MIND THE GAP:
ALIGNING INFORMATION TECHNOLOGY WITH THE BUSINESS STRATEGY

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ABSTRACT

Business organizations engage in strategic planning sessions in order to become more competitive in the changing markets. However, despite evidence to the contrary, they do not seem to realize the growing value of information and technology in achieving this. Rarely do business organizations realize the need for strategic IT planning, and more over, alignment of the business and IT strategies in one synergistic, cohesive whole. This paper explores the evolution of IT as competitive medium and as center for growth, innovation and radical change. The notion of IT centered organizations over and above IT as support or enabling function is discussed. It is maintained that organizations that do not deal with the above, that stay in flux or believe in incremental change, will not remain competitive and will be lost in the Information world.

'Act after having made assessments.
The one who first knows the measures of far and near wins
– this is the rule of armed struggle.'

1. INTRODUCTION

Literature in the business sciences abound with exposures on the need for proper, implementable business strategies. Organizations force themselves to go through the pain of annual 'bosberade', rivers are rafted, teams discuss the nature of the businesses we are in and the nature of the businesses we should be in (as if we can really be sure!). Maybe it is the essence of human nature that makes us try to determine our futures. Moreover, the gurus of management preach a grim future if we do not make sure that we plan *what* we have to do and (along Hammer and Champy's re-engineering principles [1, 2, 8, 28]) *how* we are going to do so. It principally means that business organizations have to believe in and practice the art of constant and radical change in order to survive.

In modern society, the main architects of change are technology, information and the growing importance of electronic business – maybe not in our own businesses yet, but certainly in the environment and the businesses that work with or against us. History teaches is similar examples, for instance, the demise of the Mayan civilisation [3] summarises society's inability to react to a changing world and their lack of appropriate technology: Until the late 11th century, the Mayan people lived as they had for 2000 years. During this period, many great cities flourished, each the capital of a small kingdom. (Tikal, the greatest of these, covering 23 miles^2, had 100 000 inhabitants.) Mayan achievements ranged from architecture to mathematics. For example, they refined the length of the average lunar month to within 24 seconds of the figure determined by atomic clocks. Yet, today the descendants of the ancient Mayans are an oppressed people, having been unable to recover from the Spanish invasion of their land four hundred years ago. Reasons given by anthropologists include the following:

□ Technically, they were Stone Age people. They had little or no bronze, no iron and no practical use of the wheel.
□ Land erosion (a direct result of slash-and-burn farming) caused the intricate irrigation canals to become blocked with silt and thus unworkable.
□ The Mayan calendar perceived time as a series of interlocking cycles forming repeating patterns. Because of this, the Mayans gave the Spanish 260 years before the latter would be vanquished. This rooted fatalism entrenched in their culture and resignation to the status quo, were probably the main reasons for their virtual abdication of action.

The subsequent section will discuss the emerging force of IT in process design and its relevance to the principles of Industrial Engineering.

2. THE EMERGENCE OF STRATEGIC INFORMATION TECHNOLOGY IN PROCESS REDESIGN

For many years, organisations have applied the concepts of Industrial Engineering to their production processes, with administrative processes and services remaining largely untouched. After World War II, the Operations and Management (O and M) movement did

seek to apply industrial engineering principles to administrative work, using the new data-processing technology of the time [4]. Technology was still limited and the emphasis was on automation and streamlining of existing processes rather than on rethinking the processes themselves. At the time, the technological advances were not such that they could impinge upon these processes. O and M lost its drive and radical process innovations passed to information technology (IT)[1] specialists, software providers and systems consultants. The technology and environment progressed, but the processes (designed to meet specific circumstances and a particular business and technological environment) remained unchanged. Processes only changed incrementally and without any holistic determination.

However, the message from modern Industrial Engineering is that wastefulness is unsustainable. Disciplines already applicable to manufacturing processes, must now be applied throughout all organisational processes. Not only the production line, but all aspects of the organisation must be engineered [1, 2, 8, 28]. Modern IT provide the means to do so. Not only is IT deemed by some to be the critical basis of the newly engineered processes, it also provides the ability to undertake the redesign, maximising value added and minimising costs over the large range of interdependent variables that enter into a complex administrative system. Hendry [4] believes that when the core technology of administration changes (as with the rapid development of IT), when the commercial environment changes (leading to changes in relative costs and values) or when the strategy of the organisation changes, configuring the value chain in line with the new circumstances and objectives must be the right thing to do. Enhancement of value added and the minimisation of costs must be the core objectives of this configuration, with the choice of strategy determining the balances between them.

The following have been identified as ways that IT can be deployed to accelerate the re-engineering process [5]:

- Develop the capability to build design prototypes and production prototypes concurrently.
- Treat prototyping as a real-time business solution discovery process, not just systems specification.
- Adopt object-oriented tools and methods to speed up implementation without compromising flexibility.
- Apprentice IS staff on new processes, tools, and working methods ahead of their involvement in re-engineering, not during it.

The next section will explore strategic change from the viewpoint of IT implementation.

3.   THE NATURE OF NON-LINEAR CHANGE IN THE PRESENCE OF IT

The notion of strategic change is well-known to business organizations and much time is spent implementing existing change models or developing new ones. However, viewing this in the context of *discontinuous* or *non-linear* change (mainly through the effects of strategic IT and IS) is relatively unfamiliar. Some concepts relevant to discontinuous change are introduced first, subsequent to which the change models pertaining to IT alignment will be discussed.

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[1] Although literature is generally vague on the distinction between the terms IS (information systems) and IT (information technology), this author refers to IS as the *demand* side and IT as the *supply* side of information

3.1   Organizational inertia

The mathematical conceptualisation of inertia renders possible the quantification of inertia at a given point in time. In popular terms, inertia may be defined as '.. *a tendency not to move or act*' or, not to *stop* moving or acting. In its more specific scientific usage, the term denotes '.. *the property of a system by which it remains at rest or continues to move in a straight line, unless acted upon by some external force.*' [*Schribner-Bantam Dictionary, 1980*]. The latter definition is often used in business science literature.

According to Gresov, Haveman and Oliva [6], an organisation's ability to respond to changes in its competitive environment, is of central importance to seminal design theories. They maintain that the concepts of competitive response and its opposite, organisational inertia, remain vital to modern organisational theory. Theoretical arguments have linked organisational inertia to a variety of responses, including: the distribution of organisations within populations; organisational performance; and, most importantly, the rates of failure of organisations.

The above authors define inertia as the inverse of an instantaneous rate of change between alternative levels of competitive response. Using such mathematical principles of definition provide organizational design research with a powerful tool consisting of four potential applications. They identify:

- ❑ The use of mathematical modelling techniques (for instance, cusp catastrophe models) to investigate the relative effect of different organizational aspects of organization linked to inertia. These cusp models portray the responses of a system (for example, the competitive responses of an organization) as a response surface that is related mathematically to factors that stimulate response (competitive pressure) and the factors that control or inhibit it (aspects of organizational structure and process). Such empirical research may enable the researcher to better understand which aspects of organizational design constrain competitive responses and which not.
- ❑ The mathematical model handles data relating to both incremental (TQM- related) and radical (re-engineering-related) change - known as organizational evolution or revolution respectively.
- ❑ A model that illustrates the differential effects of various organizational elements, while handling the potential for both incremental and radical change, may be employed as a diagnostic tool in order to capture the dynamics of the change process and to identify critical points where trade-offs may be prevalent. These changes typically happen over time.

Hannan and Freeman [7] cite various factors that contribute to the stability of organisations and impact on the goals, the core technology and the strategy of the organisation. These are summarised in the following table:

Table 1: Summary of factors that contribute to the stability of the organisation

INTERNAL FACTORS	EXTERNAL FACTORS
Past investments in plant, equipment and personnel	Legal and fiscal barriers to entry and exit from markets
Information-processing constraints	Availability of information due to external constraints
Internal politics	Environmental legitimacy constraints
Organisational history, values and culture	

These issues can be studied according to the cusp catastrophe model that can explain both forms of change – incremental and discontinuous – as well as a mixture of both. Specifically, it yields a measure of inertia that is viewed as the inverse of the instantaneous rate of change between alternative levels of competitive response.

3.2   Making IT part of the change

The models and concepts presented below all lead themselves to differing levels of IT implementation. Moreover, with IT's own revolution, these models should be seen in the context of an *aligned* business/IT perspective.

According to Schultheis and Sumner [9], strategic change can assume a number of forms, that is, the strategies of an organisation can be considered under the following headings:

- ❑ *Continuity* – the established strategy remains unchanged.
- ❑ *Incremental* – makes sense in the short term, but the environment may change faster.
- ❑ *Flux* – no clear direction to the change.
- ❑ *Global/radical* – change of this scale happens at times of crisis when the organisation is out of synchronisation with its environment.

These differing notions of change have been adapted from Scultheis and Sumner [9] and are depicted in Figure 1.
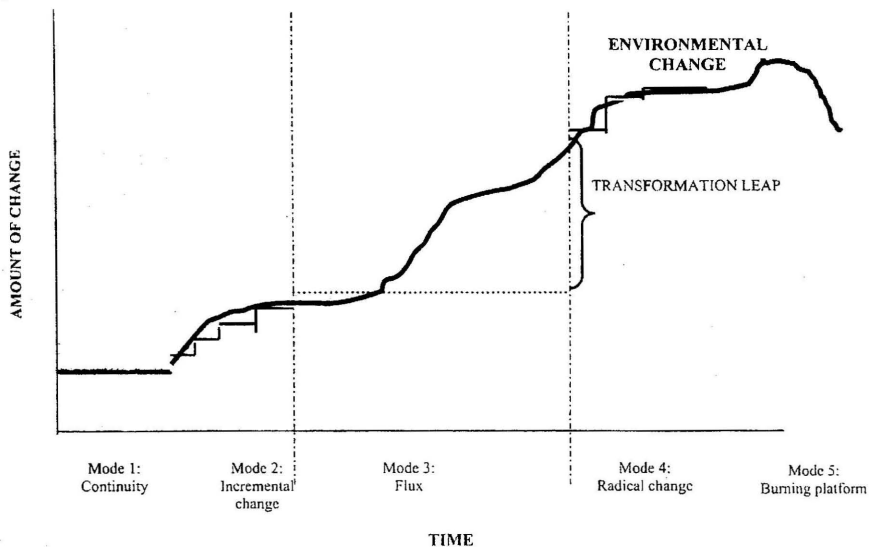

Figure 1: The nature of strategic change[9]

Ackoff [30] suggests four differing approaches to strategic change which, it is suggested, correspond to the above. Moreover, they easily incorporate emerging IT (This will be discussed in the proposed Technology Change Model in Figure 5).

(i)   *Inactive (Mode 1 in Figure 1):* Using this approach, the organization simply goes with the flow and goes about its business with no regard for changes in its environment. Although, in simply structured businesses this may work, it does involve a high degree of risk. Since the environment is increasingly more dynamic and will force change upon the business anyway, this approach is destined to fail.

(ii) *Reactive (Mode 2 or 5 in Figure 1):* This is alternatively called '...*planning through the rear-view mirror*', since the tendency is to focus on the past rather than the future, thereby resisting demands of the dynamic future. Most re-engineering ventures use this so-called notion of a *burning platform* or form of crisis management as the basis for change. Such solutions tend to be short-term, and operationally focused. Attempts to change are generally of an incremental nature.

(iii) *Pre-active (Mode 2 or 3 in Figure 1):* Most organizations which use this approach, try to figure out as best they could, the shape of the future and its effect on operations. They subsequently set out to prepare for that set of events. Hamel and Prahalad [29] label this approach '.. *maintaining the strategic fit ..* ', since it involves focusing on the question of how things will be different in the future. Since it is increasingly evident that the future is first of all different from the past and, secondly, unpredictable (mainly as a result of technological avances) this approach is generally bound to fail. The *time* to change pre-actively (cusp T_2) was discussed in Pellissier and Kruger [11].

(iv) *Pro-active (Mode 4 in Figure 1):* Although this is the most risky and challenging approach, it is by far the most preferable one in which the organization *designs* the future and *makes* it happen. It is based on the belief that the future is not pre-ordained or fixed and that organizations can, in fact, shape their own destiny. It uses the Tichy [14] concept of *envisioning* the future whereby an organization develops a vision of a future state powerful enough to arouse actions necessary for that vision to become a reality. An example of this is Microsoft's decision to promote personal computers at a time when IBM was leading the way and the industry with mainframes. Subsequently, Microsoft invented Windows-based operating systems at a time when the industry used DOS programmes – and mainframes in contrast to the PCs Microsoft proposed. The *time* to change pro-actively (cusp T_1) was discussed in Pellissier and Kruger [11].

4.   THE LINK BETWEEN IT AND RADICAL CHANGE

IT is becoming the *center* around which the organization, its processes and its structure evolve (thus the notion of an IT-centered organization rather than an IT-enabled or an IT-supported one [12]. Important change models to achieve the strategic change, include that of Burke and Litwin [13] having at its heart *leadership* and *organisational culture* or the *Revolutionary Cycle* introduced by Noël Tichy [14]. Tichy advocates the change process as a drama in three acts, that is *awakening, envisioning* and, lastly, *re-architecting* - again with *leadership* at the heart. Both these models embrace the notion that change is a cyclical process (or journey) rather than a single event never to be repeated. However, neither consciously incorporates IT as part of the strategic or radical change.

CSC Foundation's [15] re-engineering diamond (figure 2 below) touches on the links between the conventional business systems and structures, and the IT, delineating IT as important function on the organisation maintaining its business.
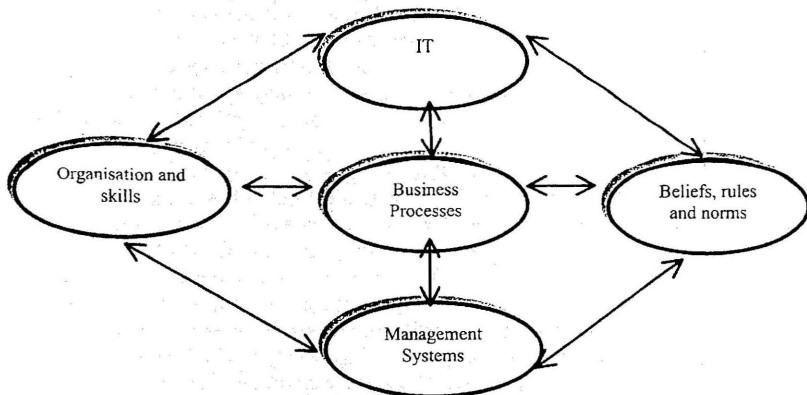

Figure 2: The Re-engineering diamond as framework for the relationship between the information and the business systems [15]

The above scheme is especially important for its critical role in providing a link between the organisation's business processes and its IT. It follows that any re-engineering exercise an organisation embarks upon, will of necessity involve the IT and information flows in the organisation and vice versa.

4.2   IT centered customer value

Market leaders understand the battle they are engaged in. They know they have to refine value by raising customer expectations. Treacy and Wiersema [16] believe that an organisation needs discipline to become a market leader and to maintain that position. They follow on the ideas presented by Hammer and Champy [1, 2, 8] for organisations to redesign the way they do work or *'How to run the race'*. They [Treacy and Wiersema] present a *'What race to run'* scenario. They redefine business competition by teaching organisations how to relentlessly drive themselves to extraordinary levels of distinctive value that will make it impossible for other organisations to compete on the old terms. They show how failure to recognise and adapt to this new competitive reality, will make businesses succeed or fail. In this, they have identified three distinct value disciplines (or dimensions), each producing a different kind of customer value.

(i)   *Operational excellence:* Organisations that pursue this dimension are not primarily focused on product or service innovators, nor do they cultivate deep, one-on-one relationships with their customers. They provide middle-of-the-market products at the best price with the least inconvenience.

(ii) *Product leadership*: Its practitioners concentrate on offering products that push performance boundaries. They offer the best product. They continually innovate. They continually redefine the state of the art.

(iii) *Customer intimacy*: These organisations focus on the specific needs of specific customers and not necessarily what the market wants. They cultivate relationships. They satisfy unique needs which they recognise through their unique relationship with their customers. They provide the customer with a total solution.

Time is an important component of value. IT redefines the value of time and redefines customers' expectations. (The current phrase, 'the money value of time', rather than 'the time value of money' illustrates this). Moreover, customers penalise suppliers who infringe on their time through delays, mistakes or inconveniences. Choosing one discipline to master, does not mean that an organisation abandons the other two – only that it selects the value dimension in which it wants to achieve market leadership and subsequently maintains a competitive threshold in the other two dimensions. This is not an arbitrary decision, but is based on extensive analysis of the organisation and its market (current and future). Treacy and Wiersema maintain that this selection of a value dimension is not the same as choosing a strategic goal. Rather, it defines what an organisation does and what it is. It entails adherence to the value discipline. Superiority in one dimension should not be equated with backsliding in the others. Indeed, the organisation should strive towards parity with its competitors in the other two dimensions, whilst retaining its competitive advantage in the first.

To choose a value dimension (and hence its operating model) is to define the very nature of its being. The value dimension shapes the organisation's operating processes, business structures, management systems and culture. Different value dimensions demand different operating processes and different technologies. The consequences of this new form of operating model are legion. For example:

□ Organisations will turn to others in order to help design and run parts of their operating model. This should lead to an increased demand for new organisational connections in the form of outsourcing, joint ventures and strategic alliances [16].

□ The workforce will be re-energised. New insights gained from value creation will encourage innovation. This should also provide relief from the demoralising effect of downsizing. There will be renewed optimism and purpose.

IT is a driving factor in every one of these dimensions:

(i) *IT in the dimension of operational excellence*: The IS (related databases and applications) will provide an understanding of the core business processes. These systems are so highly automated that they not only track the process, they contain and perform it. The power of IT is especially evident in industries like the insurance sector and the health care sector. For instance, electronic data interchange (EDI) and electronic business interchange (EBI) has brought to these businesses an entirely different operating model built on a sophisticated base of IS and automated IT that has substantially reduced the organisation's cost structures. The reason that not all businesses follow suit, possibly lies in these organisations' inability to adapt to the organisational demands made by IT. It is suggested that, without organisational

discipline or a centralised, regimented and standardised structure, state-of-the-art computer systems alone, will not provide competitive advantage.

Real time, hassle-free service, comes only through the speed and integration of IT solutions. Advantages of leading-edge technology include:

❑ Better operational efficiency and control.
❑ The information contained in integrated computer systems is not only useful in the core operating processes, it also enables the organisation to measure and monitor quality and cost.
❑ Detailed information is generated for better decision-making.
❑ The pursuit of mobile technologies to extend control and improve customer service (like notebooks, cellular phones and fax modems).
❑ The systems manage the process. Databases offer profiles of customers.
❑ Expert systems screen and grant customers credit.
❑ Telemarketing conducts analysis faster and more efficiently.

(ii)   *IT in the dimension of product leadership:* Thomas Edison probably pioneered the idea of automated process innovation in his attempts to store electricity, saying [16]: *'Genius is 1% inspiration and 99% perspiration.'* Edison's laboratory became the model for today's product leaders like Sony and Microsoft. Edison's idea of product leadership involved an organisation displaying the ability and determination to make products that customers recognise as superior – and an organisation that could deliver real benefits and performance improvements. A good example is Microsoft presenting software that enables the customer to automatically update figures in four applications while working in one.

Product leaders in high technology industries focus on devices that are smaller, faster, lighter, cooler and cheaper while at the same time capable of better performance. They continually strive towards planned obsolescence. An example of this, is INTEL in the microprocessor industry. They believe that they should: *'Double the machine performance at every price point every year'* [Andy Grove, CEO, INTEL].

(iii)   *IT in the dimension of customer intimacy:* Organisations that focus on the value discipline of customer intimacy need a deep and specialised knowledge of their customers and of the market. They use their clients to stay on the cutting edge. Specifically, logistics, marketing and IT are areas in which expertise has become deeper, more specialised and ever-changing. There is a general institutionalising of knowledge for competitive advantage.

4.3 Tichy's change model using IT

Tichy's change model follows from his notion that there are three spurs (internal and external) that drive the organisation to change. This is known as the Technical, Political and Cultural (TPC) framework and is presented in Figure 3.
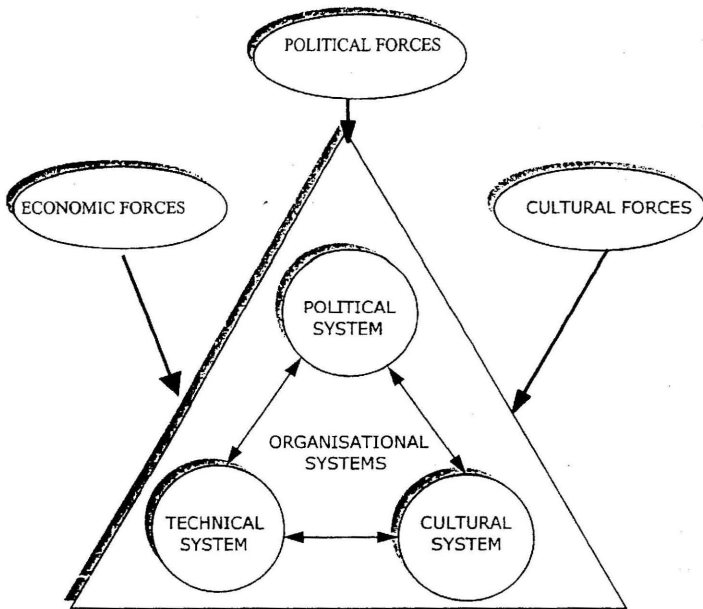
Figure 3: Tichy's TPC model showing the internal and external forces that drive the organisation to change[17]

According to this model, technology is one of the three driving forces behind change – be this an external or an internal force. The TPC issues can be seen as three intertwined strands of rope [17]. Expanding on the rope metaphor, they reiterate that:

□ From a distance, individual strands are indistinguishable.
□ Closer examination of the rope reveals that each strand is made up of many sub-strands, and, finally,
□ The strength of the rope depends not only on the strength of the strands it is made up of, but also on their connection. A rope may unravel and an organisation may come apart when its systems work at cross-purposes.

Thus, even organisations that remain inactive, will experience and have to react to, the spurs of external and internal change anyway.

Moreover, each of these three systems influence the organisation in the following way, leading to strategic change:
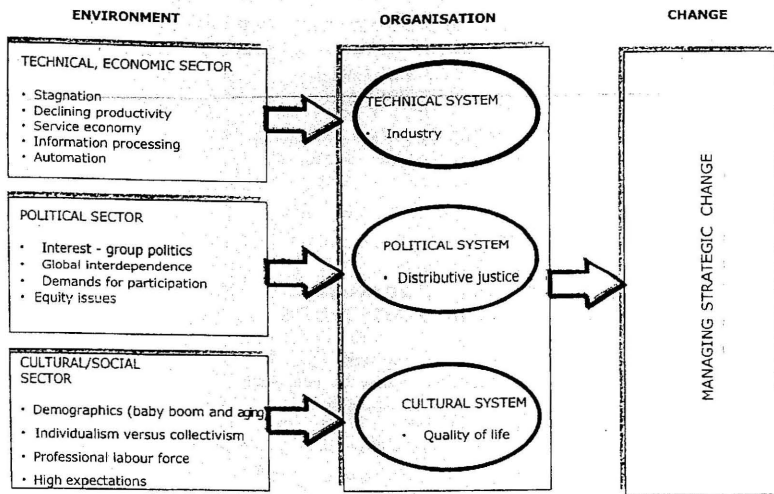
Figure 4: The influence of technology in effecting strategic change[17]

Although Tichy and Devanna did not delve any further into the detail on *how* technology acts as a driving force and enabler of change, their research shows clearly the force of technology as a revitalising agent for competitive advantage. They did not elaborate on what form the technology should take on; nor did they differentiate between existing and new technology or reflect on the scope of the technology deployed. Figures 2, 3 and 4 clearly illustrate the case for IT in re-engineering (the so-called second generation re-engineering).

4.4 Proposed change model for IT implementation

The Technology Change Model below (Figure 5) is derived from one proposed by Miller [20] in terms of knowledge applied and aspects of change. Miller introduces the term: '*out of concept problems*' (OCP) as those business problems at a level where incremental change is impossible to achieve expected positive results because of changes (economic, political, cultural and technological) inside and outside the organisation (refer Figure 1 on the nature of strategic change, Tichy's TPC model in Figure 3, and the effect of technology in effecting strategic change in Figure 4). Discontinuous (radical) change becomes the only possible solution. Moreover, the process is irreversible and different from the past. Miller likens this to the existence of villagers before and after the arrival of the European explorers. Everything they used (including technology, community structure, knowledge and power) changed irreversibly. This analogy corresponds to the clean sheet proposition in business re-engineering – and the appropriate (information) technology acquisition and implementation in making this work (Figure 2).

Miller maintains that using standard technology of change, means being guided by knowledge acquired in different circumstances that are similar but not the same. From Miller's suggested model for aspects of change and knowledge applied, the following model is proposed to show the link between IT and scope of change:
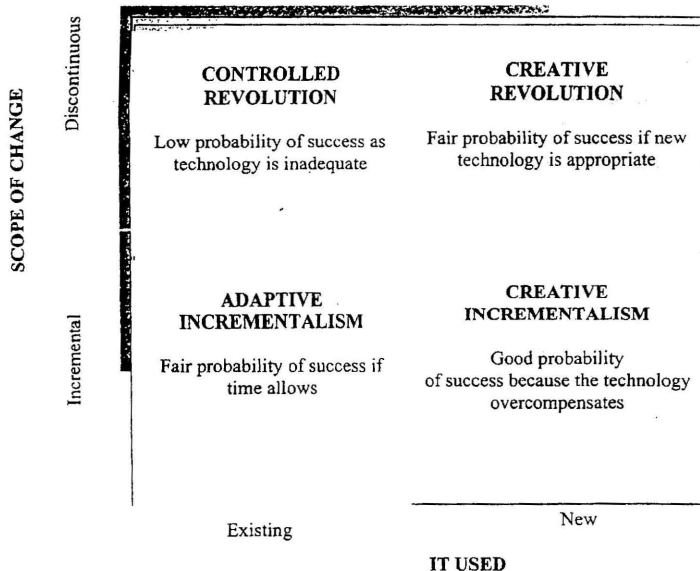
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SCOPE OF CHANGE — Discontinuous / Incremental (vertical axis)

	Existing	New
Discontinuous	**CONTROLLED REVOLUTION** — Low probability of success as technology is inadequate	**CREATIVE REVOLUTION** — Fair probability of success if new technology is appropriate
Incremental	**ADAPTIVE INCREMENTALISM** — Fair probability of success if time allows	**CREATIVE INCREMENTALISM** — Good probability of success because the technology overcompensates

IT USED

Figure 5: The proposed link between information technology and the scope of change

(i)   *Creative revolution*: Creative revolution in the context here, signifies that radical change is executed and has to be sustained in the long term. A significant example of this is the implementation of the SAP system that involves the acquisition of new technology (hardware and software) and a general re-engineering (sometimes, second generation re-engineering) of the processes around the new system. The time taken to fully achieve implementation is generally lengthy. Generally, the change is perceived negatively by employees, culture can act as barrier to the change and it is important to obtain complete buy-in from all stakeholders (especially users) before this costly and lengthy venture is undertaken. This follows the notions of jumping the curve [11]. This issue is currently relevant to most South African organisations, in terms of re-engineering and ERP implementations.

(ii)   *Controlled revolution*: Controlled revolution, on the other hand, also involves radical change, but the latter is not necessarily sustainable. Furthermore, existing technology is used. Whether it is possible to introduce sustainable radical change without new technology is highly debatable, mainly because of technology's advancement as a strategic tool in an information-related age. Such companies generally embarked on a re-engineering exercise without using the capabilities of technology to orchestrate the change. The re-engineering generally ends up being no more than restructuring or downsizing, and benefits are short term and problems persist in the long term.

(iii)   *Adaptive incrementalism*: This kind of (incremental) change involves the application of control systems used in other parts of the organisation without the introduction of new (information) technology. Since no new technology is introduced, the change is generally incremental and fragmented. The need for change may occur in the near future. Generally, cost can be controlled and there is buy-in from stakeholders.

(iv)   *Creative incrementalism*: In this process of change, new technology is used, although incremental change was needed. Technology is not used to its full potential and the organisation has probably overcapitalised.   There is no real jumping of the curve. Organisations that do this, will generally blame the implementation of a system (like SAP) as being too costly and not to their benefit. The organisations are generally *au fait* with all of the latest change technology but have not thought it through and grasped the real benefits that technology may deliver. This author likens this to the 'keeping up with the Joneses effect'. It is also possible that organisations that co-operate along the same supply chain may decide to implement the same IT to facilitate business to business applications and easier information flow.   This is possible depending upon an organisation's specific business culture and mindset.

In all of the above, the question of timing has mostly been ignored. The decision to change (especially if it involves expensive technology) has to be timed according to the following:

❑   The readiness of the organisation (especially in terms of culture),
❑   the information needs of the organisation,
❑   the environment (competition, clients, supply chain) and
❑   the specific information delivery systems to be implemented.

It is possible to change over a fairly short period of time, provided that the change is not of immense proportions. As in any re-engineering exercise, instituting new technology requires developing a vision of what the organisation wants to achieve.   The organisation then subsequently decides what it should do to attain that vision of the future. This could entail new or stronger leadership, teamwork and collaborative decision-making.

Discontinuous change requires a sharp redistribution of the new reality. It has a far greater probability of success if the new reality is not totally at odds with the present reality. If the proposed change is too extreme or impinges upon the comfort zones of employees, the organisation runs the risk of employees displaying the so-called '*bohica effect*' (namely, the slow grinding down of the will to change from within the organisation).

4.5   Multi-dimensional business/IT models

The following multi-dimensional models have been proposed by the CSC Index Foundation [15]. They maintain that it is important to identify the appropriate model for a particular situation and that some of these models are better suited to re-engineering than others. These models provide a useful framework around which to structure assessment of re-engineering. The models differ among multiple dimensions, as shown in Figure 6 below. Each model emphasises different beliefs and values regarding IS and IT capabilities and the strategic role of IT in the business.
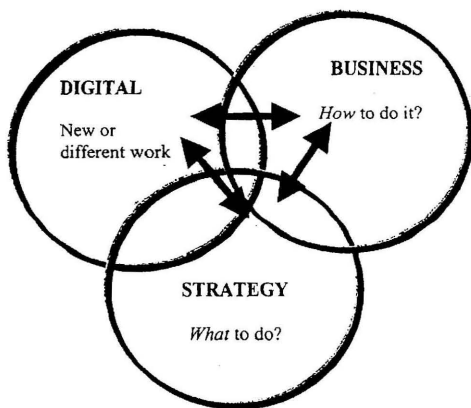
Figure 6: The multiple dimensions addressed by a migration of IT models [15]

(i)   *The Provider/User Model*: Assumes a transactional relationship. The business specifies its information needs and IT delivers these in the most cost-effective manner possible. Systems changes are formally planned. This model is geared toward stable business and technical environments and is not well-suited to re-engineering.

(ii)   *The Partnership Model*: Assumes a stronger sense of shared goals and ownership between IT and the business. Relationship management becomes a critical process. The emphasis is on meeting the real needs of the business, and there is recognition that this requires more flexibility on the part of both partners. The technology deployed should support flexibility and diversity. This model of IT, with its emphasis on providing a quick response to the business and rapid deployment of technology, is far better-suited to re-engineering than the Provider/User Model.

(iii) *The Pervasive Model*: IT provides a generic information infrastructure and the business applies that infrastructure to its needs. The nature of the infrastructure, which can be thought of as the language of the business, requires a closer relationship and collaboration between the IT department and the business unit. New technologies should be introduced directly into the infrastructure. Technology services will acquire new, finer-grained responsibilities. The Pervasive Model provides the business and IT with an IT capability that enables them to anticipate, implement and support, radical change. IT thus becomes the center of the business strategy and the business itself rather than merely enabling or supporting the business case for change.

There has been a migration from the Provider/User Model to the Partnership Model and, subsequently, to the Pervasive Model. It has been this author's experience that integration and collaboration between outside contractor and the IT department within the organisation, provides the most painless (and less costly) transition to new IT systems and has a higher success rate on buy-in from the internal stakeholders and users. (The main reason for this is probably that this provides an integrated solution using data and knowledge from within and outside the organisation). Table 2 below provides a summary of the three models and the IS/IT applications within each.

Table 2: Application of multidimensional IT models to re-engineering

| | | MODEL | |
APPLICATION	PROVIDER/USER	PARTNERSHIP	PERVASIVE
ROLE OF SYSTEMS IN BUSINESS	Improve efficiency and performance; reduce costs	Support business expansion, diversification and local variation	Facilitate responsiveness to future change
MIND-SET OF IT	Deliver what the business asks for	Understand what the business needs	Anticipate future needs of the business.
CRITERIA AGAINST WHICH IT IS EVALUATED	Cost, availability, comprehensiveness	Attitude, timeliness, fit against needs	Transparency, accessibility, pro-activity
NATURE OF SYSTEMS	Large, mission-critical applications; management-control information	Opportunistic systems	Infrastructure, not applications; uncommitted systems; expressive systems
KEY TECHNOLOGIES AND APPROACHES	Parallel processing, transaction monitoring	4GLs, relational database, downsized systems	Client-server, object orientation, peer-to-peer networking
ROLE OF PACKAGES	Cross-functional, integrated applications; buying best practice; industry standardisation.	Portfolio of smaller packages, rapid development, limited but easy local tailoring	Packages to provide technical functionality; package for front-end integration; no applications packages
IT ORGANISATION STRUCTURE AND ORIENTATION	Functional structure, technical and operational orientation	Processing structure, tactical customer orientation	Process structure, strategic business orientation

The following table summarises the different IS functionalities following from the multidimensional models which minimise cost and maximise business opportunities.

Table 3: Technology innovation in respect of the models above

IT MODEL	LEVEL OF TECHNOLOGICAL INNOVATION
Provider/User Model	Used to drive down overall cost of computing. Increase efficiency and productivity of computing assets.
Partnership Model	IS uses advanced technologies to render possible the production of new products, expansion of markets or respond to specific market demands.
Pervasive Model	The imperative of technology innovation changes and becomes central to the work of IS. It is the most important work of IS. Future technology innovation will focus around designing and building robust IT infrastructures that will be the foundation of the business and will enable the business not only to operate, but also to permutate quickly as required by the continuously changing environment.

The table above shows that technology innovation becomes one of four major processes of the IS organisation in the Pervasive Model. The activities involved in technology innovation in this model extend beyond those of the other two and assume a clearly defined and value-added role in the organisation. This model focuses on the identification and implementation

in the organisation's technical infrastructure of those technologies enabling the organisation to respond to market demands speedily, flexibly and in different ways. The IT challenge is to anticipate the business needs, analyse new technology offerings, replace them and encourage and support innovation throughout the organisation. Thus new technologies continue to be introduced into individual business units. However, each new technology is studied in terms of its value to the organisation as an entity. It is also separated into discrete capabilities for ease of individual use. With the migration to the Pervasive Model, principles of technology innovation are valued and carried out in the organisation as an essential first step:

(i) *Identification and communication of new IT:* The principle objective is to identify those new technology concepts that are relevant to the organisation's goals and objectives. Identifying new concepts entails having the intellectual willingness to explore and running a business laboratory to continually explore and translate new technology concepts into business value.

(ii) *Implementation of new technologies in the infrastructure:* The overall process in the Pervasive Model is called technology and integration, since its objective is to integrate new technologies directly into the business. The key to this model is a generic service definition that is strongly architectural in nature.

(iii) *Evaluation of the infrastructure:* This entails monitoring the natural life cycle of key technologies within their infrastructure and planning in advance for replacement of each technology before it becomes obsolete. The difficulty is in managing the influence of specific technology within the overall architecture. Thus it is suggested that dependency on a specific component should be minimised. In this, the organisation should employ skilled staff to execute the technology innovation.

It is suggested that organisations put in place the resources (people, structures and relationships) that will encourage migration and implementation of technology innovation in the Pervasive Model. Making the transition to a process-oriented workplace in both IT and business environments, focusing on the value-adding activities, will result in increased efficiency and productivity. With the establishment of centres of excellence to handle the levels of technology innovation mentioned above, organisations will develop and refine the sophisticated skills sets required of all members of the organisation to be competitive.

5. CRAFTING AND CREATING COMPETITIVE ADVANTAGE THROUGH IT

There is widespread acceptance that IT and IS have transcended the traditional administrative, back-room support orientation towards a more strategic central role within the organisation. In the subsequent sections, models illuminating the strategic relevance and importance of IT are discussed. Before the strategic application of technology can be addressed, it is important to formally define IT. Definitions of IT depend largely upon the evolution of IT, since most authors agree that IT has moved from back-office applications to front-end strategic use. According to Venkatraman, Henderson and Oldach [18], ' .. *IT has become the generally accepted term that encompasses the rapidly expanding range of equipment (computers, data storage devices, network and communications devices), applications and services (end user computing, help desk, application development) used by organisations to deliver data, information and knowledge. It provides strategic value to all parts of the business.'* According to Senn [31], ' *IT refers to a wide variety of items and abilities used in the creation, storage and dispersal of data and information as well as the creation of knowledge.'*

It seems that these generic definitions have one thing in common, that is that they broadly define the concept of IT's application in terms of its evolution. In this regard, Figure 7 presents an IT perspective in terms of investment drivers, technology cycles and innovation and radical change.
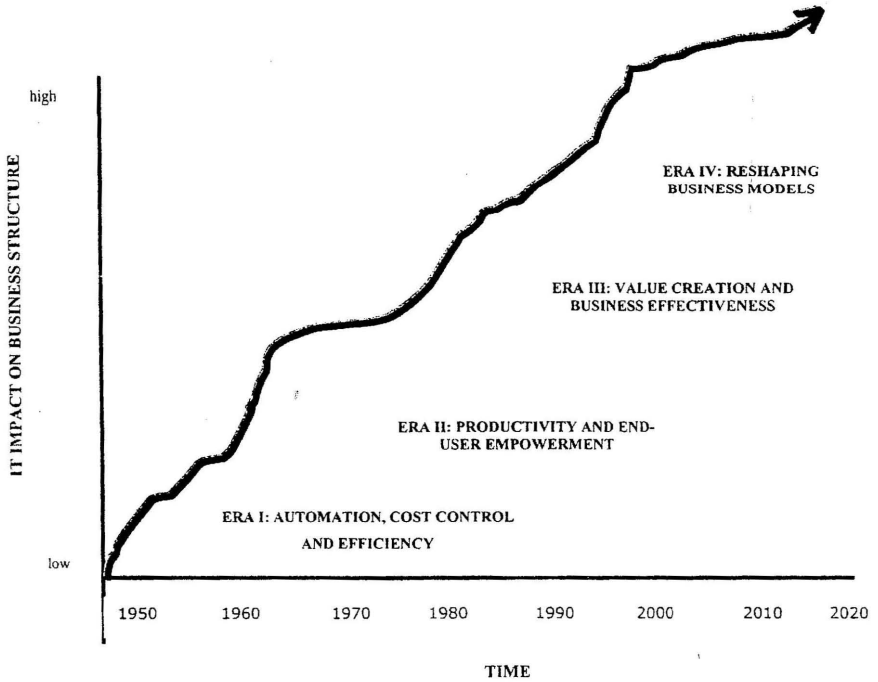

Figure 7: The evolution of IT in terms of investment drivers, technology cycles and change

In place of the term 'IT', the more descriptive acronym ITT (IT and Telecommunications) may be used as this encompasses the essential component of telecommunications [21]. ITT has evolved from a tactical tool to rationalise and to automate back-room operations of accounting payroll. In modern times, it is of strategic value to organisations in assimilating and reporting the accumulated knowledge and experiences in the organisation. Data processing and back-room operations are still practised, but organisations have mastered the intricacies of these functions as they move along the sophistication curve toward ITT as a strategic tool.. It is generally agreed that IT applications should be designed in such a way as to have an impact on the individual, the functional unit and the organisation as a whole. It is this author's belief that this also serves as the progressive evolution of IT, especially in terms of IT's use in re-engineering and transformation. This is further justified by the following table.

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Table 4: Application framework for IT, highlighting its evolution

	Roles of IT	Individual	FUNCTIONAL	STRATEGIC
Efficiency	Administrative	Task mechanism	Process automation	Boundary extension
Effectiveness	Operational	Work improvement	Functional enhancement	Service enhancement
Transformation	Competitive	Role differentiation/ expansion	Functional redefinition	Product/process/ business innovation

The above three roles of IT form part of the IT evolution addressed earlier. In an administrative capacity, the scope of IT embraces the automation of accounting and control functions, whereas IT's operational role, although an extension of the first, is distinguished by the creation and deployment of a technology platform that creates the capability to automate the entire set of business processes as opposed to only the administrative activities. However, along the same principles of viewing strategic management in terms of a hierarchy of three levels of strategies - these being: *corporate strategy* (concerned with the portfolio of and interrelationships among businesses), *business strategy* (focusing on developing a strategy that maximises organisation-specific comparative advantages to best compete in the marketplace) and *functional strategy* (reflecting efficient allocation of resources to the particular function) - the existing IT strategies have generally reflected an internal efficiency focus. However, the capabilities now exist for organisations to deploy new IT applications that use the information and technological attributes as leverage to obtain differential sources of competitive advantages in the marketplace.

The increased attention devoted to IT to influence structural characteristics in the organisation and its markets is a concern. In this, emerging IT has significant implications for organisational transformation – especially because the mere superimposition of powerful IT capabilities on existing organisational structures and processes is unlikely to yield superior competitive benefits. This contention is supported by an MIT Research Project which found that successful organisations can be distinguished by their IT leverage capabilities to transform their businesses (structures, roles and processes in Figure 3) to obtain powerful and new sources of competitive advantage. In this context, the existing frameworks [Porter's Value chain Analysis, Business Systems Planning and Critical Success Factors] are limited because of their operational focus. This section proposes two frameworks for strategic IT implementation, namely the IT Strategic Grid and the Strategic Alignment Model.

Table 5: Different IT applications in the past (Industrial Era) and the future (Information/Biotechnological Era)[2]

	INDUSTRIAL AGE	DIGITAL (INFORMATION/BIOTECHNOLOGICAL) AGE
Primary tool	Machines	Information creation, distribution and application
People	Division of labour	Connectivity of workers through: Teams, Interconnectivity, Shared information
Productivity	Mechanisation and automisation	IT
Partnership	Partnership between man and machine	Partnership of people with people

[2] Refer Toffler's economic waves of discontent [22, 23].

5.1   *The strategic grid*

Before focusing on IT, the strategic grid studying current versus future processes are discussed. This is done subsequent to Davenport's five-step framework for implementing re-engineering [31]. He suggests that one must:

1. Identify processes for innovation.
2. Identify change levers.
3. Develop process visions.
4. Understand existing processes.
5. Design and prototype the new process.

Since a major factor in discontinuous change is not only to improve old processes, but to significantly alter, or even replace, the existing processes, the current processes should be accurately described before any changes can be suggested. The dimensions of the Strategic Relevance Grid are discussed below. The first dimension in the grid portrays the strategic relevance of the current processes (low to high), while the second dimension portrays the strategic relevance of the proposed re-engineered processes (low to high).

(i)   *Processes in the strategic quadrant:* Both current and proposed processes in this quadrant are ultimately important. Implementation of the re-engineered process is particularly critical and is deemed absolutely essential for the long-term survival of the organisation. Consequently, these processes require maximum commitment and the re-engineering campaign should address these urgently.

(ii)   *Processes in the turnaround quadrant:* These are critical to improvement of the business performance. Current processes are acceptable but not considered strategically relevant. The proposed re-engineered process is strategically relevant and is expected to produce better performance and/or competitive advantage. Thus, the benefit of the proposed re-engineered process should be communicated clearly and the re-engineering campaign should start soon.

(iii)   *Factory and support cell processes:* These processes should be re-evaluated for re-engineering. The nature of re-engineering suggests dramatic improvement in organisational performance. Even if the proposed re-engineering process itself is not strategically relevant, the results of the process (improved efficiency, improved effectiveness, decreased costs) should be strategically important. Since support quadrant processes are not strategic (and are not expected to be), it will be particularly hard to convince employees of the need for the proposed re-engineered process.
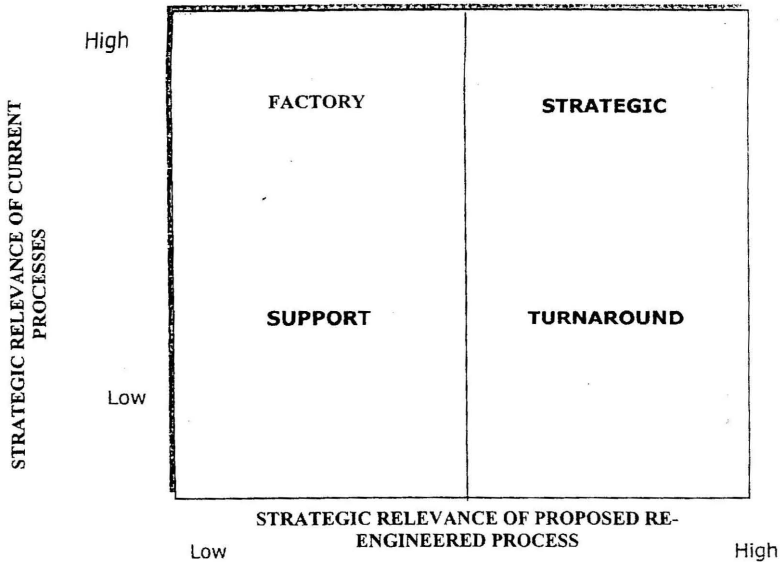
Figure 8: Strategic Relevance Grid [24]

Following from this, in assessing strategic relevance of IT (current vs future) this grid is adapted and presents a well accepted planning tool for assessing the value of a particular organisational element to the strategic direction of the organisation.

Cash et al [25] applied the Strategic Grid to IS projects and labelled it the IT Strategic Grid. The axes of the IT Strategic Grid portray the current (= y-axis) and future (= x-axis) strategic importance of IS activities in the organisation. Four quadrants are again: *strategic, turnaround, factory* and *support*. In respect of the quadrants in the above Grid, the following may be noted:

(i)   *Strategic quadrant:* Organisations in this quadrant are critically dependent on the smooth functioning of the IT activity for both their current and future needs. Strong IT planning is essential and should be closely integrated with corporate planning. The impact of IT on organisational performance is such that there should be significant top management attention and guidance in the IS planning process.

(ii)   *Turnaround quadrant:* Organisations in this quadrant are not critically dependent upon IT applications for their current operations, but applications under development, are expected to play a vital role in the organisation's future. As is the case with organisations in the strategic quadrant, turnaround organisations should have significant top management involvement in their planning process. Since turnaround organisations are not used to this type of involvement, other changes should occur to enhance senior management's understanding and overview of IS.

(iii)   *Factory cell:* Organisations in the factory cell are critically dependent upon existing IT support systems. However, applications under development are not crucial to the organisation's ability to compete successfully. Strategic IT planning and linkage to long-term corporate plans are not nearly as critical in this environment. IT planning should continue to take place with guidance as to where the organisation is going, but, senior management involvement in the planning process is commensurately far less.

(iv)   *Support cell organisations:* These organisations are in the low quadrant of the grid, suggesting that they would place the minimum emphasis on IT planning in terms of top management concern and involvement.

The four IS/IT environments delineated by the Strategic Grid framework suggest that each environment requires a different information management approach. IT is of significant importance in some organisations, but to a lesser extent in others. It should be noted, however, that, since the inception of the Grid in 1993 by Cash **et al,** the use of and need for, IS/IT has dramatically increased and it would be unwise (in fact, unlikely) for organisations to remain competitive by maintaining a 'support cell' IS culture.

5.2   The continuous strategic alignment model

The *Continuous Strategic Alignment Model* will be discussed as an analytical and administrative approach to conceptualise and manage the emerging nexus. The implications of the IT evolution revolve around the potential not only to support chosen business strategies, but to shape new business strategies [26]. However, the following are real areas for concern:

❑   The anticipated value of the (sometimes huge) IT investment is not achieved.
❑   There is evidence of minimal productivity gains at an aggregate level of the economy.
❑   There is increased evidence of IT outsourcing.

It is argued that the inability to realise value from IT investments is largely due to the lack of alignment between the business and IT strategies. Furthermore, it is asserted that the organisation's ability to use IT functionality as a lever to obtain differential advantage in the marketplace requires a dynamic administrative process to ensure continuous alignment between the business and IT domains.

The concept of the Continuous Strategic Alignment Model is based upon two building blocks:
❑   Strategic fit (or alignment) and
❑   Functional (or administrative) integration.

Neither of the above components is sufficient in isolation and both are required to create and sustain the dynamic link between business and IT domains. This is depicted in Figure 9 below.
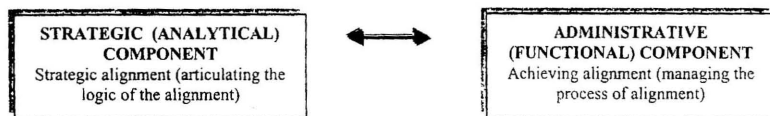
STRATEGIC (ANALYTICAL) COMPONENT		ADMINISTRATIVE (FUNCTIONAL) COMPONENT
Strategic alignment (articulating the logic of the alignment)	◀▶	Achieving alignment (managing the process of alignment)

Figure 9: The two components of continuous strategic alignment [26]

(i)   *The strategic fit* recognises the need for any strategy to address both external and internal domains (Figure 3). The external domain is the business arena in which the organisation competes and is concerned with decisions such as product-market offering and the distinctive strategy attributes that differentiate the organisation from its competitors, as well as the range of 'make/buy' decisions, including partnerships and alliances. The internal domain is concerned with choices pertaining to the logic of the administrative structure and the specific rationale for the design and redesign of critical business processes (product delivery, product development, customer service and total quality). The internal domain is also concerned with the acquisition and development of the human resource skills necessary for achieving the required organisational competencies.

Within the business domain, it has been argued that the fit between the external and internal positioning is of critical importance for maximising economic performance. This is also true for the IT domain. It is contended that the IT strategy should be articulated in terms of an *external* domain (that is, how the organisation is positioned in the IT marketplace) and an *internal* domain (how the IS infrastructure should be configured and managed).

The Strategic Alignment Model is shown in Figure 10 below and summarises four dominant alignment perspectives – each representing a triangle of three concepts covering both business and IT domains, as well as internal and external domains. Each perspective is unique in terms of the driving force (business or IT strategy) and represents distinct and mutually exclusive management implications.
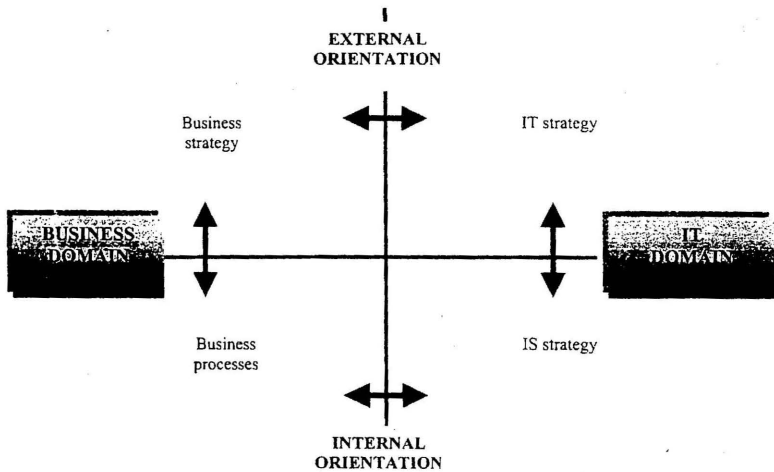

Figure 10: The Strategic Alignment Model [26]

The four dominant alignment perspectives according to the cross-domain relationships are:

❑   Business strategy (strategic) and organisational infrastructure (operational) representing the *business domain* as driving force.

❑ IT strategy (strategic) and IT infrastructure and processes (operational) representing the *IT domain* as the driving force to achieve new or enhanced business.

Then, according to Henderson and Venkatraman [26], the link between business strategy and IT strategy reflects the capability to use IT strategy as a lever to both shape and support business strategy. Correspondingly, the link between organisational infrastructure and processes, and IT infrastructure and processes, reflects the need to ensure internal coherence between the organisational requirements and expectations and the delivery capability within the IT function.

Perspective 1 - Strategy execution:
This perspective reflects the notion that the business strategy is the driving force behind both organisational design choices and the logic of the IT infrastructure. It is arguably the most common and widely understood alignment perspective as it corresponds to the classic, hierarchical view of strategic management. Consequently, there are various analytical methodologies available to operationalise this perspective (for example 'Enterprise Modelling', and 'Business Systems planning', [27]). Top management should act as a strategy formulator, while IT management should act as the strategy implementor in order to efficiently and effectively articulate the required IS support for the particular business strategy. The performance criteria will involve financial parameters reflecting a cost centre focus.

Perspective 2 - Technological potential:
This alignment perspective involves the articulation of IT strategy to support the chosen business strategy and the corresponding specification of the required IT infrastructure and processes. In contrast to the strategy execution logic, this perspective is not constrained by current organisational design. Rather, it seeks to identify the best possible IT competencies through appropriate positioning in the IT market environment, as well as the identification of the corresponding IS architecture. For this alignment to succeed, top management should provide the technology vision to articulate the logic and choices pertaining to IT strategy that would best support the chosen business strategy, with the role of the IS manager being that of technology architect – who efficiently and effectively designs and implements the required IS infrastructure that is consistent with the external component of IT strategy (scope, competencies and governance). The performance criterion is based upon technology leadership with qualitative but insightful benchmarking along a set path of critical measures pertaining to the positioning in the IT marketplace.

Perspective 3 - Competitive potential:
This alignment perspective is concerned with the exploitation of emerging IT capabilities to impact upon new products and services (the business scope), influence the key attributes of strategy (distinctive competencies) as well as develop new forms of relationships (business governance). Unlike the previous two perspectives which considered business strategy as a given (or a constraint in terms of organisational transformation), this perspective allows modification of business strategy through emerging IT capabilities. Beginning with the three dimensions of IT strategy, this perspective seeks to identify the best set of

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strategic options for business strategy and the corresponding set of decisions pertaining to organisational infrastructure and processes. Top management's role is to make the perspective succeed; it is that of visionary, articulating how the emerging IT competencies and functionalities as well as changing governance patterns in the IT environment would impact on the business strategy. In contrast, the role of the IS manager is one of catalyst, interpreting and identifying trends in IT to assist managers to understand the potential opportunities and threats from an IT perspective. The performance criteria are based upon business leadership with qualitative and quantitative measurements pertaining to product leadership (market share, growth and new product introduction).

Perspective 4 - Service level:

This alignment perspective focuses on how to build a world class IT/IS organisation within an organisation. This requires the articulation of the external dimensions of IT strategy with corresponding internal logic for the IS infrastructure and processes, with appropriate implications for the organisational infrastructure and processes. Business strategy plays an indirect role. This perspective is often viewed as necessary (but not sufficient) to ensure the effective use of IT resources and be responsive to the growing and rapidly changing demands of the end user population. Analytical methods require a systematic analysis of IT markets and also of the possible service contracting approaches. Top management's role is that of prioritiser, articulating optimal allocation of scarce resources both within the organisation and in the IT environment (for instance, joint ventures, licensing and minority investments). The IS manager's role is that of business leadership, with specific tasks of making the internal business succeed within the operating guidelines from top management. The performance criteria are based upon customer satisfaction with qualitative and quantitative measurements with internal and external benchmarking.

(ii)   Functional fit: The second component of the continuous strategic alignment model deals with the management challenge of translating the strategic decisions, according to the above perspectives, into operational practicalities. This is similar to the four phases of re-engineering (namely analysis, design, transformation and evaluation), with much time and effort allocated to the analysis and design phases, but the transformation and implementation phase lacking in energy. This execution component should be done according to the following mechanisms for administrative achievement of alignment. These mechanisms are [18]:

❑ *Governance process* – dealing with the policies, procedures and systems for allocating decision rights to key decision-makers,
❑ *Technological capability* – dealing with the administrative process for creating the required IT capability for supporting and shaping the business strategy,
❑ *Human capability* – dealing with the administrative process of creating the required human skills and capability for supporting and shaping the business strategy, and
❑ *Value management* – dealing with those actions taken to establish means to select IT investments, define a performance management system that will maximise the likelihood

of these investments to attain their goals and learn how to adapt this performance measurement over time.

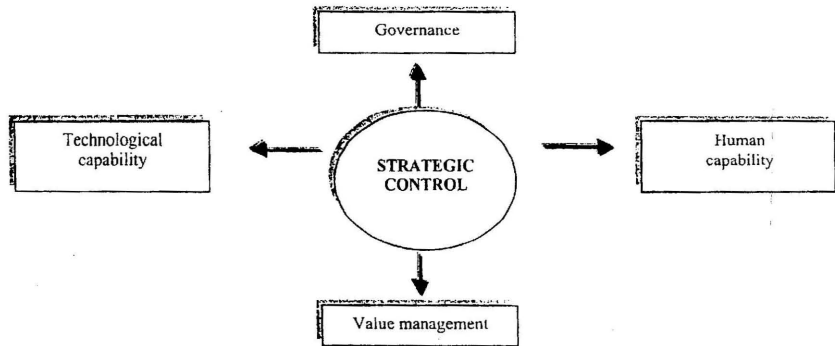These are summarised in the scheme below.

Figure 11: Summary of the four administrative functions needed to support the IT alignment strategy [18]

Following on earlier discussions and since the effect of and the evaluation of the IT investment will be studied the above issue of value management needs attention. According to Venkatraman, Henderson and Oldach [18], value management comprises of three interrelated activities:

(i)   *Investment decisions:* IT investments traditionally fall within the domain of capital budgeting, with the potential IT impacts described as a measure of productivity. However, IT does not generally use productivity as leverage in the short-term (the so-called productivity paradox), and thus there is widespread dissatisfaction with this view of value management.   As IT impacts upon the reshaping of the work environment (i.e. re-engineering), the productivity/financial orientation of most capital budgeting processes proves too limited in scope to handle either the true value of the investment or to adequately represent the risks (radical change) associated with the investment.   While the technical component of risk may be recognised (that is, the risk that the system may not deliver the required technical features), the true risk associated with the radical change is generally underestimated.
The value of many capital investments is associated with the future flexibility provided by the resulting infrastructure.   Traditional capital budgeting will systematically undervalue this opportunity to create future options.   Moreover, application of the NPV approach to IT investments tends to further obscure the true risks of the IT investments, since it generally results in a single-point investment decision, rather than the multi-phased process required to manage both the risks and opportunities associated with an options-creating investment.

(ii)   *Performance measurement::* This deals with the design of a measurement system that will be used to guide the operational activities with the emphasis on the logic of the design.   Within the application of Total Quality Management (TQM), the involvement

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of leadership is critical in the design of an appropriate measurement to ensure that the IT investment achieves the desired benefits.

(iii)   *Evaluation:* This is deemed different from the traditional technological audit, in the sense that evaluation should be considered from the initiation phase of any project to maximise potential benefits and organisational learning.

In conclusion, one may ask which alignment perspective is preferable. The answer is that no single universally superior model to formulate and implement strategy, exists. If the converse had been true, strategy would have been meaningless. All four alignment strategies are equally useful and powerful in the application of IT as a transformation tool. Leadership is urged not to deem the role of IT a panacea and consequently focus only on those two perspectives with IT strategy as the starting point (namely, business transformation and service level); nor should the business strategy be the starting focus. The potential of IT is so varied, the landscape so broad and complex, that all perspectives should be considered before the institutionalisation of the appropriate set of alignment mechanisms.

6. CONCLUSION

It is no longer possible to ignore the power and force of IT. Businesses are aware of the need for proper, sustainable business strategies. What is more a concern is whether organizations realise the true value and nature of IT benefits and how to strategise the latter in terms of the organizational objectives and goals and realise the gap between the IT investment and the strategies of the business – especially since different change strategies are more (or less) relevant to growing IT.

The strategic relevance and importance of IT is still fairly new. The more so the *alignment* of the business and IT strategies. Competitive advantage surely lies not only in the appropriate application of (r-) evolutionary IT, it lies in the *alignment* of the business and IT strategies and in the value gained from the IT investment. This generally entails centering (depending on the nature of the business) the organization around IT and understanding its revolutionary nature, more than using IT as support or enabler. Business organizations need to develop a business case for change taking cognisance of information needs and technology developments. The question is whether business leaders understand this and whether they are doing so. This will give new meaning to 'walking the talking'!

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