for quality and quantity exist;
- diversification of global markets limit control;
- technology changes render simple production equipment obsolete.

These conditions spawned new trends that are driving fundamental enterprise changes. One of the first identifiable trends was the switch from mass production to flexible production systems. Other trends that also became clear were:

- unwieldiness of the larger enterprises contrasted with the resilience of the smaller ones;
- new flexible management methods evolved related to worker involvement in production processes;
- intensified worker performance;
- decentralized initiatives and decision-making;
- absence of major disruptions in production processes;
- inter-enterprise networking;
- corporate (enterprise) strategic alliances (Castells, 2000: 5,147,256).

Mature enterprises were faced with the challenge of having to be flexible in a competitive environment. In many cases, it was difficult to adapt. Although many were early adopters of technologies, these soon turned into legacy problems. Some of these early systems were designed for efficiency improvements in particular areas of functionality only that were often geared for bulk processing. Their levels of sophistication were sometimes of variable quality while mergers and acquisitions contributed to the havoc caused to systems growth over a period of time.

One of the most important enterprise needs to surface was that of building for competitive need. The contention was that problems arose when the flexibility of the enterprise only extended to the current or outdated competitive needs of the past as a result of its financial or technological constraints. Enterprises ought to be technologically adept enough to include its *future* competitive needs (Reddy & Reddy, 2002:5). They should be as flexible as its technology *and vice versa*. But mechanistic foundations could not cope with these demands from a volatile competitive environment. (Brewis, 2004: 584; Smaczny, 2001:797,801). It was inevitable that enterprises were steering towards two realities:

- remaining competitive in a rapidly changing competitive environment;
- integrating new technologies successfully into an existing information processing capability.

If they retained their legacy systems, they were to run the risk of encountering constraints in processing information that would render them unable to respond to the global competitive environment. The (better) option was to consider information systems as a competitive necessity (Reddy & Reddy, 2002:5).

2.3.1 Differentiating Impact of Speed

The network enterprise by the 1990s was already enabled by information-processing technologies to provide a flexible time information processing ability. For once, the stranglehold of time on capitalism and culture was broken. A type of 'freed of time constraints' time became embedded in the structure of the rising global network society (Castells, 2000:464,467). Ironically, once all notions of time were stripped away, only time in the context of speed remained and this became the very prerequisite for business success.

Business acceleration became part and parcel of corporate strategies. In the 2003 CIO survey mentioned earlier, respondents referred explicitly to the impact that speed exerted on their business. By 2002, one-third already found it difficult to respond quickly enough to customer demands, while another third admitted their failure outright to do so (Alter, 2003:57-59). The Standard & Poors 500 rating listed an increase from sixty-eight to a high of 233 companies between 1982 and 2000 which included negative special items in their earnings reports, a clear indication of being caught by surprise by unexpected business events. The 1978 number of business failures was 10 000, a figure that rose to 75 000 failures annually in 1998, a mere twenty years later (Meyer, 2002:59).

'Speed to market' was critically important to seventy-four percent of respondents in the same survey. 'Responding faster will reduce costs' was a statement that elicited an affirmative response from sixty-nine percent of the respondents. A similar number was convinced they could respond faster to changing conditions than their competition. Speed seemed to be very important to the respondents judged by the other speed-related findings of the survey which were:

- decision-makers should have access to continuously refreshed (speedy) information (95.1percent said it was 'very to somewhat important' and 76.3 percent 'already had initiatives in place');
- business processes should support quick decision-making (94.7 percent agreed it was 'very to somewhat important' and 63.5 per cent 'already had initiatives in place');
- supporting corporate culture enabling rapid business process changes (90.8 per cent agreed this was 'very to somewhat important' and 51.8 per cent 'already had initiatives in place');

- ability to redeploy resources rapidly (87.5 per cent agreed this was ‘very to somewhat important’ and 53.8 per cent ‘already had initiatives in place’);
- speed to market to produce new products and services (82.6 per cent agreed this was ‘very to somewhat important’ and 53.3 per cent ‘already had initiatives in place’ (Alter, 2003:57-59).

These findings seem to validate the statement that speed has a differentiating impact on the temporal business relationships between enterprises and its stakeholders (Castells, 2000:460-468).

2.3.2 Demands and Intents in Business

The primary functions and processes of the global economy became network-centered over the course of the past twenty-five years from the 1980s onwards. Productivity and competition unfolded in a context of interconnectedness between business networks spanning the globe as *global capital markets unified into one global economy operating in real time*. Increasingly, financial markets based their economic activities on knowledge-enriched information that flowed non-stop in newly integrated networks.

The transformation of capitalism was rendered inevitable by the informational³, networked and global reach of the new network economy that transformed time itself, freeing it from clock time. Information technology eroded all the traditional notions of time as linear, measurable, irreversible and predictable. ‘Timeless time’ fused the past, present and future into one ‘forever universe’. In enterprises, time was soon regarded as a scarce and expensive resource that had to be processed and not simply managed (Castells, 2000:77, 460-468, 500, 502; Lang, 2001: 544). In this way, efficient time processing could then contribute to lower labour costs (Meyer, 2002:61).

The demand for mobility posed another challenge to enterprises. Not only customers, but also workers and suppliers expressed a growing demand for mobility both within and external to the enterprise. Information was needed regardless of location or time and *on demand*. In response to this need, the Wireless Application Protocol (WAP) was developed to become a reality by 1999. One of its most interesting uses in an enterprise is delivering management information to the recipient regardless of time and location. WAP enables:

- real-time operations;
- faster and better decision-making;
- real-time file transfers;
- remote monitoring;
- collaborative work.

³ Informational is the application of knowledge to knowledge as the main source of productivity (Castells, 2000:17)

By its very nature, WAP facilitates the transmission of salient information only, as it cannot accommodate large amounts of text transfers (Van Steenderen, 2002:219). In a real-time information-processing environment, this means that only the most important information can be culled for delivery from information that has already been identified previously to be of critical importance to the enterprise (McGee & Raskino, 2004).

2.3.2.1 Customers

Time processing also assumed new meaning viewed from the customer demand side. Customers had their own expectations relating to changing market needs that included business response times to their business demands. Customers grew increasingly accustomed to using modern technology that enabled them to buy products and services faster than ever before possible (Flint, 2003b). This bestowed customer power on them (Lang, 2001: 544). They demanded and expected faster access to accurate information to make competitive comparisons, expecting calls to be returned immediately and not in a few day’s time. They needed speed. No longer would a distinction be made between the response times of physical and virtual businesses. A slow response time simply meant bad service and this was the trigger to transfer the customer’s business elsewhere (Rupp & Smith, 2003:1157, 162, 165; Flint, 2003b).

Referring back to the CIO magazine survey of 2003, 65.5 per cent of respondents agreed that customer needs across five industries⁴ were changing either ‘very rapidly’ to ‘somewhat rapid’ (Alter, 2003:58). Within four years, from 1998 to 2002, the demand for faster response times (Hayward, 2003) resulted in the following time contraction figures across industries (Table 1 below):

SERVICE SECTOR	DEMAND IN ±1998	RESPONSE EXPECTED IN 2002
Trading analytics	30 minutes	5 seconds
Airline operations	20 minutes	30 seconds
Call Centre inquiries	8 hours	10 seconds
Tracking finances	1 day	5 minutes
Supply Chain updates	1 day	15 minutes
Document transfers	3 days	45 seconds
Phone activation	3 days	1 hour
Renew data warehouse	1 month	1 hour
Trade settlement	5 days	1 day
Build-to order computers	6 weeks	1 day

Table 1: Contraction in Service Response Demand Times (Meyer, 2002:54-59)

⁴ Financial services, Government, healthcare, manufacturing and non-IT manufacturing (Alter, 2003:58).

A visual presentation clarifies the trend strikingly (See Appendix A for a graphic illustration). Despite customer demands for quick business responses, the trend-line for business response times to these demands indicated no corresponding line at all (Alter, 2003:59). It seemed as if businesses cannot keep up with the pace that demands speedier responses. One solution is for business to move beyond Customer Relationship Management (CRM) to the realm of 'customer intent'. Here they can analyze the detailed interactions of customers that may lead to the discovery of patterns pointing in the direction of customer intentions (Fenn, J. [et al.], 2004). Businesses are aware of the negative effect of rapidly occurring phenomena on their income statements if they do not detect and act on them in time, preferably before they occur. Fads should not be dismissed, but should rather be seen as expressions of customer intent serving as prior warnings to whoever is in that line of business (McGee & Raskino, 2004). An enterprise such as the real-time enterprise that plans its activities in close approximation of customer demands from a customer-centric perspective, is involved in a process aimed at its potential profitable growth (Aminoff, Auramo & Punakivi, 2002:513, 521).

2.3.2.2 Workers strike a Balance of Demand and Supply

Organizations process information to lower task uncertainty and to reduce equivocal information as a means of improving decision-making and understanding the competitive environment more (Choo, 1991; Rozwell, 2001). The amount of information required to perform the task to the desired level of performance is determined by the difference between information already in the possession of the enterprise and the information it lacks (Choo, 1991). Only enough information is required and used that is necessary to construe the adequacy of the purpose and not to continue to search for the absolute truth (Brewis, 2004:581). Enterprise structures are designed to facilitate information processing abilities for task performance at desired levels of performance. Digitization facilitates the information life cycle by making more detailed and timely information available in the whole enterprise. An enterprise then consciously matches the balance between the information processing capacities of the enterprise against its task information requirements. If the balance is not maintained, business performance will be reduced due to schedule overruns or increased budgets.

Enterprises have to face the daunting challenge of a global amount of available information described as 'velocities' of information flows (Roberts, 2002). According to the information supply model devised by Goldstein and Zack in 1988, information use is bound to increase, commensurate with the supply and distribution of information. In terms of this model, the greater the amount of technology applied to information supply and distribution, the greater the information use and environmental knowledge created, *provided* a balance is struck between information demand and information supply. First, inefficiencies need to be eliminated from information flows to avoid information overload and then information access has to be rendered as easily and seamlessly as possible to the user. The outcome should be information agility, also equated with informational efficiency (Bajgoric, 2000:121). Based on its annual rate of increase, it presents organizations with a bare choice: it can either reduce the flow of information or it can improve its information processing capability (Choo, 1991). The reduction of information flows in the form of abstractions is a convenient mechanism to reduce

complexity, but it only serves to abridge reality (Brewis, 2004:581). Alternatively, too much information is confusing and misleading (Rozwell, 2001).

Although technological solutions such as intelligent search agents and intelligent interfaces were designed to address the problem, their effect by 1999 was still not discernible operationally. Technologically, it is possible to extract the maximum amount of information from systems without succumbing to information overload through an automatic collection or as a by-product of existing processes. A checkout clerk and the back-end operational database may use one set of information *without* increasing the workload of employees (Metz, 2004: 31; Raskino, 2004). By shortening information flows, layers of middle management in the network enterprise may be removed resulting in the reassignment of some managerial functions either upwards or downwards in the enterprise to avoid slowing down existing information flows. As a result of these layering cuts:

- information is not distorted and customized for management;
- red tape and silo's are minimized;
- information hoarding is discouraged.

The US Presidency at the White House streamlined their information flows by cutting protocols between State Departments and countries like Israel whose generals do not have to follow formal protocol rules to contact White House staff in an emergency. The risks of direct information flows are however, obvious. Over-shortened direct information paths could lead to 'stovepipes' that bypass stakeholders or professionals who should otherwise have been allowed to intervene in the interest of business performance. The Pentagon for example, was bypassed by the US State Department in the build-up to the war in Iraq in 2003, thereby creating political unease between the two departments (Metz, 2004:28, 30). From this example, it seems evident that culture and power still affect the supply and use of information (Choo, 1991).

Ironically, the renewed focus is not on technology as a means of streamlining information flows, but on *human intervention*, seen to be the last key to the information society. The improvement of information and digital information literacy in particular, could become a powerful way for workers to reduce information overload by:

- recognizing a need for the supplied information;
- having the ability to match information with a specific problem;
- successfully finding required information;
- evaluating and organizing the information;
- using the information to resolve the issue (Bawden, Courtney & Holtham, 1999:253).

The question still remains how individual users are expected to cope with a voluminous supply of information to establish a balance between supply and demand. The intellectual capacity of humans has remained static for about one hundred thousand years, but human knowledge has increased rapidly, doubling every thirty years. If the two trends do not meet at one point in time, it will become impossible for people to deal with the amount of available knowledge. Some contend that this has already happened, even predicting that it will be worse before long (Fuka & Hanka, 2000: 279-280) because humans have only a limited capacity to process unrelated data (Rozwell, 2001).

A balance has to be created in enterprises between rich information (face-to-face meetings said to be the richest form of communication) and other forms of information (rules and regulations), depending on the interdependence or specialization of departments and on the amount of uncertainty and equivocality resident in the environment of the enterprise.

2.3.3 Influence of Speed and Networks on the knowing Cycle in Enterprises

Despite the advent of the new global economy and its incumbent global networks, enterprises still need to solve problems, make decisions and grow their knowledge on an on-going basis. They need to continue to process information by enactment (creating conceptual environmental models), selection and by the retention of interpretations for future use. Its primary function has not changed. It still has to process external information to reduce some of the equivocal content. Managers are still involved by entering into discussions on environmental cues so that a common interpretation can be reached on their external environment. As the decision-makers, they prefer to consult credible sources. Verbal media, which consumes up to seventy-eight percent of their time, remains popular. Workers will continue to select information of a lower quality if it is more accessible, rather than choose information of a higher quality, but which is difficult to access. The most preferred sources of information remain those that are accessible and credible (Choo, 1991).

2.3.3.1 Sense-making

Network enterprises are more inclined towards sensing and responding to changes in their environment to enable faster responses to environmental changes than a conventional 'command and control' response expected from traditional or hierarchical enterprises. Increased flexibility heightens the enterprise ability of sensing and responding rapidly to their environments compared to traditional enterprise responses (Laudon & Laudon, 2002:6-7, 21). Business has to sense its environment more than attempting to control it. Control is impossible in any event, as the environment is fraught with surprises and uncertainties. This kind of volatility is created by the combination of speed and connectivity. As higher volatility is commensurate with the richness of connectivity, a single signal sent through a richly connected system will create so many variables that a traditional means of analysis would not possibly begin to unravel all of its meanings (Meyer, 2002:55,58).

Information is very seldom clear in all its implications (Sutcliffe & Weber, 2000:6). Sense can only be made from moments happening in the past in a very subjective process that draws upon a pool of tacit understanding (Leibold *[et al.]*, 2002:318). In the network enterprise, 'giving meaning' is transcended by 'making sense'. Meaning is derived from sensory perception, but sensing is a holistic framework that merges different meanings⁵ into a coherent understanding of their purpose. This understanding then becomes the foundation for future actions (Leibold *[et al.]*, 2002:317). The only solution to understanding the environment is to identify the source of volatility or as Weick (Leibold *[et al.]*, 2002:318) defines it, the cues that drive business volatility. These cues have to be matched with an understanding to enable action. Only then can sensed events or changes be understood to enable responses and adaptations that are crafted to suit the business (Leibold *[et al.]*, 2002:318; Meyer, 2002:55,58). Managers have a stronger need for consistently clear holistic mental frameworks of understanding to interpret the facts than for the actual body of facts itself (Sutcliffe & Weber, 2003: 6).

Given that the unconscious sense-making of cues is indicative of commonly held assumptions and shared sense, it becomes vitally important to integrate a social system into the network enterprise structure that is guided by coherent mechanisms in the form of values, norms and purpose. This will familiarize employees with the purpose of the enterprise. Workers will also come to share a common concept of its essence when they are actively involved in making sense of environmental cues (Leibold et al, 2002:318,139). Managers continue to play a very important role in this process. They are more likely to manage, to communicate meaning and to make sense. These are actions that depend more on the type of enterprise than on the information itself (Sutcliffe & Weber, 2003:6).

2.3.3.2 Knowledge Creation

The only meaningful economic resource in the knowledge society is knowledge itself, not land or capital that had been important economic measurements in a prior industrial age (Grant, 1999:134). Knowledge is regarded as the driver and the main source of the new global economy (Ciroto & Youssef, 2003:390; Bailey & Bogdanowicz, 2002:125). It is a source of growth and a basic input into value creation and especially innovation (Arora, 2002: 240;Lang, 2001:543). The importance of workers is illustrated by their ability to create information and knowledge as a result of their human information practices used in the innovation cycle (Kettinger, Marchand & Rollins, 2000:10; Bell & Gerrard, 2004). The tacit knowledge they possess is regarded as *the* most important strategic resource of the enterprise (Grant, 1999:134) and a source of competitive advantage (Choo, 1998:3; Bailey & Bogdanowicz, 2002:125). Yet, it is worth remembering that knowledge workers possess their own means of production, namely their knowledge. Ultimately, it remains their decision whether to share or not to share their knowledge with others in the enterprise (Lang, 2001: 544).

⁵ Different meanings are derived from a sense-making process in which mental frames are constructed that act as filters when interpreting cues (Leibold *[et al.]*, 2002:318).

The network model however, driven by efficiencies, is intent on fostering innovation (Leibold [et al.], 2002:137-138). It creates explicit processes that promote knowledge flows and collaboration throughout the network enterprise to create returns on investment (Ash & Burn, 2000:153-154). Improved knowledge management practices may support its development of a competitive advantage (Berawi, 2004:427). This will support those managers who are under intense pressure to regard innovation as a competitive necessity to create value for the enterprise (Prahalad & Ramaswamy, 2003:12; Linder, Davenport & Jarvenpaa, 2003:43). Innovation will only flourish in an organic enterprise structure (Reddy & Reddy, 2002:8) where the same conditions are found that are conducive to the agility of market knowledge (Ciroto & Youssef, 2003:390). Creativity and entrepreneurship will only be present as long as the prevailing conditions do not elevate order as a value above all else (Leibold [et al.], 2002:143). In this environment, managers have to share power, distribute resources appropriately and learn to devolve autonomy where necessary for the sake of innovation (Ciroto & Youssef, 2003:395; McCarthy & Tsinopoulos, 2001: 106).

Although technology and communication systems are still regarded as vitally important, they are continually integrated in a sense and respond cycle that involves the application of the human intellect as a direct force of production (Castells 2000:31; McCarthy & Tsinopoulos, 2001: 103). This cycle is specifically aimed at fostering innovation in the network enterprise (Castells 2002:31, 256; McCarthy & Tsinopoulos, 2001: 103). The cyclical movement between innovation and innovation used to create new knowledge is set in motion by the application of information and knowledge to create new knowledge and information processing or communication tools. One contention is, the greater the use of information, the larger the knowledge base (Choo, 1991). Technology may also assist in identifying and facilitating appropriate data, information and knowledge to support decision-making and is considered a necessary condition for Knowledge Management (KM) success (Arora, 2002:240, 248).

Surprisingly, only a few studies exist on the role of workers and organizational characteristics despite the acknowledgement of the role of people in models of organizational competitiveness through agility. Two approaches have been identified in a network enterprise that nurtures an innovative culture, namely the lean production approach (LPS) and the Socio-technical Systems approach (STS). In following the STS approach, technology assists workers to develop their skills and improve decision-making. Teams own their work, not the individuals. Inter-personal relationships are regarded to be of crucial importance because it is people who are the creators of knowledge. People are consciously motivated. In the LS approach, experts and standardized processes prevail and a good relationship between workers and management is of paramount importance. It improves efficiencies, whereas the STS improve work from the worker's perspective. In other words, the worker has to improve the work, as opposed to the LS environment where experts step in and take over (Ciroto & Youssef, 2003: 390, 395, 399).

2.3.3.3 Decision-making and taking Action

The fundamental changes exacted by the new world economy from enterprises also had its effect on enterprise decision-making. As threats and opportunities appeared and disappeared in an instant anywhere in the world, decision-makers were expected to keep up with this pace so that surprises could be deflected from the enterprise. Only if the enterprise was resilient enough, could it cope with unforeseen business events (McGee & Raskino, 2004). Rigidity was cut from information flows in the network enterprise and redirected away from structured decision points to where lateral relations had been created. As a result, the level of decision-making was moved down to where the information actually existed. These lateral relations took the form of:

- direct contact established between managers who share problems;
- liaison roles created between departments with frequent contact;
- overarching task forces to address cross-functional problems;
- integrated leadership role to resolve lateral issues;
- substantial differentiation calls for managerial-linking roles instead of integration;
- matrix design to establish dual authority relations (Choo, 1991).

Not only did changes have to be made to reporting systems, but methodologies and cultures also had to evolve to adjust to the speed required of enterprises in the new economy (McGee & Raskino, 2004). Autonomous decision-making serves as an example. Having decisions taken autonomously by those on the bottom rung of an enterprise, but close to the action, is nothing new. In the 1940s at the height of World War II, the German 'Wehrmacht' was renowned for its decentralization and use of so-called bottom specialists. Its blitzkrieg strategies relied on those closest to the action to have the authority to exploit opportunities as they presented themselves. They also had direct, immediate communication with headquarters and other military units that could possibly support them. Panzer units at the frontline for example, could ask directly for air support (Metz, 2004:28).

Currently, senior US executives are grasping with the same 'closing in on the action' principle to make better decisions in response to the environmental and technological changes they face albeit sixty years on. Executives are becoming increasingly involved in the operational activities of their enterprise, (Ellis, 2003:5) fusing strategy and operations, but not as the sole decision-makers any longer. Decision-making authority of network-centric enterprises is decentralizing through the managerial ranks serving to expand the management span of control (Ellis, 2003:5; Laudon & Laudon, 2002:20). Phil Condit, CEO of Boeing, (as quoted in MIT Sloan Management Review, 2003:1) confirms that the best decisions will ultimately be made by those closest to the action.

Executives and workers alike are all expected to be informed in the new network enterprise, so that they are enabled to make decisions in real-time (Castells, 2000:467). In the absence of real-time information, the real risk lies in taking inaccurate or meaningless decisions. Decision-makers need up-to-date key information and data for the best results to:

- aggregate and analyze;
- benchmark in the industry;
- conduct peer reviews;
- plan (Rabin, 2003:37).

Fundamentally, organizations still shape the decision premises of decision-makers, but not the decision itself (Choo, 1991). Information processing may actually be slowed down if a decision-maker is presented by information with an even distribution of attribute levels. This will oblige the decision-maker to search for *more* information to distinguish between values or attributes, which then becomes time-consuming. As decision-makers often adapt their decision-making process to suit their decision-making environment, it is possible that the information structure of the enterprise may impact information processing, as well as the quality of the decision itself (Lurie, 2004:474) with reference to a network enterprise that processes information in real-time.

2.4 Rising Importance of Networked Enterprises

From the mid-seventies onwards, long before technological changes diffused the globe, fundamental changes were incorporated into organizations in the prevailing logic of the time. This was a result of the split between the organization of production and the organization of economic markets. Its exact underlying causes remain unknown. Despite the vagueness of a precise timeline marking the rise of the new enterprise organizational transformation (Castells, 2000:165), it was soon clear that the pace of enterprise change was increasing. Global Information Communication Technologies (ICT) caused fundamental changes to economies, which in turn amplified and accelerated a force of transparency observed worldwide. But internal and external forces were not limited to technology alone. A set of forces or demands needs to be taken into account when designing an agile enterprise to suit its competitive environment (Table 2 below).

**There is no singular “agile organization” design.
Each organization must design itself to be appropriately agile
in response to a unique set of external and internal forces.**

Economic forces	Business forces	Organizational forces	IT forces	Work forces
Globalization	Cost reduction	Sourcing options	Enterprise architecture	Distance collaboration
Emerging markets	Shared processes	Funding models	Real-time infrastructure	Virtual teaming
Employment unrest	Distributed buyers	Changing competencies	Priority projects	Global diversity
		Leadership		
		Distributed decision making		

Table 2: Forces driving enterprise Agility (Ambrose & Morello, 2004).

The moment these new networked economic demands became everyday occurrences, the enterprises of the previous industrial economy no longer seemed able to cope with such volatility. These forces (demands) were reflected in corporate revenue shortfalls, stock market crashes, low inflation and interest rates, high gold prices, missed earnings, bankruptcies, fraud, failed mergers, acquisitions and general economic confusion. In addition, they had to contend with threats and opportunities that appeared and disappeared in a flash round the world. All of these factors vastly increased the element of uncertainty in the world of business (Castells, 2000:467; McGee & Raskino, 2004). To prove the point, CEOs worldwide recently revealed in an IBM survey that their top concern was dealing successfully with uncertainty and turbulence in their businesses (McGee & Raskino, 2004). As the demand for flexibility and short production cycles pressurized enterprises into an overhaul mode, enterprises initially responded by increasing their flexibility in marketing, management and production (Leibold *et al.*, 2002:139). As changes continued, it eventually consolidated into flat-structured horizontals in a shift away from the vertical hierarchies and relegated them to the past. Information would in future be carried in personal networks, between internal networks in the enterprise and also between these new types of network enterprises. To react swiftly, enterprises were obliged to rely on a wide variety of network connections between individuals, enterprises and also between countries to create their potential for unplanned networking (Fenn, J. *et al.*, 2004). Eventually, information started to flow between computer networks globally. Inter-firm links made a substantial contribution to the ability of the network enterprise to reconfigure itself flexibly and swiftly in response to the volatility of the environment (Leibold *et al.*, 2002:139). High levels of agility and flexibility came to be expected from the enterprise itself that had to measure up against its dual roles of competitor and co-evolver as demanded by the network economy.

This development spurred on a further exploration of *all* their competitive bases. Enterprise performance was hinging on how well managers could assemble the knowledge resources in its value chain to create the activities focusing on value creation in the competitive market (Lang, 2001:544). By integrating their reconfigurable resources, it was possible to unleash the quality, speed, innovation, flexibility and profitability of the enterprise in combination with the best practices of their knowledge environment. This approach enabled the exploitation of opportunities as and when these were presented, so that the eventual delivery of 'customer-driven' products and services could be enabled (Leibold [*et al.*], 2002:138; McCarthy & Tsinopoulos, 2001: 105). Network enablement and streamlining soon accounted for the potential of the new network enterprise to reach unheard-of heights in terms of competitiveness and profitability. Its optimization of information technology, in combination with all the capabilities of the enterprise, resulted in sought-after levels of high productivity ratings. Significantly, it also called for the complete redesign of the enterprise (Laudon & Laudon, 2002:6, 25; Lang, 2001:540).

In an evolutionary, progressive process, techno-centrism made way for enterprise process-centrism. The new 'network enterprise' logic of responsiveness of the business model was related to, but not dependent, on the technological changes that swept through the 1980's. Some notions of organizational responsiveness were already in vogue in the pre-electronic era, long before technology was widely diffused on a global scale. The notion of lean inventories or 'Just-in-time' inventory management procedures was already well known (Castells, 2000:467). It underscored Castells's (2000: 5,147,256) observation that technology on its own does not shape society and neither does technology shape the working arrangements of enterprises in that society (Castells, 2000: 5,147,256). In the network enterprise, a reliance on information technology was to be combined with the intangible human resources of the business to create competitive advantages (Reddy & Reddy, 2002:5). Process rationalization and integration turned workers into a resource pool ready for reintegration as agents of manual intervention. They had to accept that (constant) human intervention in decision-making and control loops were generally ruled out at the rate at which real-time systems were run. Changes to business processes laid the foundation for improved enterprise engagements with its internal and external environments. Well-crafted business processes implemented in a real-time (agile and adaptive) enterprise environment have the potential of becoming a map for the enterprise to provide it with business transparency, decision-making criteria (how and even why decisions are made) and to define sequential activities by roles requiring specific capabilities. Workers would be able to improve their understanding of their role among the various relationship ones already existing between a network enterprise (Bell & Gerrard, 2004) and its environment. The crystallized new network enterprise business model (Appendix B) exhibited the following qualities:

- flexibility was combined with rapid adaptability to lay the foundation for innovation and continuity;
- dynamism;
- shortened operational cycles;

- swift reallocation of resources;
- 'strategically planned network of self-directed units' based on decentralization, participation and coordination (Castells, 2000:164-178,467);
- digital enablement of almost all of its critical business relationships both internally and externally to the enterprise (Laudon & Laudon, 2002:6).

In future, enablement and streamlining will become a direction foisted on many enterprises driven by opportunities resident in the global competitive environment. Enterprise-wide process applications could become commonplace on condition these instill a process culture in the enterprise - an essential condition for continued success (Bischoff, 2004). The capabilities of self-management, self-configuration and connectivity of the network enterprise of the future may be enhanced further by the use of new technologies such as wireless communication technologies in the form of ultra wideband and Worldwide Interoperability for Microwave Access (WiMAX). Innumerable, real-time data points from connected objects could be multiplied even more for information processing to turn the advent of tera-architectures, sensor networks and event-driven (real-time) software models⁶ into a distinct possibility (Fenn, J. [et al.], 2004).

It is foreseen that networks will remain the basis of all new enterprises operating in the new economy, not only currently, but also into the future (Castells, 2000:180, 502). Networks based on innovation, decentralization and globalization, are exceptionally supportive of their own supporting base. Networks currently assume an importance as the very *core of integration and communication* in the world of business (Fenn, J. [et al.], 2004).

2.4.1 Self-structuring

Self-structuring is the ability to reconfigure the entire range of inter-firm capabilities and enterprise competencies swiftly to address the changing needs of the business and so deliver optimum business value. The hallmark features of the network enterprise are flexibility, agility and adaptability (Castells, 2000:164-178,467). These enable its self-restructuring in a continuous and relentless (Leibold [et al.], 2002:134,139) process of changing and adapting to a volatile business environment (Castells, 2000:164-178,467; Ambrose & Morello, 2004). Self-structuring is also systemic by nature. Each part of the holistic whole shapes other parts of the same whole (Leibold et al, 2002:134,139) to rid itself of wastage and to suffuse the new enterprise logic into its decision-making fabric, operating all the while in a networked environment and in real-time (Castells, 2000:164-178,467). While many enterprises have an innate understanding of the need for agility in the new global economy, their structures do not necessarily reflect it as yet (Ambrose & Morello, 2004).

⁶ Tera architectures will be capable of processing terabytes of data per second, while sensor networks respond quickly to events in the environment without awaiting user inputs (Fenn, J [et al.], 2004).

2.4.2 Enterprise Workers and the New Demands

The new informational paradigm that was in place by the 1990's also exerts its influence on employees. In more sophisticated societies, the number of informational occupations such as managers and professionals increased significantly since then (Castells, 2000:233, 244). Worker relationships and reporting lines have also changed. CEO's and CIO's are currently expected to share responsibility for business strategy, which is no longer the exclusive domain of the CEO. Multiple layers of management are removed as a result of job automation following the introduction of lean production methods that reduce the number of tasks and lower labour costs (Ambrose & Morello, 2004). Managers continue to play a strategic role as change agents and transferors of meaning (and making sense) rather than information in the whole transformation process. Complex business environments call for leaders who:

- understand the whole value chain;
- lead through purpose;
- build trust;
- design and support processes;
- articulate clearly and meaningfully;
- respect other workers' time and priorities;
- remove obstacles to productivity;
- reinforce the strength of workers;
- balance internal and external environments (Ambrose & Morello, 2004).

Managers still have to promote the shift in the strategic paradigm while simultaneously striving towards an agile management style suitable to information processing, knowledge and human resource management. These disciplines have become vitally important to enterprise performance in the same vein that good management is vital to the continued survival of the enterprise (Ciroto & Youssef, 2003: 390-391; Ellis, 2003:5; Laudon & Laudon: 2002::20; Rupp & Smith, 2003:158,162; Sutcliffe & Weber, 2003:6).

To engender loyalty among those who report to them, managers should exhibit three traits commonly shared by Fortune 100 enterprises:

- powerful and visionary leadership;
- employees who felt an affinity for their physical environment;
- sharing a deeply rewarding purpose that brings work fulfillment (Rupp & Smith, 2003:158).

The impact of change on top management levels was made visible by their increased involvement in the operational activities of the enterprise (Ellis, 2003:5). This was where the best decisions in a network-centric enterprise would be made according to Phil Condit, CEO of Boeing (as quoted in MIT Sloan Management Review, 2003:1). Their work satisfaction at the upper levels of the enterprise is still related to levels of satisfaction lower down in the enterprise (Ambrose & Morello, 2004).

Saving time and increasing operational production levels of workers became less important than nurturing the development of workers to become informed enough to make decisions in real-time (Castells, 2000:467, 472). In the network enterprise, it is expected of a worker to be informed. This approach turned the principle of management into a 'self-help' work ethic (Castells, 2000:467-468, 472). Given access to improved levels of quality information and the opportunity to redirect their focus to the processes that really mattered (Parkinson, 2003:22), they are enabled to make decisions in real-time. They can manage their own working time by balancing flexible hours with their payment in accordance with an 'as required' principle of lean production (Flint, 2003c) taking into account that their reputations are measured against the *last project only* which they have completed (Ciroto & Youssef, 2003: 390-391).

The principle of worker reintegration in alignment with a specific function distances them from a conventional enterprise distribution diagram (Ciroto & Youssef, 2003: 390-391). Such alignment addresses the issue of role overloads that were usually the cause of high frustration and low productivity levels among workers (Rupp & Smith, 2003: 161). In the network enterprise though, human capital assumes a greater measure of importance judged in part by the rising trend of direct reporting lines between Human Resources Directors to their CEOs (Smaczny, 2001: 800).

But in the wrong hands, reengineering technology could prove to be dangerous to workers. The effects of reengineering technology on users were measured in a Bain & Co. survey that found it resulted in:

- loss of innovation;
- declined morale;
- trust erosion;
- fragmented teamwork.

Information technology has to be applied *solely* for the improvement of specific business situations. The successful motivation of such independent workers requires knowledge of how they respond to external influences (Smith & Rupp, 2003:158,162). Knowledge of internal influences is also important, though. Employers have to consider whether workers are ready for change in terms of the conditions of 'not willing to change', 'not able to change' or 'not knowing how to change'. (Ambrose & Morello, 2004). Yet, despite all the information already known about the effects of technological changes on work processes (which could include the effects of speed), the whole picture is not yet fully known.

This is borne out by empirical studies and surveys lagging behind the pace of change (Castells, 2000:263-264; Ciroto & Youssef, 2003:388) and inadvertently bearing testimony to the speed of change wrought on society as a whole.

The one unassailable emerging trend globally is the progressive erosion of the traditional view of a lifetime career for employees with clear task delineations and the prospect of full-time employment in the enterprise. In the network society, workers are left to grapple with the complexity of working in two diverse environments: a network enterprise environment prized for its high levels of integration that operates simultaneously in a larger global environment where the very same integration principle is anathema (Castells, 2000:290, 472-473).

2.4.3 Controlling Complexity

Beer's viable system model (VSM) dates back to 1985 when he proposed an approach to enterprise performance based on the information and structures of natural systems. Complex systems operations have to mould a fit into the environment through focusing on ways in which they can adapt to new information received from the external environment. Beer's model demonstrates how a complex entity can be broken down into sub-structures, but at the same time, still be connected to each other via information and regulatory channels from which its common identity and cohesion are derived (Brewis, 2004:584; Perrey *[et al.]*, 2004:158). In a complex enterprise, autonomous workers will be interacting with others in an adaptable and flexible enterprise to create emerging structures to become the unique properties of that 'enterprise system' (Rupp & Smith, 2003:161-163).

Many have so far expressed their views on complexity theory and its interpretation and applicability on modern business. In the traditional world of business, complexity theory has as yet not been wholly accepted (Rupp & Smith, 2003:163). Some theorists (Smith and Rupp, 2003:163-164) are convinced it could be used as a model to explain the complex business environment itself and ways of dealing with it. Managers need to understand that linear predictions of business have given way to non-linear complex systems that are flexible enough to deal with uncertain environments. Ernst & Young proposes that complexity theory should be applied to *operational issues* where real-life simulations can be developed for enterprise problem resolution, but only if they are perceived to be realistic enough (Rupp & Smith, 2003:164). Without delving into the mechanizations of complex adaptive systems, fractals and complexity theory, it is sufficient to mention that enormous diversity requires an underlying set of basic rules to prevent a collapse into total chaos (Leibold *[et al.]*, 2002:139).

Enterprises should neither be too structured nor too chaotic or else they run the risk of stagnation (Rupp & Smith, 2003:163). The key to this new type of organizational structure required by its seemingly conflicting capabilities of co-evolution *and* competition, is a new type of business model altogether. The dualities of speed and innovation have to be managed through driving its efficiencies and nurturing innovation to enable a rapid adaptability to the enterprise as both a competitor and a co-evolver in its environment (Leibold *[et al.]*, 2002:137-139; Dreyfuss, 2003a).

To facilitate such opposites, it is suggested that the network enterprise design incorporates guiding mechanisms into its social system to allow for the dual mindset approach to strategic management. This will accommodate the antipodes of rapid adaptability and formalized enterprise structures. A virtual matrix could be introduced as a management tool to support complex cross-functional operations in the network enterprise (Bell, 2004). Some enterprises like General Electric (GE) introduced scaled down control systems so that innovation would not be clamped down. The introduction of values, norms and common purpose as coherence or guiding mechanisms ought to support efforts at bridging such a gap between control and creativity (Leibold *[et al.]*, 2002:139). This will strike a balance between structures and processes. In the network enterprise of the new network economy, structure will bond people while flexible processes will nurture the adaptability and innovation of the network enterprise (Rupp & Smith, 2003:162).

Chapter 3

Could the real-time Enterprise be a differentiating Factor for Business Survival?

3.1. Time and the Meaning of 'real-time'

Nothing happens in real-time. Events occurring at the same time cannot have an impact on the other. If that *were* the case, causality would have broken down and be non-existent. According to the Theory of Relativity, all events in the real universe occur in a clear sequence in an observer's individual frame of reference, as required by the principle of simultaneity and the limiting velocity of light (Parkinson, 2003:21).

3.1.1 Defining the 'real-time' Concept of the RTE

All forms of communication are based on the creation and use of signs. There is no distinction therefore between what is real and what constitutes a symbolic representation. If 'virtual' means existing in name or in practice and 'real' means actual existence, then it means that reality, as it is experienced, has always been virtual because it is not possible to determine what is 'real'. The contention is that reality is always perceived and communicated through symbols, our senses and thought processes and can therefore *not be accessed directly* (Brewis, 2004:581; Castells, 2000:403-405).

As all reality is virtually perceived, it follows that any criticism of fakeness leveled at the electronic communication media harks back to a primitive preference for that which is untouched or which is still not encoded, the so-called real experience. But this never even existed in the first place. A communication system that generates real virtuality is one where reality itself is captured in its entirety and is fully immersed in an environment of virtual images. Images then communicate experiences and do not only exist on a computer screen for the user (or worker), but actually *become* the experience itself. The danger is that users in such a system need to adapt to its logic, unless provision has been made for the design of a multi-nodal and horizontal communication network resembling the Internet (Castells, 2000:403-405). These comments and insights are pertinent to an understanding of the real-time enterprise (RTE) paradigm as a networked competency in the world of business.

In the specific context of a network enterprise operating in real-time, it assumes an *optimization* meaning. An RTE is a network enterprise that has optimized its business processes to make information available immediately when input is received or as soon as it is required by all stakeholders in its value chain (Gartner, Inc, 2004:1). As yet, no definitive answer exists as to the meaning of 'real-time' in an organizational context. Although current research suggests a *fully representative RTE was non-existent* by the end of 2003,, some enterprises have gone ahead and started their RTE transformation programme, regardless (Laudon & Laudon, 2002:7; McKenna, 1997:119).

As it is impossible to remove all causes of delay (Flint, 2003c) in a business process optimization drive, the following interpretations of 'real-time' in relation to the RTE, probably account for this observation:

- 'as immediately as possible' (Hayward, 2003);
- near real-time communication;
- immediate processing (Goldenberg, 2003:39);
- little or no delay between an event and a response (Meyer, 2002:55);
- highlighting changes in information (Rabin, 2003:37);
- 'instantly reporting key changes' (Goldenberg, 2003:39).

Real-time could then be construed to mean the 'reaction time' of the enterprise (Parkinson, 2003:21). Importantly, businesses do not only rely on 'real-time' information. Sometimes, it is necessary to make use of near-real time, semi-latent and even historical information to make contextual comparisons of events in a specific historical context. Such 'business-time' information becomes possible in an integrated enterprise information architecture (Griffin, 2004: 16)

3.1.2 Real-time Cycle

A simplified version of the RTE real-time cycle is illustrated in Table 1 below:



Table 1: Simplified RTE cycle (*Gartner, Inc, 2004:1*).

3.1.3 Relationship of RTE Principles and Business Performance

RTE principles are applicable wherever business policy and Service Level Agreements (SLAs) are the drivers of dynamic and automatic optimization of the technological infrastructure. It reduces costs, increases service quality and heightens the agility of the enterprise (Dobrik, Flint & Dobrik, 2003; Roberts, 2002). RTE principles allow for:

- the agility to change processes and underlying systems over time amid increasing complexity, scope and scale (Hayward 2003);
- real-time information flows in the value chain across enterprise boundaries (Roberts, 2002);
- enabling and streamlining flexible and efficient internal and external business processes;
- user empowerment related to role, not position, as sanctioned by management;
- real-time integration of all applications supporting processes, between them and other systems including the central infrastructure;

- rooting out any waste and delay by re-engineering and improving business process efficiency anywhere in the enterprise;
- constructing and deconstructing business relationships dynamically;
- removing latency or slack from its pivotal internal and external business processes, enabling management to take actions in slack time that may lead to even more appropriate business responses;
- focusing on deep process changes that include industry processes.

The key underlying principle of the RTE is to gain benefits from the reduction of redundant and unprofitable time gaps through optimizing technology so that these benefits can be applied to various other existing strategies in the enterprise (Dobrik, Flint & Raskino, 2003; Roberts, 2002).

3.1.4 RTE Paradigm

The RTE paradigm narrows the focus of the overarching technological paradigm prevailing at the end of 20th century (Castells, 2000:70-72). This paradigm is bent on 'constructive demolition'. It tears down, but it also rebuilds to reach far beyond the network enterprise into a value network. It is neither a process nor a new technology, but a programme directing a new way of thinking about a business and how to run it. The following are ten main thoughts on the RTE:

3.1.4.1 Evolve

- think laterally;
- build systems for change;
- avoid words like 'lasting' and 'static'.

3.1.4.2 Accept change

- manage across boundaries instead of controlling completely;
- ensure continuous availability of information;
- create universal application compatibility;
- leverage suitable existing technology.

3.1.4.3 Business priority

Business comes first, followed by technology that enables. (Draw the business map first, followed by the technology road).

3.1.4.4 Building blocks

- one framework connects the enterprise technology to manage real-time status;
- business process styles (first) determine information technology architectural styles (following) such as transactional processing, real-time, utility, analytical and collaborative;
- patterns or logical technology models are aimed at achieving results;

- bricks (the foundation link to the framework) can be pushed together or pulled apart without impacting other parts.

3.1.4.5 Extend and open up

- Internet is the architectural backbone;
- integration is everything;
- common digital language use across applications.

3.1.4.6 Golden Rules

- information technology decisions are based on business principles;
- capturing a methodology for logical technology use;
- obeying the rules.

3.1.4.7 Buy-in is crucial

Obtain buy-in from top management as allies.

3.1.4.8 Integrator as Conductor

A high-level champion drives integration.

3.1.4.9 Phased Approach

Start small.

3.1.4.10 Continuous Improvement

The world never stops and neither does the development of the RTE. Align the RTE with constant change. This paradigm tolerates few manual interventions. Fast, inter-woven, sleek and responsive, also alert, agile, ever-changing and flowing. These are the basic thoughts uppermost in one's mind when dwelling on the RTE (*Gartner, Inc*, 2004:1-21; *Laudon & Laudon*, 2002:7; *Rabin*, 2003: 39, 41).

3.2. RTE Approach to Business

Business success in the 21st century is measured by an understanding of the *present*, more than the past, but still not the future. Competitive pressure emphasizes knowledge of the here and now. The future is an unknown to all. It is said that what enterprises do not know at this *very moment in time* about business events, may harm them the most (*Raskino & McGee*, 2004). It is a type of pressure that is driving enterprise transformation to the RTE to enable fast business responses to market events in a more intelligent way of sensing and predicting events than previously, as technology enables new types of enterprise agility, flexibility and adaptability (*Bell*, 2004; *Hayward*, 2003). By reacting instantly to events in the macro environment, it becomes possible to improve the management of volatile financial markets (*Castells*, 2000:258-259; *Cirotto & Youssef*, 2003: 394).

As mentioned earlier, not all enterprise information has to be presented in real-time, necessarily. Only information and events that can and should be monitored in real-time are identified and reviewed to avoid unpleasant business surprises (Fenn, [et al.], 2004; McGee & Raskino, 2004). It is in the interest of the enterprise to make rapid distinctions between important and unimportant information in a given process. These decisions are largely made *on behalf of or for* the user in the RTE when considering the pre-selection of the most critically important processes to flow in real-time. This pre-selected information should be reliable and also be organized properly. The ability to find documents when they are needed in the right format to enhance their usefulness lies at the core of managing the information of the enterprise (Rozwell, 2001). The real-time effort of the RTE is therefore spent on information *worth* tracking for the particular enterprise with no distinction drawn between data and information (McGee & Raskino, 2004). The pre-selection of suitable information is performed when weighed against its:

- cost versus benefit of real-time data (and information) provision;
- vitally important proper problem escalation route;
- use of the data/information (Buytendijk, 2002).

Simply put, the criterion is simply to choose information/data ('material information') that will influence the course of action in the judgment of the enterprise for real-time processing (McGee & Raskino, 2004). Having chosen or prioritized a selection of information, the transformation programme can be designed that will turn enterprises into RTEs. On this scale, the programme consists of a series of projects crafted to remove delays in the management and execution of the critically important business process flows of the enterprise in a *progressive* way (Buytendijk, Raskino & Wood, 2004; Dreyfuss, 2003). The RTE programme approaches management processes from three angles:

- signals indicating the occurrence of events that were unresolved;
- resolutions that may be in the form of a person or an automated process that receives a signal to evaluate and analyze an event and crafts a resolution;
- responds when resolutions are implemented to introduce changes (Harris, 2003).

Incontestably, it is a costly, slow (Rabin, 2003:37) and difficult transformation for any enterprise. Still, it is distinctly possible to deliver 'real' value provided the transformation process is followed through with determination, diligence (Roberts, 2002) and strategic vision. This approach follows closely on the heels of the dot.com era of the 1990's that was intent on exploiting market opportunism and the range of n-variable products and services so demanding by customers. The failure of the so-called 'dotcoms' was ascribed to their separation of the physical and virtual interfaces of business with their customers and a lack of overall business process integration.

3.2.1 Lessons from the 'dotcom' Era

The RTE competence is honed over time in a transforming enterprise. RTEs harness the insights and methods of fast responses from various business and systems concepts across various established disciplines ranging from telecommunications to military and engineering as a means of improving business process efficiency. The lessons learnt from the 'dotcom' era are related to changing market conditions and increased responsiveness to customer demands:

- create a variable IT cost structure to expand and contract based on demand;
- reduce capital and labour costs through automation and improved resource deployment;
- create an agile IT infrastructure that changes dynamically in response to business demands (integration);
- improve service levels to correct failures when they happen.

These new knowledgeable solutions paved the evolutionary path for RTE growth in the wake of the 'dotcoms' (Dobrik, Flint & Raskino, 2003).

3.2.2 Integration as a key Approach to Business

The primary focus of the RTE is to speed up business processes. Response times are slashed and the quality of responses is improved (Harris, 2003). This optimization means business processes have to change in the transformational network enterprise to effect:

- efficient resource use;
- lowest cost;
- speediest possible execution.

Business process change is a fundamentally important part of real-time transformation to become not only responsive, but also adaptable to the environment. The enterprise-wide RTE programme calls for lateral thinking and clear communication in the enterprise of the depth and breadth of this change (Bischoff, 2004). Network operations have proved to be imminently suitable to environments that are competitive, mainly because structures and automation follow process design, as it rightfully should (Ambrose & Morello, 2004).

The successful RTE model is rooted in an approach of overarching integration that aims to close the gaps in the business process layers of the enterprise itself, between top management and workers. But it also proceeds externally to connect all the multiple layers it has with other enterprises and meshes these into one single value network (Buytendijk, Raskino & Wood, 2004; Dreyfuss, 2003). It calls for the interconnection of *all* spheres of enterprise activity (McKenna, 1997:106). Barriers are torn down only to be rebuilt while processes are aligned for optimization. In time, all the stakeholders benefit from accessing information, which supports the key decisions of the enterprise (Buytendijk, Raskino & Wood, 2004; Dreyfuss, 2003; Ambrose & Morello, 2004). . In Japan, business already

exemplifies the networking enterprise in operation in environments without boundaries. Here, the competencies of flexibility and adaptability have become the drivers of Japanese organizational competitiveness (Ambrose & Morello, 2004). Time delays and time wastage perceived to exist between demand and delivery, regardless of on-demand pricing, management or billing processes are reduced and cut out to improve business performance (Scardino & Scaldwell, 2003) so that information and data become available at any time and anywhere in the enterprise (Laudon & Laudon, 2002:6) as soon as it enters the system (Gartner, Inc, 2004: 1; Dobrik, Flint & Raskino, 2003). The whole integration process is smoothed over by the alignment of business processes with their methodologies, metrics and systems (Buytendijk, Raskino & Wood, 2004; Dreyfuss, 2003). It is clear that such a total integration approach involves the whole enterprise as it delves deeply past transactional processing through and across business layers to the back-end to solve entrenched business process issues that only impede the free flow of information throughout the enterprise (McKenna, 1997:106).

Business purpose and business value are retained across the boundaries of the enterprise, (Dobrik, Flint & Raskino, 2003; Rabin, 2003:39) during the streamlining of internal and external business processes in the business value chain to increase their response speed (Flint, 2003a) across boundaries (Roberts, 2002). Outsourcing also becomes a real option to increase speed (Flint, 2003c). Examples of business integration or business 'fusion' are Customer Relationship Management, Supply Chain Management (SCM) and Enterprise Resource Planning (Hayward, 2003). The real-time information competency (of flexibility and adaptability) enhances the effectiveness of SCM even further (Aminoff, Aumoro & Punakivi, 2002:519).

IBM and the research group, Gartner, both subscribe to the integration of business processes across enterprise boundaries so that quick responses are enabled to meet, exploit and counter:

- customer demands;
- market opportunities;
- threats in the external environment (Bittman & Scott, 2003).

Table 2 below illustrates IBM'S integration environment. The enterprise identified three key areas in an RTE that will supply the real-time type of information, namely:

- business transformation⁷;
- operating environment⁸;
- flexible financial and delivery offerings⁹ (Bittman & Scott, 2003).

⁷ Business transformation is the need for re-engineering business processes to achieve speed, dynamic business change and the integration of processes in and between enterprises (Bittman & Scott, 2003).

⁸The operating environment is the IT architecture supporting efficient business transformation and financial and utility capacities (Bittman & Scott, 2003).

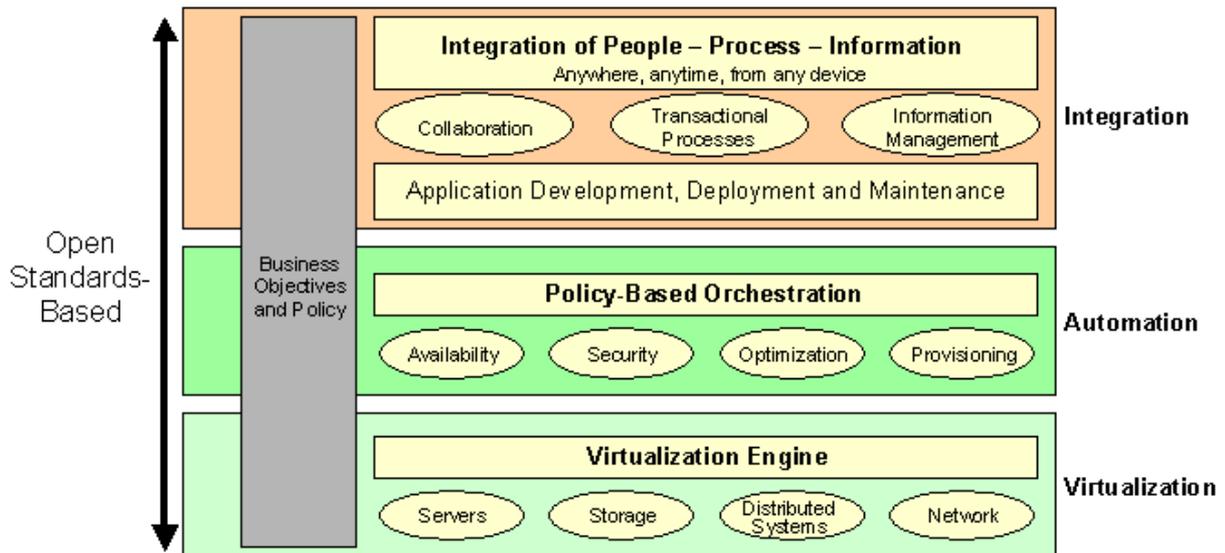


Table 2: IBM's on Demand operating Environment (Bittman & Scott, 2003).

The RTE competency is not exclusive to certain types of industries. Just the opposite is true, considering that even government is included. In fact, it is applicable wherever business has to deal with the combination of demanding customers and volatile environments (Dobrik, Flint & Raskino, 2003). The decision to transform the enterprise is a strategic one and so fundamental that it involves the redesign of the enterprise itself (Laudon & Laudon, 2002:6). Network integration of this magnitude requires not only new technologies as enablers, but also the confidence and exceptional professionalism exhibited by a wide range of supply network partners (Aminoff, Aumoro & Punakivi, 2002:529). The ultimate reward of course lies in the gain of major improvements in efficiency (Govekar, 2002) for business. The only process in the enterprise that will not be facilitated by claiming access to real-time information that was reviewed, selected and prioritized beforehand, is the decision-making process (McGee & Raskino, 2004).

3.2.3 Importance of integrated Information and not Application Flows

Real-time information is not unknown in the world of finance, either. For years it has been used to expedite flows of stocks, currencies and derivatives. But its back-end or settlement processes were neglected and started to lag behind (Roberts, 2002; Scardino & Scaldwell, 2003). This is also applicable to a range of other industries. In the RTE approach, ways are investigated in which all the information flows in an enterprise, including basic real-time transactional data processing, may be optimized and enabled by technology (Roberts, 2002; Scardino & Scaldwell, 2003). A review of enterprise information systems in the past such as enterprise resource planning (ERP) systems, data

⁹ Financial and delivery offerings consist of managed operations, utility services including technological and financial capacities as required (Bittman & Scott, 2003).

warehousing, business intelligence and the evolving technologies of enterprise application integration (EAI) seem to indicate a perceived failure to render the type of support that was required for streamlining business processes specifically (Griffin, 2004; White, 2003). The ERP in particular exhibited its shortcomings in the network economic environment (Aminoff, Auramo & Punakivi, 2002: 521) where a new trend in the approach to integration manifested itself. In a significant shift of focus from application integration to information integration, attention turned to the information contained *inside* these applications to the integration of information flows to support the streamlining, agility and flexibility of the enterprise (Griffin, 2004). The purpose of the RTE competency as shaped over time is to ensure the timely, secure and accurate flow of information *throughout* the enterprise that includes disciplines such as business intelligence, knowledge, collaboration, as well as transactional data flows (Roberts, 2002; Scardino & Scaldwell, 2003). This competency focuses on the flow of information between enterprises. This is generally regarded as a complicated exercise involving changes to management processes to enhance and raise the levels of visibility of real-time information flows. Nonetheless, managing the flow of information has grown to become vitally important, (Auramo, Aminoff & Punakivi, 2002:513,521) especially as it enables all internal and external users to access a common, but still diverse view of data in an integrated and architected environment (Griffin, 2004; White, 2003).

3.2.4 Defining the Role of Technology in a Business Context

The RTE transformation programme comprises business change processes. It should be perceived neither as a cycle of technology refreshment in the enterprise or as a process (Raskino, 2004). Although the RTE is almost completely reliant on technology (Laudon & Laudon, 2002:6) this may be misleading at face value, as the RTE remains a business-focused solution with business purpose and value focus that spans across all business boundaries (Dobrik, Flint & Raskino, 2003; Rabin, 2003:39). A superficial view of the RTE would be one that assumes it is a technology tool used to reduce time-to-market. The RTE does not chase speed to market solutions, at least not with blind-eyed ferocity. Such an assumption would belie its competence to involve the whole enterprise in improving business process efficiency using technology to reduce or eliminate time delays and sheer time waste so that information can flow freely (Dobrik, Flint & Raskino, 2003). The primary support of RTE technology or Real-time Infrastructure (RTI) to enterprise business processes are rendered by:

- responding to warnings emanating from external events;
- reporting results to stakeholders;
- monitoring internal operations (Dobrik, 2001);

Business process integration (Aminoff, Aumoro & Punakivi, 2002:520) in the RTE context is enabled in a context of an emphasis on business purpose and business value that technology enables (Dobrik, Flint & Raskino, 2003). RTI is closely linked to RTE business processes, which it serves to optimize to enable the enterprise to gain major efficiencies (Govekar, 2002).

3.3. Requirements for Transformation to an RTE Model

Some of the characteristics of the RTE model are its virtual matrixed teams, its flexibility, ability to adapt and the competitive means to respond immediately to threats or opportunities in its environment (Bell, 2004). Before embarking on a difficult and expensive transformation programme of projects¹⁰ (Dobrik, 2001; McKenna, 1997:130), businesses will have to know what the advantages and disadvantages are of real-time transformation. Business stakeholders need to understand where the value lies before implementing any new approach, not just the RTE (Perrey [*et al.*], 2004:143). Faster or better decisions cannot necessarily be expected of workers who are supplied with real-time information. Instead of solutions, it may even create more problems (Rozwell, 2001). The holistic infrastructure model provides collaboration and connectivity to support its adaptive ability to the environment. Its primary structure resembles that of the modular organization (Bell, 2004).

Whoever makes the strategic decision to proceed, will know that real-time information access may have an effect on the competitive balance of the industry. In the enterprise, it may exert a different effect on its routine and exceptions, its internal and external environments and on various other parts of the business. Once the strategic business decision *is* made, the next challenge will be to develop a suitable business model for the implementation of an overall business strategy. The model implies fundamental strategic change that will involve the restructuring of the entire business (Andal-Ancion Cartwright & Yip, 2003:35-37, 41; Dobrik, 2001). The RTE strategy involves:

- reduction of delays in operations;
- managerial reporting periods are shortened;
- delays in periodic report completion is removed;
- model-based warnings are implemented;
- enhanced frequency of shareholder reporting.

RTE strategic implementation involves the five steps listed below as an indication of what is at stake for an enterprise intent on deriving such value.

Step 1: Identify no more than seven critically important business processes across the supply chain externally from suppliers to customers (not all business processes are suitable) such as planning, budgeting, sourcing workflow, financial and change management (Gerrard & Bell, 2004; Roberts, 2002) and identify certain key roles that dovetail with the key business processes (Gerrard & Bell, 2004);

Step 2: Calculate individual total process costs.

Step 3: Measure the amount of time taken for workflows through each process.

¹⁰ The RTE is a series of different projects in an overall RTE programme that removes delays in processes and should not be seen as a single process of behemoth proportions (Flint, 2001).

Step 4: Evaluate the potential for a dramatic increase in process speed.

Step 5: Rank the identified processes according to value of opportunity and how easy it will be to start the process (Roberts, 2002). (Appendix A).

3.3.1 Corporate Governance and legal Compliance Demands for real-time Reporting

Governance is a critically important mechanism to assign decision rights and to create a framework for accountability to ensure the outcome of desirable behaviour. Among others, governance clarifies the role and responsibilities of key stakeholders. The complexity involved in the fast deployment of workers to address environmental change requires a clear and strong direction from a governance point of view. It defines the boundaries and enterprise context within which teams can operate collaboratively and effectively (Bell, 2004). It frees the enterprise from inflexible reporting structures along with the ability to prioritize work tasks in time and responsively (Gerrard & Bell, 2004). External to the enterprise, multiple partners in a value network will need to establish common governance rules among them to depict the responsibilities of each in the value chain. The RTE requires an immediate response to every event without causing time delays to determine accountability. Such a collaborative approach would be applicable to both process design and process management (Dreyfuss, 2003a).

Legally, the US Securities and Exchange Commission demands public disclosure of material business events within four days in terms of the US Public Company Accounting Reform and Investor Protection Act of 2002 (Sarbanes-Oxley Act), Section 409 (Fynn, [et al.], 2004). The Sarbanes-Oxley Act of 2002 goes one step further in requiring real-time information disclosure per se from US enterprises (McGee & Raskino, 2004).

3.3.2 Worker Requirements for the RTE Transformation

Employees need to understand the direction a RTE takes, what the process is and ways in which it will impact them. Workers in these environments cannot execute the businesses processes of the RTE without understanding the flow, density, security and timing of information. Clarity of business purpose and an agile ability to execute go hand in hand in the RTE. The supporting culture will change itself and evolve into one that will embrace change by supporting the transformation of the entire enterprise (Alter, 2003:63; Flint, 2001; Buchanan, 2002).

People create the RTE, more so than does the use of technology. Shaping the culture and behaviour of workers to work with real-time information is regarded as more challenging than the actual provision of real-time information itself. As a result, the RTE attends to individual change, as well as enterprise change (Rozwell, 2001).

It needs to ask three pertinent questions during the RTE transformation of its workers, namely:

- Are they aware of the pending changes and the impact it will have?
- Will they be able to respond to widely varying business conditions?
- Will they be able to work efficiently and effectively during changing conditions (Ambrose & Morello, 2004)?

Working with real-time information requires a focus and concentration from workers, which may lead to complications. One possible solution is a daily work rotation between high and low intensity work (Rozwell, 2001). In an agile network enterprise, workers display competencies that embrace technology as much as they embrace the business and behaviour. Workers need to exhibit behaviours, which are self-sufficient, customer focused, commercially oriented, patient, relationship conscious and strategically minded (Ambrose & Morello, 2004). Their skills and leadership, negotiation expertise, resource management and change readiness are required to find common goals and solutions during the estimated three to ten years it takes for RTE principles to take root, before even the benefits of cost reduction, responsiveness, agility and improved service quality will become noticeable (Bittman & Scott, 2003; Roberts, 2002; Ambrose & Morello, 2004).

3.3.3 Leadership and Management

In an IBM survey conducted in 2003, CEOs expressed their need for RTE information to respond to market dynamics and increased competition (McGee & Raskino, 2004). They would need to learn to trust automated systems apart from having to empower the people who report to them (Flint, 2001). Executives also need to bear in mind that real-time information does not obviate the continued need for strategizing and planning. They should not become enmeshed in operational issues. Those problems should be dealt with by workers who are skilled to do so with a clear escalation path when escalation becomes unavoidable (Buitendijk, 2002).

Leadership skills are becoming increasingly relevant to real-time business effectiveness in a real-time business environment. Managers have to build an environment in which to foster trust, accountability and empowerment, so that all workers are enabled to take the initiative and are enabled to perform at their best (Rozwell, 2001). Workers become part of decentralized decision-making work in an autonomous, but also a collaborative way with other workers in what may be labeled dichotomous relationships (Bell & Gerrard, 2004; Ambrose & Morello, 2004). This includes management.

The most successful businesses have top executives who are humble and optimistic (Sutcliffe & Weber, 2003:6). It is clear that an old-fashioned hierarchical reliance on job titles and rank in this environment has become wholly inappropriate (Bell & Gerrard, 2004; Bell, 2004). Managers and leaders will no longer supervise, but will lead processes, teams and projects (Ambrose & Morello, 2004). In this regard, the RTE is better suited to managers with a participatory, rather than a command-and-control style (Rozwell, 2001). It is also incumbent on managers to encourage workers

to collaborate and share information that will support informed decision-making (Rozwell, 2001). In the RTE context specifically, management has to overcome certain personal challenges before embarking on the initiative, namely:

- executive arrogance (need to be accepting of their own mistakes and listen to others);
- time indifference (need to believe that time is a valuable resource);
- agreement (not all decisions need to be taken by consensus);
- bureaucracy (reduce complexity of processes);
- technical purism (use appropriate technological support) (Flint, 2004c).

The dynamism of real-time operations, based on roles and not positions, requires a dynamic management tool, the virtual matrix. Managerial relationships with workers are visible in matrices used as management tools to aggregate workers in workgroups which share a common purpose, business processes, tools and knowledge in fulfillment of their role, not their position (Bell & Gerrard, 2004). This management tool is able to make visible the 'organic' workflows along various channels to which it can sense and respond. It can be constructed and deconstructed at will, is diverse and emphasizes collaboration. The most important proviso for its success is profound leadership with a clear purpose and strong vision to direct the enterprise (Bell, 2004). Overall, enterprises need to create a management culture that will support the values required to work in a real-time environment (Flint, 2004c).

3.3.4 Underlying Real-time Infrastructure (RTI)

The real-time infrastructure (RTI) is a prerequisite for creating a real-time enterprise. This technological infrastructure is shared by customers, business and applications alike (Bittman & Scott, 2003). It can expand and contract in rapid response to new and rapidly changing business requirements where the key word is integration. Integration in this sense equals the connection of processes, people and the information they need in a way that is as secure, dynamic and simple as possible to enable rapid business changes (Bittman, 2003). But integration is inordinately difficult to accomplish, not least because of the development of disparate systems and technologies over time (Reddy & Reddy, 2002: 7). If integration, communication and information management technologies can be utilized, together with real-time intra- and inter-enterprise process support applications (Dobrik, Flint & Raskino, 2003;), the following RTI capabilities will be created:

- shared technological resources versus disparate application in isolation so that many resources are used as one and one resource used as many;
- technological resources automatically allocated as determined by business priorities;
- predictable service levels amid a volatile demand for technological services (Bittman, 2003).

The measurement of these rapid responsive capabilities is equally important to having and implementing them. RTI technologies therefore need to measure the response times and the availability for application transactions accurately across a distributed computer network infrastructure to render instrumentation in the RTE successful. Application Programming Interfaces (API) may be used in the RTI as valuable metrics to identify bottlenecks and to speed up business processes. These types of metrics contribute to business performance by:

- measuring transaction counts;
- establishing end-user response times;
- identifying and analyzing problems very quickly;
- determining end-user performance degradation in an active way;
- measuring business transactional timing to improve business processes.

Based on the *business* of the RTE, not its technology, these metrics will support the planning capacity of the RTI, establishing a close relationship between business systems and business itself in the process (Govekar, 2002). These filters should be carefully built to avoid a flood of alerts that may cause executives to distrust their workers. Alternatively, the danger of ignoring them is also very real (Buitendijk, 2002).

The importance of portal technology should not be diminished in the RTE. Here, it acts specifically to benefit the RTE by:

- aggregating content into repositories;
- enabling fast searches using search engines;
- facilitating data and information access through integration technology;
- integrating access and authorization (and rapidity) with single sign-on;
- enabling varying degrees of management and administration;
- supporting collaboration mechanisms.

In broad terms, portals greatly enhance the RTE by providing the mechanism for information delivery to workers, creating a broader synergy with existing RTE initiatives by breaking down stovepipes systems application. More importantly, portals and the RTE have more in common than technology only. They are also connected by virtue of skills, governance and implementation (Phifer & Valdes, 2002).

Some main challenges remain for the RTI, though. Among them, process redesign, application integration and the understanding required to assess the potential of new information technologies that could deliver technologically enabled accelerated business processes to the RTE (Flint, 2003a). At least, in the current era, it seems as if the potential of technology is finally understood (Castells, 2000:257).

3.4. Effect of Speed on the knowing Cycle¹¹ in the RTE

The information culture of the RTE is one in which action is encouraged in real time with the support of management. Workers have clear Key Performance Indicators (KPI) to guide their use of real-time information and importantly, real-time information is made accessible in the desired format, in context and in a timely and accurate way (Rozwell, 2001). It is in this context that the principle of bounded rationality assumes new meaning. The question is whether the transformation process into the RTE adds or detracts from the limited capacity of the human mind to solve complex problems. 'Limited', compared with problems whose solutions are required for rational behaviour in the real world. Would workers still settle for satisfactory courses of action and continue to simplify the real world in the real-time environment? These questions are pertinent given that an enterprise (as an organizational entity) can alter the limits of rationality of its workers by either creating or changing the environment in which decision-making takes place. The enterprise does not control the decision itself, but controls the decision premises on which decisions are based. Still, the environment will be designed to enable the individual to attain rationality in decision-making as closely as possible based on the goals of the enterprise (Choo, 1991). In the RTE, specifications have to be made clear on who in the enterprise will receive what level of pre-selected information and what decisions they would be delegated to make (Rozwell, 2001).

3.4.1 Sense-making

The rapidity of 'sense and control' systems of the RTE outperforms static business control models and decision-making rules (Parkinson, 2003:21). The more 'sense and respond' and 'learn and adapt' is built into an RTE, the more the business will be changing itself over time (Meyer, 2002:57) to correspond with the way the business works (self-structuring). Gartner's definition of the RTE highlights this sense and response approach. It monitors, captures and analyzes events critical to its success the instant they occur, but it responds by identifying new opportunities, avoiding mishaps and reducing delays in the core business processes of the enterprise. It exploits the information to progressively remove delays in the management and execution of its critical business processes.' The strong emphasis is on preventing surprises in the environment. Gartner proposes that natural, man-made and business surprises have warning signs that can be detected beforehand, leading this research group to conclude that unpleasant surprises may in fact be reduced or altogether avoided if detected and acted on in time. Response in real-time does not seem to be as important as identifying threats upfront before they happen, a competency referred to as 'real-time early detection' (McGee, 2004; Hayward, 2003).

¹¹ Knowing cycle consists of sense-making, decision-making and knowledge creation. It is also referred to as strategic information management (Choo, 1998:18).

3.4.2 Knowledge Creation

In most industries, value is added in the form of knowledge (Berawi, 2004:427). Some regard knowledge as the greatest asset of an enterprise (Arora, 2002: 240). It enables an enterprise to adapt to changes quickly to create a competitive edge in order to survive its competition (Harris, 2001). Rapidity is essential to real-time knowledge creation (Lang, 2001:544) as exemplified by the 1990's, when speed became critically important to the microelectronics industry and custom-design was deemed essential (Castells, 2000:258-259; Cirotto & Youssef, 2003: 394).

The management of knowledge is regarded as such a critically important component of the RTE that it is estimated that two-thirds of all RTEs successfully implemented by 2006, will also have a Knowledge Management discipline (Harris, 2001). The four favourable conditions for enabling KM in the RTE are as follows:

- identification and linking of decision-makers and experts to business processes;
- fast distribution of and easy access to information flows to decision-makers;
- provision of collaboration spaces for analyses of information, collaboration and coordinating work;
- collaboration tools to enable network connections (Harris, 2001).

The last condition illustrates the importance of the application of RTE technology in enabling innovation in business operations across a whole enterprise (Raskino, 2004). This does not in any way detract from the importance of interactive communication by face-to-face discussions, which remain the precondition for innovation and knowledge creation (Aminoff, Auramo & Punakivi, 2002:516; Lang, 2001:544) in any enterprise. In RTE KM, human collaboration is a focus area. The successful RTE KM initiative is dependant on the quality of tacit knowledge sharing and face-to-face collaboration among employees. This is the *real focus* of KM in the RTE (Harris, 2001). Knowledge work therefore remains dominated by communication as part of the social nature of the workplace where tacit knowledge is created (Lang, 2001:544).

With reference to decision-makers, they should be able to interact with other relevant content and workers for the purpose of meeting to analyze information, to make an appropriate decision and most importantly, to take action. But RTE managers, who possess the knowledge necessary to distinguish between the relevant and the trivial and whose intangible knowledge already encapsulates the best understanding among all the workers of the business in the enterprise, still need to acquire a broader understanding of KM in their capacity as decision-makers in the RTE (Harris, 2001).

The immediacy of the real-time environment impacts on the KM role that coordinates enterprise activities (Harris, 2001). It defines the *pace* required by KM to synchronize its activities. This sets the stage for KM to become a key enabler to leverage the RTE principle further in the enterprise. It even becomes possible to make knowledge available *on demand* to suit the specific needs of users (Fuka & Hanka, 2000:280-281). By inference only in a RTE context, one can assume that it is also applied in the RTE *without delay* to create *new* knowledge (Castells, 2000:17). In terms of the four RTE favourable KM conditions mentioned earlier, each can be related to the application of knowledge in turn by:

- signaling which processes use identified information and knowledge relevant to the event in question;
- resolutions processes rely on KM to identify people whom to collaborate with to analyze and resolve the event, ways of interpreting the analysis and ways in which to implement the resolution. Knowledge processes and knowledge content will support the analyst in the resolution. When automated, the knowledge will be derived from a codified knowledge database;
- response processes will involve testing the validity or quality of the response. If accepted, the results of the response will be used to update the real-time management processes in anticipation of future occurrences.

On the human or worker side, the reuse of experiences will result in the enhanced ability of the RTE to have a speedier and more complete response to similar events in future by decreasing the time it takes to make a quality decision. Their tacit knowledge is integrated into processes to support future decision-making. Meanwhile, knowledge in the form of codified knowledge is displayed overtly as rules and decision data and is updated simultaneously to support the automated systems responses of the RTE (Harris, 2003).

The RTE requires a series of management disciplines, not only KM. It is imperative therefore that all knowledge initiatives should be carefully aligned with the enterprise vision as it coexists with other management disciplines, namely Business Intelligence (BI), business process management and collaboration. This is a means of defining a work ethic and to distribute knowledge as widely as possible in the enterprise, to people, across networks and integrated into (systems) technologies. The overall RTE strategy will guide both the identification of the most relevant knowledge resident in the enterprise and the relationships between the various knowledge sources (Harris, 2001).

3.4.3 Superior Decision-making closest to the Action

Informed decision-making that is geared toward the profitability of the enterprise is another hallmark of the RTE (McGee & Raskino, 2004). What it requires is a speeded-up decision-making process to synchronize with the pace of real-time processes (Fuka & Hanka, 2000:280-281) of the RTE.

The pro-active identification of decision-makers and experts becomes a crucial means of linking these workers to business processes as part of the knowledge process or the knowledge cycle. This will allow for the fast flow of real-time information emanating from real-time reports, monitoring and alerts for delivery to appropriate workers as quickly as possible (Harris, 2001).

Contrary to expectations perhaps, complexity and risk are not reduced in the RTE. Decision-making still depends on the degree of difficulty and risk. The RTE approach to decision-making is two-fold: automation and decentralization. Workers lower down in the enterprise that are near the action are given more decision-making authority. It is foreseen that RTE workers will make increasingly complex decisions at a higher level of risk (and complexity), as automation continues to subsume the lower risk and easier decisions (Ambrose & Morello, 2004). Decision engines are already vitally important in the RTE to automate certain decisions related to loan approvals and rating risks.

Processes may also be redesigned to hasten the decision-making cycle (Rozwell, 2001). This will only be effective when the lowest number of organizational layers possible remain between decision-makers and the actual event (Buytendijk, Raskino & Wood, 2004; Raskino, 2004). Reduction of organizational layering as a RTE requirement may be a factor in the ongoing decentralization of decision-making lower into its managerial structures, this despite the deepening involvement of top management at an operational level. In Figure 1 below, an indication is given of the relationship between the various decision-making authorities in a hierarchical business model compared to the RTE decision-making model.

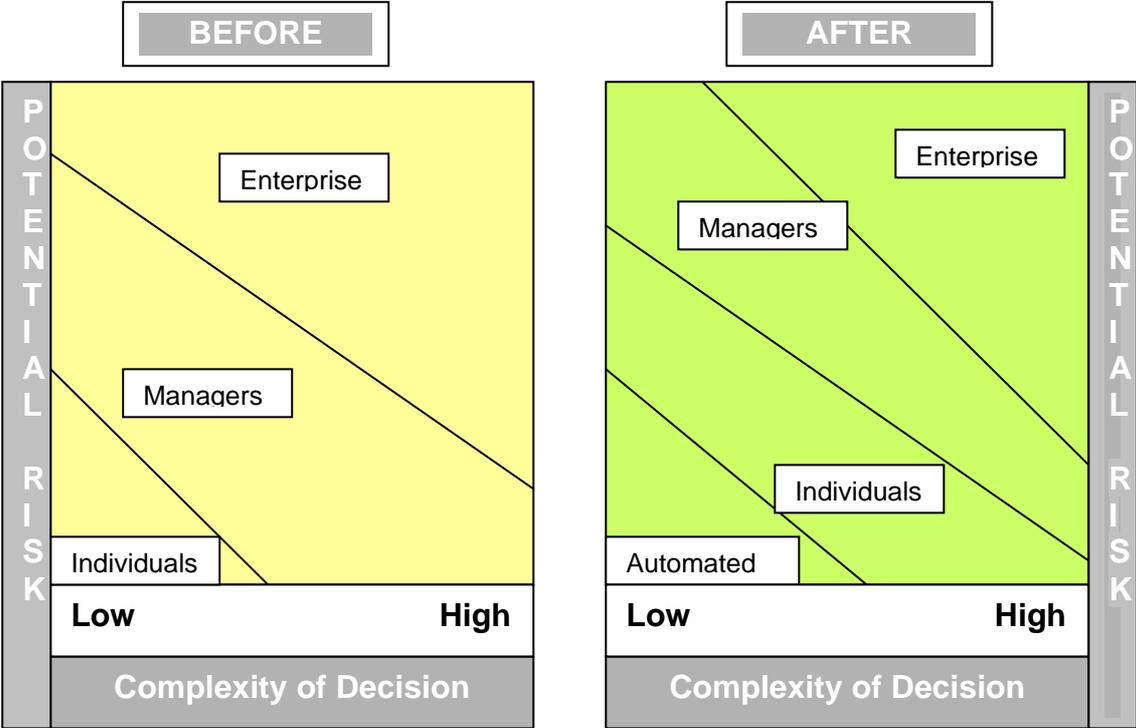


Figure 1: Decision-making before and after real-time information became available (Rozwell, 1991).

Seemingly among the first to write about such operational involvement by top management were Bengt Holstrom, Professor of Economics, Finance and Accounting at the MIT Sloan School of Management, Professor R. Rajan from the University of Chicago Graduate School of Business and Professor Julie Wulff from the Wharton School of Business at the University of Pennsylvania (Ellis, 2003:5). Phil Condit, Chairman and CEO of the Boeing Company in Seattle (USA) confirmed their observations. Thomas Kochan and Richard Schmalensee from the MIT Sloan School of Management (as quoted in MIT Sloan Management Review, 2003:1) quoted Condit as saying that those closest to the action (using instant messaging to meet and take decisions in real-time, for example), would make the superior decisions in a network-centric enterprise. Paulo Costa, the President and CEO of Novartis Pharmaceuticals USA, agreed. In fact, the implementation of strategy involving senior executives in the USA can be traced back fifteen years to the late 1980's (Ellis, 2003:5). Alternatively, real-time solutions could be pushed to a CEO's desk in the form of a real-time management cockpit or a dashboard similar to General Electric's displays to senior management of information pertinent to decision support (Raskino, 2004).

Viewed holistically, it is entirely possible for an enterprise that can reform or restructure itself to enable the establishment of a network of 'multi-functional decision-making' nodes to foster a superior form of decision-making (Castells, 2000:178). In practice, instant messaging could become such a node where real-time decisions are taken (Flint, 2003a). Cognizance should be taken of the correlation between the amount of information (delivered with speed in the RTE) and the amount needed in the RTE decision-making process. Theoretically, available information will only improve decision-making to an optimal point and no further. If additional information is received stretching beyond this point, the quality of decision-making will actually decline.

Access to real-time information is still no absolute guarantee of improved decision-making quality. The simple reason for this is that users will continue to incorporate information, real-time or otherwise, into their decisions *regardless of its relevance*. Less important information is filtered out once enterprises start focusing on value-adding information (McWhorter, 2003:23). The RTE prioritizes and selects only information and events for real-time processing anyway, as not all information is deemed suitable for real-time processing (Fenn, *et al.*, 2004; McGee & Raskino, 2004). Given the human factor, real-time decision-making cannot be equated automatically with faster and better decision-making (Rozwell, 2001).

The RTE distinguishes upfront in the first stage of progressive RTE transformation what the important information is and what is not important. In this way, the most critically important real-time process information is pre-selected (Rozwell, 2001; McGee, 2004) to facilitate decision-making by rooting out the volumes of seemingly unimportant information in a particular process.

3.5. Ignoring the RTE Option

The strategic decision whether to start the time-based transformation to an RTE should be weighed against the option of continued inaction, given all the indicators of events that point in the direction of RTE development. A Gartner research project on the RTE environment discovered that:

- Prior warnings pre-empt business surprises;
- Very little information in real-time is used to uncover opportunities and avoid unpleasant business surprises;
- RTE champions will always have a feeling of coming events ('epiphany').
- CEOs desire real-time information (McGee, 2004).

In an inactive state, the traditional enterprise will remain a bastion fortified by an internal hierarchy and a command-and-control approach with external information flows that are moderated (Roberts, 2002). In this state, it will remain unable to react to market changes and opt to become a niche player instead (Dreyfuss, 2003a). Remaining as a traditional, hierarchical enterprise, it will continue to contend with familiar problems, among which will be:

- flawed reordering and delivery;
- lagging behind competitors;
- ignorance of financial status of customers;
- little negotiating power with external stakeholders;
- managing work in silo's (instead of leveraging expertise elsewhere in enterprise);
- levels of ascending authority;
- clearly defined enterprise boundaries between internal and external environments (preserving insularity);
- pre-defined set descriptions of work roles, responsibilities and workflows (inhibiting initiative and action);
- sub-optimum production and service levels.

The most pertinent risk in the list above is the potential need to redo work already done when the suitable information does become available eventually (Roberts, 2002). Another result of inaction is the noticeable growing misalignment between the volatility of the real-time business environment and the rigidity of authoritative hierarchical structures. This will make it very difficult for them to respond appropriately to trend shifts and exceptional market events (Raskino, 2004). In all fairness, factors such as the complexity, cost, time and sheer daunting scope of balancing internal supply chains have to be taken into consideration as mitigating factors to stall a RTE transformation, especially when these are operating beyond enterprise boundaries with external stakeholders (Rabin, 2003: 41-42). Sometimes, enterprises simply need to embark on chaotic new business ventures, as their strategy has to match the chaos of their business environment to increase their chances of keeping up with the relentless pace of change. If not, they may face the serious consequences of their conservatism.

Some regard this approach as the tragic flaw of big enterprises. In the eighties for example, more than 40 percent of the enterprises listed on the Fortune 500 enterprises crashed due to environmental forces, whereas enterprises which took the plunge to transform them, reaped the rewards. One example is Citicorp's indiscriminate extension of credit across the US with MasterCard which was another way of successfully realizing the vision of the bank to extend itself nationally against all odds (Peters,1990).

Meanwhile, enterprises *do* seem to be moving away from a hierarchical enterprise approach to business (Bell & Gerrard, 2004). It is an evolutionary business response in terms of speed and scope (Hayward, 2003) to competition and time acceleration viewed as economic realities that impose new technologies and new rules on them. Some, no doubt, are irresistibly attracted to the lure of coordinated operational efficiency, reduced costs and effective planning provided by the RTE (Meyer, 2002:55, 60; Rabin, 2003:41). The rest however who purposefully choose not to follow the rules of the new economy will simply be phased out of it (Castells, 2000:94).

Chapter 4

Is the RTE sacrificing Value for Speed to gain Profitability?

4.1. Conceptual Values of Information and Profitability

In the new global networked economy in which capitalism prevails, value is derived from the combination of information technology with the technology of information (Castells, 2000:160, 259-260). It has become necessary to determine which systems behaviours add value to the enterprise because business is increasingly reliant on technology for its value-adding behaviour (Perrey *[et al.]*, 2004: 143). While business stakeholders need to understand the underlying value of any new considered approaches, technology models have to be more explicit in illustrating business value. It is accepted that due to issues surrounding value measurements for systems behaviour, the identification of value-adding activities in the enterprise will be flawed at the outset. Regrettably, it is regarded as an additional activity and an unacceptable overhead. It is possible notwithstanding to deduct value from the reasons why a solution was built, rather than from what was actually built. In this way, an alignment (or lack of it) can be made between systems behaviour with the strategic goals of the business to determine its value (Perrey *[et al.]*, 2004: 143).

The responsibility framework of the following roles highlights the meaning of value in a production process organized around information technology, regardless of goods or services:

- Executive managers (commanders): strategic planning and decision-making;
- Researchers: product and process innovation;
- Designers: innovative preparation and targeting;
- Integrators: managing relationships between design, innovation, decisions and production in the context of the enterprise ability to achieve its goals;
- Operators: autonomous understanding and fulfillment of tasks;
- Managed employees: fulfillment of tasks that cannot be automated (Lang, 2001:547).

To understand value making better, the framework above has to be combined with the need and the capacity of both the performer and the task itself to connect with other employees and tasks in real-time, inside and outside the network enterprise. At times, this framework combines with the decision and relation-making frameworks of the network enterprise to create its value (Castells, 2000:160, 259-260). Since value and competencies are connected, it is possible to identify where value is added in an enterprise by:

- analyzing value chains;
- core competency analysis;
- competitor analysis;

- value management;
- value analysis.

In 'value analysis' (mentioned directly above), the focus is directed at the improvement of product quality instead of calculating its cost to the end consumer. It is significant though that the *customer is the only decisive factor to determine what constitutes the value of a product*. Customers interpret value as a combination of cost and price, but heavily influenced by their perception of a product or a service. It is of paramount importance to satisfy customer expectations. It is regarded as the most important factor to establish customer-perceived value (Perrey [et al.], 2004: 143-145; Lang, 2001:547).

As value transcends operational efficiency, profitability does not even feature as an element of a customer-focused business culture. The rationale is that profitability will flow anyway from superior performance based on customer value (Lang, 2001:547). But value through profitable growth can only be created through innovation (Prahalad & Ramaswamy, 2003:12; Castells, 2000:258). The underlying principle seems uncontested: the sole reason for the existence of any enterprise is the *creation of customer value* (Lang, 2001:547).

4.2. Value-adding Focus of the RTE

The real value of the RTE needs to be investigated. Its value is said to lie in its flexible adaptation of existing enterprise and legacy systems in support of the information and messaging needs of the enterprise (Rabin, 2003:37). It enables businesses to detect business opportunities and avoid surprises, as the data, information and the warnings that pre-empt these are already in existence (McGee, 2004). The main goal of the RTE is the time-based and progressive, holistic transformation process of the enterprise that never stops. More specifically, it concerns itself with two intertwined sub-processes. Firstly, a process to reduce elapsed time to maximize business processes and one intent on the extension of the capabilities of the business. Information is supplied quickly to decision-makers where it is needed to change their planning focus from a past-orientation to a current and even a future one. This increases business transparency and improves top management's decision-making capability.

Value can be added to the enterprise in the long run when time and materials wastage is cut by acting on early warnings of movements detected in the competitor landscape that signals changing demands or competitor actions. Improved efficiencies will then be reflected in improved products and services (Dobrik, 2001; Dobrik, Flint & Raskino, 2003; Rozwell, 2001). The focus on slashing and eliminating time-wasting practices from the system serves to combine activities previously dependent on disparate systems for delivery (Hayward, 2003). These can then be visibly monitored and manipulated at management and operational level, alike.

The RTE does not only concern itself with the delivery of specialized real-time operational systems as found in real-time airline systems, other booking systems, utilities, transactional processing or real-time power station or rail monitoring. The RTE competency is renowned for delving deeply into the enterprise to tighten back-end customer service processes to eliminate time-wastage in processes at source (Hayward, 2003; Dobrik, Flint & Raskino, 2003). Business process fusion is the next stage in the way in which business applications are developed, delivered and deployed to achieve business value. It represents a significant discontinuity in IT and the value that it can deliver to the business. Only those enterprises that recognize this discontinuity will be positioned to achieve a new order of value from their IT investments (Hayward, 2003). Although it is difficult and expensive to create an RTE, it is an essential investment with real benefits (McKenna, 1997:130; Parkinson, 2003: 21).

The key 'value propositions' of the RTE are seen to be the following:

- cost reduction as the overall top benefit of rapid response followed by increased profitability (Alter, 2003:61) as a result of improved resource deployment, reduced staff component, visibility, control, reduced material waste and automation;
- improvement of service levels achieved by adjustments and/ customization of technological services;
- improved customer satisfaction levels through responsiveness and faster real-time customer service e.g.;
- improved overall efficiency and business transparency;
- heightened agility resulting from early warning signals leading to fast responses to provide new competitive products, customer services and/resources;
- more frequent reporting of financial results;
- scaling of existing services (Bittman & Scott, 2003; Dobrik, Flint & Raskino, 2003);
- exploitation of market opportunities presented by the networked economy;
- lower inventories and cash flow requirements;
- timely, secure, validated and accurate data and information flows (Roberts, 2000).
- enhanced flexibility and openness in Government budgeting and improvements to their customer service levels (Bittman & Scott, 2003; Dobrik, Flint & Raskino, 2003; Dobrik, 2001).
- increased profitability;
- operational performance and reduced lead times;
- improved productivity;
- sustainable competitive advantage (Goldenberg, 2003:39; Alter, 2003:61);
- enhanced decision-making as a selection is made of data and information that should be tracked enabling a focus on relevant information amid too much that is available (McGee, 2004).
- provision of timely and appropriate information that is actionable (available when needed) (Rozwell, 2001).

These timesaving benefits are then applied to the improvement of various existing implementation strategies across the enterprise, so that CEOs and line management are able to share the benefit of access to real-time information. This is also referred to as the 'enterprise logic' (Castells, 2000:164).

At a worker level, value is derived from a real-time capability that may contradict the conclusion of a worker who regards a task as 'completed'. Real-time systems may force employees to rethink a process. This ability strips away any guises of business performance by presenting management with the reality of a situation (close to the event). In this way, provision is made for prescient management with updated key business indicators, to alert managers to problems or defective operations long before a surprise surfaces (McKenna, 1997:118; Raskino, 2004).

4.2.1 Foregoing Speed to create Value

Workers need to find a balance between effectiveness¹² and efficiency¹³, which may become an exercise in complexity. Interdependent tasks and standardization are viewed as 'efficient' in terms of leanness (lean production or LS) only, but does not necessarily support the quest for agility (Ciroto & Youssef, 2003:390) or by inference only, 'efficiency'. The ability to detect *alertly* and process information *flexibly* has to be combined with *appropriate* reactions. Neither overreaction nor neglect will be appropriate. Managers especially, would do well to cultivate this ability to balance the stakes (Rozwell, 2001). The combination of effective efficiency is found in operational processing, as well as on the business side of RTE in its processes where effectiveness and efficiency are combined to create deep-rooted value for an RTE.

The RTE value proposition in the context of speed is seen to be the:

- replacement of static control models by dynamic control (assets are optimized);
- enrichment and consistency of customer interactions (same set of information is used in all customer interactions);
- steady improvement of decision quality (previous decisions are recorded and measured against their outcomes for improvement);
- higher levels of worker production (access to better quality information with a focus on only critically important information relevant to the enterprise).

Quick responses to competitor moves do not always translate into greater benefits. Businesses would do better to fight a strategic war on the competitive front. They need to forego a mindset of whoever is first to market wins the battle than live to regret a hasty decision simply because real-time information was available (Griffin, 2004:16). Taking wrong decisions and actions taken in haste may bind the enterprise to certain actions it may lead to regret in time (Lansiti, McFarlane & Westerman, 2003:58).

¹² Accomplishment is an achievement (Fowler & Fowler, 1970:389).

¹³ Competent or capable (Fowler & Fowler, 1970:389).

The Red Queen effect of running faster simply to stay in one place, but remain in the race may be eliminated *to a degree* in the RTE through the prior detection and correction of errors by sensing the competitive landscape more intelligently (Hayward, 2003;Dobrik, 2001).

More RTE real value resides in its ability to:

- accelerate or decelerate product and profitability cycles;
- flexible cross-functional resource application as and when required;
- time lag controls of technology availability versus competitors;
- manage time as a resource (Castells, 2000:468).

Sometimes, even under optimum RTE conditions, enterprises can still fail to make sense of their environment. It follows that effective real monitoring of internal events does not translate automatically into meaningful real-time information of the business environment. Businesses would have to discover their own drumbeat in the inter-relationship between itself, the industry and related activities as a means of determining ways of creating their own value (Dobrik, 2001).

4.2.2 Do Shortcuts add Value in the RTE?

Risks related to value creation in the RTE, involve the flow of information in a flat structure. Even though the RTE is compacted vertically, it has also expanded laterally, so that the meaning of information may still be lost in the horizontally wide expanse of the RTE. Although the loss of the middle management layer has enhanced effective information flows, it still runs the risk of a reduction in efficiency rates when human interpretation cannot be supplied. Another risk is one of too much autonomy dispersed in the enterprise. Superior information management therefore, will continue to remain important (Metz, 2004:36) even in the RTE.

4.2.3. Competitive Advantage

The ability to adapt to market demand and technology is the foundation of the competitiveness of the RTE (Castells, 2000:468). Not only does it activate error detection and correction before problems surface, but its responsiveness is heightened to achieve new levels of agility, flexibility and adaptability (Hayward, 2003). The competency of the RTE to sense and respond to market events gives rise to competitive adaptations in the short run that replace long-term scenario planning (Raskino, 2004). Should more 'sense and respond' capabilities be built into the RTE to learn and adapt to the way the business really works, it will increase its chances of self-restructuring. This will lead the business to change itself over time (Meyer, 2002:57). This ability is completely in line with a systemic perspective on business in which one part shapes the others in an organized and self-organizing way (Leibold [*et al.*], 2002, 135).

The adoption of the so-called 'critical path method' enables the identification of time bottlenecks in the transportation network that can be eradicated step by step (Dreyfuss, 2002) or simply be circumvented. It becomes possible to access schedules that are in progress to determine a real-time status, followed by an appropriate action (McKenna, 1997:118; Raskino, 2004). This is significant in view of seasonal market trends that are at odds with traditional manufacturing trends based largely on stability. The true benefits of built-to-order that requires real-time information flows will only be realized once demand and capacity management are coordinated to achieve the optimization of the whole system (Waller, 2004:11,18). Streamlined business processes can then be linked to form seamless chains to operate at the same time. In other words, enterprise-wide business processes could be optimized end-to-end through the creation of 'straight through processing' to remove bottlenecks and constraints (Raskino, 2004).

By looking beyond the immediacy of RTE benefits, its value is seen to be dispersed in an application to create product mixes presented to customers, customized pricing, capacity management in manufacturing and logistics. Even though RTE principles are embedded and are indispensable in fighter aircraft, its rapid response ability extends for example to the control of flight surfaces to enhance the performance of the aircraft (Parkinson, 2003:21-22). In the same vein, customer-driven stockless order supply is seen as a pressing challenge (Waller, 2004:10). If real-time information is used pro-actively to supply customers without inventory it could lead to a potential increase in sales, a reallocation of resources and the best prices to be offered to customers at certain times (Meyer, 2002:57). In addition, workers who are closest to customers will derive a high benefit from the availability of real-time information by means of wireless technology (Rozwell, 2001). Real-time dynamic pricing could be supplied to customers based on a fast analysis of sales data and accelerated changes in pricing (Raskino, 2004). In short, supply and demand in the competitive market is therefore best served by the provision of updated, real-time information (Waller, 2004:10).

4.3 RTE and monetary Value

Gartner research group contends that enterprises applying RTE principles with a focus on time-based transformation, could expect an improvement in profitability rates by as much as fifteen to twenty-five per cent. Money may be made or saved by paying attention to improved supplier management by a reduction of goods in transit or in a warehouse, by more accurate supply chain demand forecasting and by a reduction in internal expenses by avoiding rework when suitable information eventually becomes available (Dobrik, Flint & Raskino, 2003). The initial yields of a semiconductor manufacturer increased by twenty-eight percent while its mature yields increased by five percent. It could eventually save \$100 million over the life cycle of the product (Flint, 2003a).

A 2003 survey highlighted some measurable benefits by enterprises over a two-year period after they had improved their ability to respond quicker to changing business conditions:

- reduced costs (69.1 per cent);
- increased productivity (61.4 per cent);
- higher revenue (49.7 per cent);
- customer retention (45.6 per cent);
- increased customer satisfaction (33.3 per cent);
- increased market share (32.2 per cent);
- increased shareholder value (24.7 per cent) (Alter, 2003:61).

The potential profitability of RTEs has been illustrated by the creation of a hypothetical financial construct that indicated a profit realization of millions of dollars annually (Roberts, 2002). Such figures however, have yet to be proven or disproved in the real market.

4.4. Value Creation and Workers

Decentralized decision-making enables junior, middle and top management, including the CEO, to make superior decisions when they happen to be closest to the action (Ellis, 2003:5). Real-time information processing fosters collaboration among workers by exchanging information in real-time. Networks have a democratization influence on workers by facilitating greater frankness and communication among groups (McKenna, 1997:115). The use of Java programming language facilitates transparent networking technology (McKenna, 1997:113). In real-time operations this has evolved to the point where the RTE crafts fast and rationalized processes to distribute information throughout the enterprise without unnecessary interventions. This enables fast and qualitative decision-making (McKenna, 1997:113; Raskino, Flint & Dobrik, 2003). When geared towards the improvement of their work performance, it becomes vital to provide workers with access to real-time information with no prohibitions and the prioritization of all information processes beforehand. Still, those who can read and interpret volumes of information such as financial managers will have an advantage, as they will be able to optimize their access to real-time information (Rozwell, 2001;McGee, 2004).

4.5. Customers and Value Addition

Trading partners in the supply chain such as distributors, suppliers and retailers all enjoy the value of accessing real-time information to balance supply and demand (Rabin, 2003: 38). In this regard, key process cycles can be planned to dovetail with the pace preferred by the customer (Raskino, 2004). Actuals optimization entails business decisions based on actuals data. Dynamic pricing is an example where prices are determined by prior sales including the most recent one. In the United States, wireless consumer electricity meters that transmit consumption in real-time, is in an experimental phase to match supply and demand in peak periods.

The 'pay as you drive' option is another pricing model that varies according to the location of a vehicle. Cement in Mexico and groceries in the UK are delivered to customers within one hour of ordering. Timing cadence is designed to time services to meet the needs of customers (Raskino, 2004). The value to the customer as the recipient is obvious.

Value needs to be co-created with consumers who are not only connected, but active, informed and living in a competitive landscape that is changing due to convergent industries and technologies. While competing on product variety alone is easy for competitors to replicate and is therefore no longer sufficient, it is more difficult to compete for value through the same product variety. Consumers are becoming the co-creators of value in enterprises through innovation (Prahalad & Ramaswamy, 2003:13;Lang, 2001:548).

4.6. Adding Value to the knowing Cycle

4.6.1. Value of Knowledge in the RTE

Value is created through profitable growth that can only be achieved by innovation (Prahalad & Ramaswamy, 2003:12). It is increasingly required as a result of intense competition (Castells, 2000:279). In most industries, value is added in the form of knowledge (Berawi, 2004:427). In some enterprises, knowledge is their greatest asset (Arora, 2002:240). Certainly in the RTE, knowledge is regarded as a critically important component (Harris, 2001). With reference to the three RTE management processes, it is clear that the RTE experiences are re-applied to enhance its ability to respond faster and better. Its value also lies in updating or refreshing the knowledge of both automated systems and knowledge used by workers in their decision-making processes (Harris, 2003).

When information technology is accepted as a vital part of the work process, it may be regarded as a determinant of innovation capability. Information technology becomes a contributor to the creation of value in both products and processes through the use of innovation by allowing a shifting focus from repetitive task performance to work where human intellect is required, namely in analysis, decision-making and the improvement of inter-personal skills to convey information and communication (Castells, 2000:258-259; Ciroto & Youssef, 2003: 394).

4.6.2 Value and Decision-making

Information is carried by speedy, rationalized business processes obviating unnecessary handling, cumbersome manual formats (reports) and hierarchical flows. Pro-active decision-making becomes a reality when it is based on real-time information flows and responsive key partners in an optimized 'whole' system (Waller, 2004:18). The decision-making process is speeded up by cutting out delays from the provision of critically important information to where ever it is required (Roberts, 2002) in suitable formats. This ties in with decentralized decision-making, which results in the integration of management information throughout an enterprise to add value to the RTE (Buytendijk, Raskino & Wood, 2004). A decentralization of decision-making trend or a delayed (decentralized) response

down into the enterprise will serve to secure a higher measure of control over latency access or time wastage, will regulate the quality of critical information flows better and ensure the facilitation of decisions and actions regardless of location in the RTE as a network enterprise (Ellis, 2003:5; Raskino, 2004). Value could be derived from establishing such decision-making nodes across the enterprise to improve management overall (Castells, 2000:178).

Decision-makers are also alerted pro-actively to events in the competitive landscape to enable effective and efficient management (Rabin, 2003:38). Information intended for real-time processing is extracted from information flows because it is seen to be critically important to the RTE. The focus is on the existence of warning signs pre-empting events to facilitate early detection (Fenn, [et al.], 2004). Managers used to managing on the basis of periodic reports, are alerted to emerging problems. It becomes possible to structure reports appropriately to make sense and add value whenever needed. Additional value is added when managers are able to interpret these alerts in context and to take appropriate action (Flint, 2001). In this way, top decision-makers are enabled to plan for current and future events with a focus redirected away from the past to current timeframes enabling operational business decisions (Raskino, 2004; Dobrik, Flint & Raskino, 2003). Past decisions are saved, so that their outcomes may be analyzed for further improvement (Parkinson, 2003:22).

4.6.3 Adding Value to Sense-making

Faster reporting to external stakeholders may shorten current cycles from 'periodic' to 'current'. This may add value to investor operations in stocks and related financial markets (Dobrik, 2001). But the real value will reside not so much in rapid responses, as in *sharing* 'real-time early detection' as a competency to identify threats early (McGee, 2004; Hayward, 2003). As business warning always pre-empt the actual event, business uncertainty may give way to business insight when the warning signals of pending business events are detected and processed in time by the right people to eliminate or reduce business surprise and its harmful consequences (Fenn, [et al.], 2004).

4.7 Do RTEs exist that combine Speed and Value?

Research suggests that the fully representative RTE does not exist and is yet to be created. Although some enterprises have embarked on the journey of transformation (Laudon & Laudon, 2002:7; McKenna, 1997:119), the prediction is that the real RTEs would have emerged by the end of 2003 (Harris, 2001). One of the reasons for the delay could be ascribed to the mediation and digital enablement of key business relationships with all the stakeholders both internally and externally to an enterprise, which can become extremely complex. Prominent enterprises such as Cisco are digitized RTE enterprises in the making only (Laudon & Laudon, 2002:6-7). The Cisco model is singled out as an example of a networked and globalized business model that has become a shining example for highly successful competitors around the world (Castells, 2000:184). Cisco Systems has a well-established ability to 'close the books' given a 24-hours notice (Dobrik, Flint & Raskino, 2003).

Another enterprise deserving mention on the RTE transformation path is IBM. It acquired PwC Consulting to create IBM's capability to deliver industry-specific offerings in this area (Bittman, 2003). Its bid was to re-engineer business processes for speed, dynamic business change, and process integration throughout IBM and with other enterprises. Dell Computer implemented its holistic supply-chain-management process — from buyers through to suppliers. Also in the USA, Wal-Mart Stores implemented buy-side supply chain management and the airline company, easyJet, maximizes its yield by resetting ticket prices in real-time. Even the US Army makes use of real-time instant messaging technology to speed up its collaborative and decision-making processes. Fashion retailers such as Zara can respond to shifts in demand in the competitive market with new designs created in days as opposed to competitors taking weeks to catch up (Dobrik, Flint & Raskino, 2003). Driven by its need to be more responsive to the market, Ford Motor Company reorganized its vehicle design process completely. This not only reduced the cycle time by thirty percent, but also improved the quality and served to cut its annual costs by \$1.2 billion (Flint, 2003b). One semiconductor manufacturer used a production process model to optimize the process even before production started (Flint, 2003a). Workers at Hewlett Packard and the GTECH Corporation are already working in virtual matrix environments (Bell, 2004). In Europe, GAP overtook clothing manufacturer Benetton in 1995 by its sheer ability to address changing consumer dress needs in the competitive market (Castells, 2000:468).

These enterprises are all examples of RTEs in the making and already on the transformation path, but which have yet to reach the desired state of the fully representative RTE. It is evident that enterprises world-wide are changing and moving away from strictly hierarchical structures, due in large part to pressure from a competitive environment that does not seem to tolerate slack and wastage of any resource very well. It is a remarkably difficult transformation, proven by the observation that a fully functional RTE did not exist by end of 2003. Instead of discouraging new entrants, it does seem as if enterprises have little choice to attempt it, as competitive environmental pressure continues to increase.

Chapter 5

Conclusion

It is entirely possible to dismiss the RTE as too conceptual given that a real RTE is yet to be seen. It is inarguably expensive and time-consuming. It is complex for all who has a relationship with the RTE, both inside and external in the value network. It is a business venture navigating in uncharted waters that serves to raise risk levels considerably. Yet it begs the question why established enterprises like the Hewlett-Packards and IBMs of the world would want to embark on this venture despite such complexity. Perhaps a scrutiny of the available alternatives in reverting back to industrial style hierarchies provides an adequate answer. In this sense, it is evident that the world economy has changed irretrievably over a relatively short period of time driven by various social, economic, political and technological factors. The movement away from the Industrial Age to one in which knowledge is regarded as the most valuable asset of an enterprise, is a cause for reflection on the massive changes that global business is subject to at the dawn of the 21st century.

Land, labour and capital as forces of production have subsided in importance only to be superseded by knowledge when the human mind was applied to technology as a force of production for the very first time in history. This evolution may seemingly bear endless possibilities in the new economy with its incumbent business paradigm. The network society is technologically pervasive enough to facilitate trade on a global trade in real-time, irrespective of time and space, thereby forming the global context for the rise of the RTE. The hierarchical enterprise is a square peg in a round hole of the new global network economy in a proverbial sense. Enterprises are moving in the direction of the RTE though, tailoring a fit with their environment as they are evolving and transforming. It is a direction foisted on them by the driving forces in an intensely competitive environment where the barriers to entry and competitive differentiating factors were considerably complicated over a relatively short period of time. It may be said that the survival of enterprises are reliant on the way in which they interpret these demands. If they do not perceive the need to change as a means of increasing their responsiveness, they will already be setting themselves up for business failure. Speed is vital. Businesses come and go as quickly as opportunities and threats present themselves. Those who remain uninformed, who are resistant to continuous learning and who do not realize the implications and the potential of global networking on their business will find their chances of survival compromised. Enterprises are all touched in some way or another by the global network economy in societies based on knowledge due to the pervasiveness of technology globally.

Those enterprises that do respond in the form of the RTE (as a new type of organization) are as fundamentally different from the industrial enterprise as the global economy is removed from the old-style world economy. The evolution of the RTE dovetails with that of its competitive environment. Instead of resisting or capitulating to it, the RTE finds redemption and justification for its auto poetic or 'edge of chaos' organizational stance in nature itself where chaos exists in simultaneity with an underlying supporting structure of order. The RTE draws on complexity theory for substantiation of its

application of the 'order in chaos' principle as a way of nurturing innovation amid ruthless competition while continuing to operate in a structurally sound way. The few that are on the path of transformation are the pioneers, paving the way for others to follow to some or other degree. There is no map to success on this roadway. It is complex for a multitude of reasons, but one salient aspect of the successful RTE is its quest to find balance in a complex environment. It needs to pursue its business purpose by striking this balance between opposites. It needs to know when to slow down to make strategic gains or speed up its information systems to facilitate real-time information processing. In knowing how to determine the balance between chaos and order, it needs to craft 'appropriateness' to a finely honed skill to enable appropriate responses and appropriate decisions with appropriately selected information. Business and information technology have to be understood equally well in the RTE to be able to grow this skill.

Technology is finally understood in the network economy and the context of the RTE. Ideally, the RTE is an example of business and information technology that is not only thoroughly understood as separate entities, but also more importantly, understood in their complementary interaction, the one with the other. Information technology is needed not for the sake of technology alone, but as a vitally important component to simplify business operations. It frees workers to spend more time on important enterprise issues and it supports the human mind in trying to control the complexity of the environment. Information technology may even drive certain data transactional processing business processes which have been around for some time, but the real value of technology comes into its own when it delivers to the expectation of business. By concentrating on the integration of information flows and not sheer application integration, business planning allows for the use of technology to reduce and eliminate time wastage right to the very back-end operations of enterprises. Technology fuses, operationalizes and streamlines RTE strategic business planning. The RTE fuses business and information technology in an understanding of business survival in a new era.

Ultimately though, the RTE is driven by its workers. The human element is of paramount importance, as the human mind drives the RTE in its application of technology and implementation of business processes, steering it through turbulent times, sensing the environment pro-actively to enable appropriate responses, when to react or not, always learning and most importantly, always innovating in their communication with other workers and making complex and risky decisions. Workers in a real-time working environment is provided with the challenge or opportunity even to be visionaries, to be creative and sociable, to have access to quality information in real-time and to be empowered to make decisions, all the while building customer value for the enterprise. While the RTE gratifies many demands, expressed internally and externally by workers and customers alike, it remains a formidable challenge. It requires fundamental changes, which can only be met by those who perceive themselves up to the challenge of shaping a new business enterprise that operates in tandem with the new network economy in which all enterprises have to operate, survive and ultimately, have to be proven successful.

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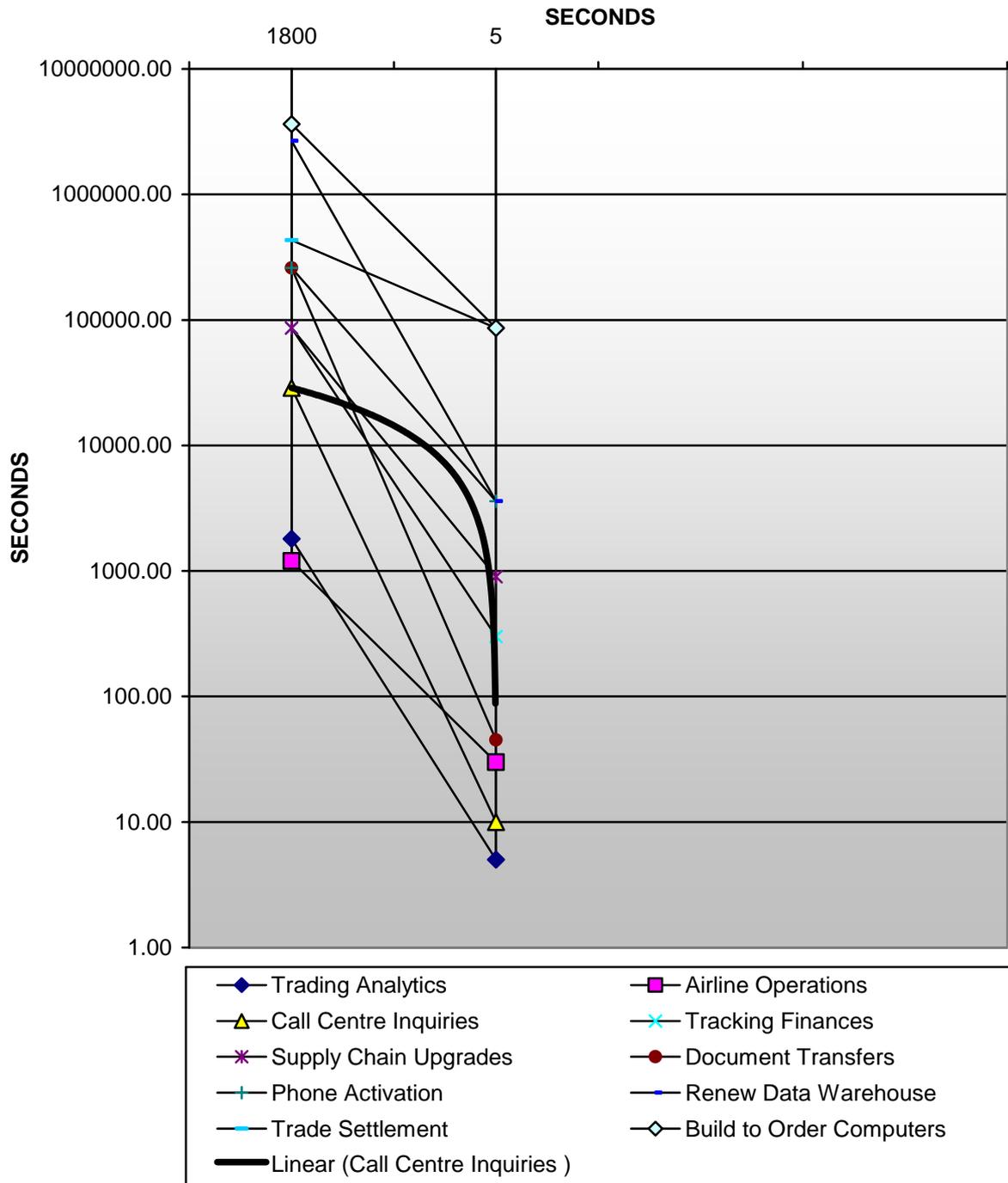
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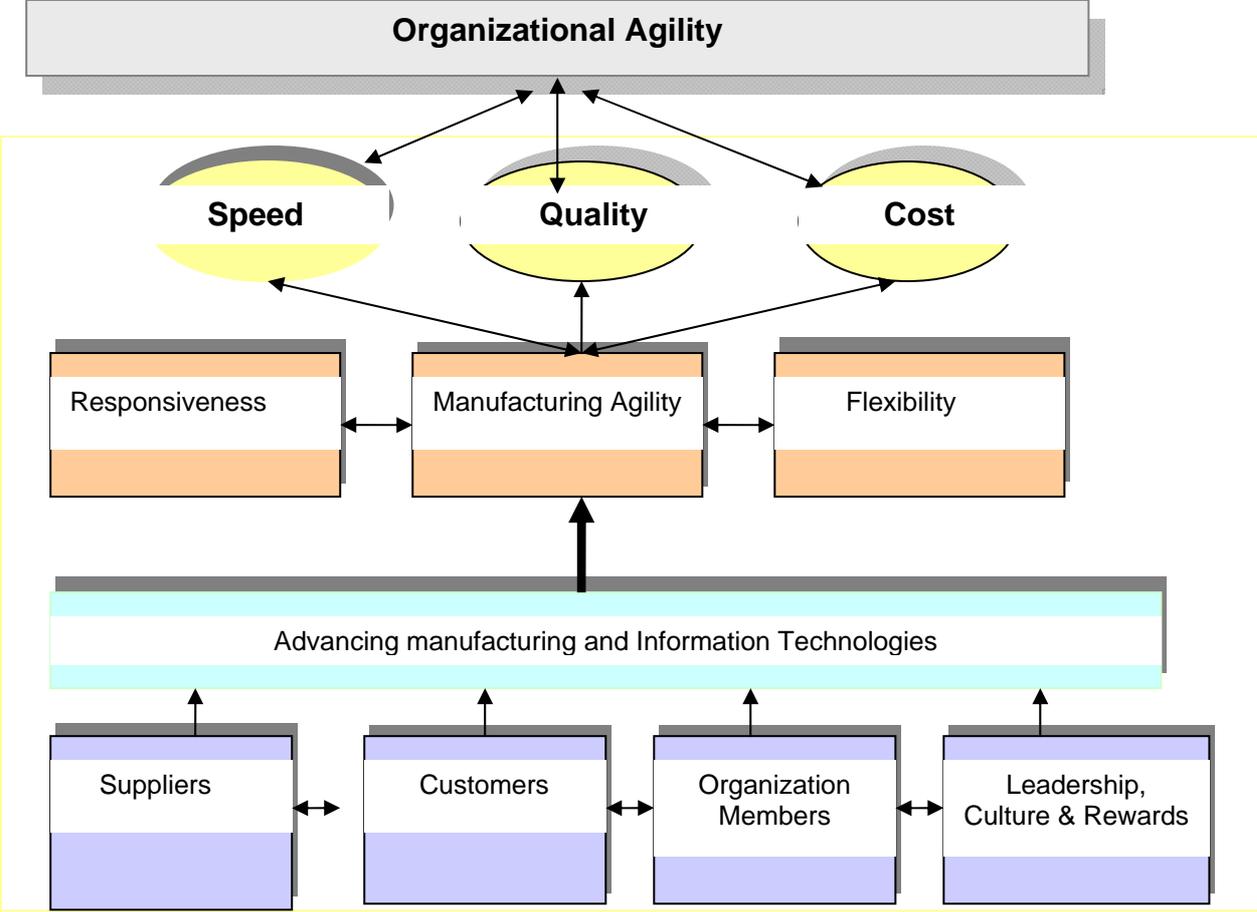
Appendix A Accelerated Response Time in diverse Service Industries from 1998 to 2002

ACCELERATED RESPONSE TIMES IN DIVERSE SERVICE INDUSTRIES 1998-2002 (with trend line)



(Meyer, 2002:54-59)

Appendix B Organizational Model of Agility



Cirotto & Youssef, 2003:392