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Rediscovering the IT Productivity Paradox

The Alignment and Dynamics of IT-enabled Change

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給兩位我最愛的母親
一位在人間　一位在天堂

To my two mothers,
Who have taught me much about how to *live*.

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Disclaimer

The interpretation in this dissertation is the sole responsibility of the author and in no way represents the views of the case study organisations, nor of the Warwick Business School. Some of the names of departments and organisations have been changed to maintain confidentiality.

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ABSTRACT

There is a growing recognition that sustainable competitive advantage requires a viable integration between information technology (IT) and organisational change. Increasingly, firms are interested in the transfer of IT-related best practices in the hope that fundamental organisational change will thereby be achieved. However, the investment in IT is often disproportionate to the benefits obtained. This issue of what has been referred to as the *IT productivity paradox* requires a re-examination of the organisational dynamics rather than a mere proclamation of the insufficiency of best practices. In this study, the re-examination is based on the viewpoint of alignment and contextualism. To achieve this aim, the study is divided into two phases. Phase one uses five cases to investigate the alignment behaviour of organisational change, and proposes four change patterns. Phase two uses one in-depth case study to explore the problem of IT-enabled change backfire and enhance the contextualism perspective of change in terms of four propositions (underlying logic, reciprocal causality, time effect and frame awareness). This conceptualisation offers a social-scientific perspective on the analysis of the IT productivity paradox, and draws out the practical implications for change management based on a "reflective transfer" model that complements the planned approach. The research adds to current understanding of the IT productivity paradox by highlighting the importance of the alignment and dynamics of organisational change.

Chapter 1: Introduction

Increasingly, firms have been forced to adopt information technology (IT) in order to confront the challenge of global competition. IT has therefore become an imperative enabler for organisational change, transforming the fundamental rule of competition. However, as many researchers have demonstrated, the benefits of IT are not as clear as they should be. Often, the more IT is used, the more turmoil is created, and the less productivity grows, a situation that is referred to as the *IT productivity paradox* (Brynjolfsson, 1993; Harris, 1994; Brynjolfsson and Hitt, 1998; Willcocks and Lester, 1998). Although this paradox has been examined from various perspectives, there still seems to be no satisfactory answer. This study attempts to contribute to this debate with specific reference to two new dimensions: change alignment and change dynamics. The first chapter provides an overview of this debate, allowing some emergent issues to be identified and thereby defining the research agenda for this study.

1.1 PRELUDE: IT-ENABLED CHANGE

The rise of global challenges in today's changing market has brought with it increasing organisational complexity. IT offers great benefits to firms, for instance through the streamlining of processes, the enhancement of intra- and inter-firm

interdependency, and the transformation of the nature of business. Firms come to recognise that these global challenges can only be resolved by the effective use of IT and the resulting advantages in the areas of quality, cost and time-to-market. Consequently, firms seek to exploit IT in order to produce more strategic options to deal with competition, as well as to resolve problems caused by firms' growing complexity.

The new strategic options generated by IT-enabled change have prevailed in all sectors. For example, Rolls Royce Aerospace Group have introduced virtual assembly technology through EPD (Electronic Product Definition, a form of CAD application) in order to shorten the time-to-market cycle (Mills, 1995), and Toyota Motors have implemented knowledge management to enhance collaboration between departments and to foster innovation (Nonaka and Takeuchi, 1995). As many experts predict, the concept of information-based organisation has become increasingly popular, and accordingly the application of IT has become multifaceted (see, for example, Strassmann, 1985; Clemons, 1986; Earl, 1988; Feeny and Ives, 1990; Scott-Morton, 1991; Keen, 1991; Tapscott and Caston, 1993; Ciborra and Jelassi, 1994; Turban et al., 1996; Yetton, 1997). Table 1 summarises some approaches to employing IT-enabled change. These applications show that IT is transforming its role from that of an enabler (for operational automation) to that of a platform (for

organisational change).

IT	Company	Application	New Competitive Advantage
Groupware	Allied Signal	Project management	Links up 87,000 employees into 3,000 teams spread throughout 30 countries.
Intranet	AT&T	Virtual organisation	Uses telecommuting to save $80m in real estate cost and promote productivity.
Internet	Richard Fairbank	Electronic commerce	Credit card banking on Internet to promote sales and track customers.
IS (Information Systems)	Marriot	Global distribution systems (hotel industry)	Facilitates 2,000 sales staff to handle over 21 million calls and generate $4 billion in revenue.
Decision Support Systems	Calgary co-op	Retailing management	Analyses market information and the trend of sales performance.
Database	Australia NHS	Health care system	Uses standard data structure to unify transaction processing.
Data warehouse	Zeneca	Integrated contracting systems	Supports sales managers to offer customer advice and win over competition.
EDI	Avex Electronics	Standard electronic document	Shortens lead time and creates trading opportunities

TABLE 1. Examples of IT-enabled Change

(Source: Haag et al., 1998)

Gradually, IT has become a technology that dramatically increases the ability to record, store, analyse and transmit information in ways that permit flexibility, accuracy, immediacy, geographic independence, volume and complexity (Zuboff, 1988: 415). The term IT (Information Technology) now refers broadly to refer to any computer-based tool that people use to work with information and which supports the information-processing needs of an organisation. There are three main uses of IT: (1) as a tool to support information processing tasks; (2) as an enabler to reduce time and space, and (3) as a lever for business innovation. It is almost impossible to

introduce organisational change without considering the use of IT. However, there is also a social impact of IT-enabled change. Firms cannot implement an IT project alone, but have to take into account the joint outcome of IT and organisational change (Coombs, 1997). Organisations that simply use IT to pull through organisational change will often be faced with conflict and failure (Scott-Morton, 1991; Yetton, 1997).

1.1.1 A Macro View of IT-enabled Change

The concept of the "digital economy" starts from the premise that the future economy will be characterised by information intelligence (Tapscott, 1998). In the old economy, information flow was physical and involved cash, checks, invoices, reports, telephone calls, engineering blueprints, etc. In the digital economy, information is stored virtually in the bits of the computer and travels across networks. This enables the spread of new ideas and knowledge, the co-ordination of work around the world, and the increase of competition. According to Tapscott's (1998) study, the implications of IT-induced change can be understood in terms of several corresponding themes.

First of all, most types of communication have been transformed from a physical flow into an information flow stored in digital formats. This type of communication

enables the formation of virtual teams and corporations, thereby changing the relationship of institutions and speeding up the metabolism of economic activities. Organisations thus have to shift to team-based (molecular) structures in which employees are empowered to act and create value. In addition, corporations have to integrate internally and externally, using IT to link up inter-firm activities. The result of the interdependent relationship enabled by IT will ultimately be to eliminate intermediaries in economic activity, including agents, brokers and middle managers. Moreover, a convergence between different economic sectors (for example, computing and communication) will inevitably occur. Innovations based on knowledge creation rather than the traditional measures (such as the cost of labour or raw materials) become the main source of value. Knowledge becomes an important element of the product. Thus, organisations have to engage in organisational learning in order to sustain competitiveness. For businesses, knowledge becomes the basis of value, revenue and profit, and IT-enabled change is the key to achieving this end.

1.1.2 A Micro View of IT-enabled Change

At an organisational level, IT has shifted to a new strategic role. In its traditional role, IT generally involved the automation of existing processes, in order to perform jobs faster, more cheaply and more accurately. A new emergent role assumes IT as a key

enabler for strategic change: that is, to facilitate strategic intent, create new advantages, and enhance the core competencies of businesses. To facilitate such a strategy, IT can be used in a supply chain in order to boost productivity, and IT applications can be guided by three generic strategies (cost leadership, differentiation, niche market) so as to provide competitive advantage (Porter, 1985).

Keen (1991) highlights three major benefits of IT-enabled change in terms of geographical, organisational and human resource advantages. From the point of view of geographical advantage, IT can assist companies to establish a globally coordinated, virtually centralised control mechanism. In terms of organisational advantage, IT can reduce administrative complexity and facilitate effective communication within the organisation. This may enhance the interdependence of the organisation, thereby transforming labour-based activities into knowledge-based production. In terms of the human resource advantage, IT can assist in bringing about a more effective method of organisational learning that can transcend the boundary of time and space.

In similar vein, the MIT 1990s research (Scott-Morton, 1991; Allen and Scott-Morton, 1994) explains that IT-enabled change can help businesses to move towards an adaptive organisation. IT can enable changes in the way work is done, shifting from physical production (e.g. through the use of robotics or sensors) to information

production (e.g. through the use of accounting systems) and knowledge production (e.g. through the use of email/groupware, CAD/CAM or CASE tool). Moreover, IT can facilitate the integration of intra-firm and inter-firm functions at all levels. In this way, IT provides more strategic options for reassessing company operations, enabling firms to change from *automating* (focusing on production cost reduction) to *informating* (workers become analysts) to *transforming* (introducing business redefinition, new leadership style, rethink processes and new visions).

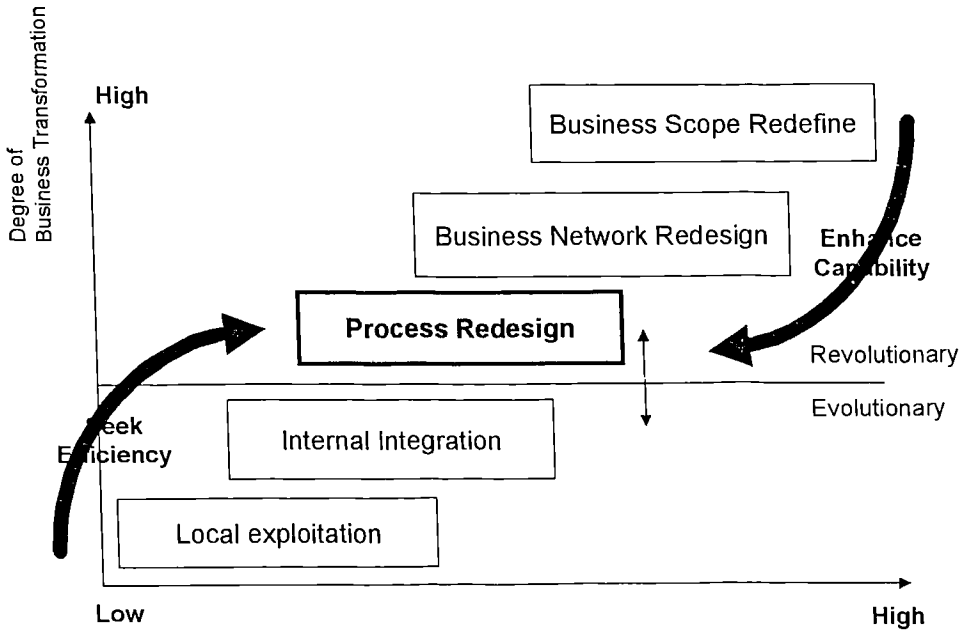
The RAND research also points to five influences of IT-enabled change on organisations (in Ciborra, 1993). The first is the efficiency effect, in which IT infrastructure allows barriers in time and space to be overcome. The second effect relates to the strategic content within which IT supports the collective problem-solving and decision-making necessary for the organisation to attain a given goal, thus providing a platform to implement new tasks in an improved way. The third effect is concerned with socialisation: by providing more opportunities for reciprocal exchange, IT allows the scope and depth of teamwork and, more generally, group activities, to be enlarged. The fourth influence is the learning effect: group members are able to learn about the setting they are immersed in, and to reproduce it more quickly than traditional practices. The fifth influence is the transformation effect: the interaction between team and IT leads to new ways of thinking and intervening,

resulting in the abolition of hierarchical forms and the introduction of a more flexible organisational structure.

Venkatraman's study (1994) proposes another strategic view for initiating IT-enabled change. He suggests that the exploitation of IT's potential depends on different degrees of change in the organisation. Based upon action research, his study outlines five types of IT-enabled change (see Figure 1): local exploitation, internal integration, process redesign, business network, and business scope redefinition. He suggests that businesses should determine the level at which the benefits correspond to the requisite changes before proceeding to any change initiative. The value of organisational change will be marginal if companies only superimpose IT on existing organisational conditions (such as strategy, structure, processes and culture).

There are two useful lessons to be seen in this framework. First, a distinction can be drawn between evolutionary and revolutionary changes (i.e. different scales of change) for different strategies of IT-enabled change. For changes occurring at the first two levels (local exploitation and internal integration), evolutionary changes are required in order to consolidate IT and organisational conditions. On the other hand, when companies pursue the later three levels (process redesign, business network redesign and business scope redefinition), revolutionary changes are preferred for IT and organisations to be blended together. This indicates an important issue: namely

that higher IT potential may require a higher degree of change and risk and different approaches (incremental or radical) to change. Secondly, this framework offers two strategies for linking the five levels of change: that is, bottom-up or top-down (centred on "process redesign"). The bottom-up strategy seeks to achieve IT-enabled change through an increase in process efficiency, starting from the local application of IT and upgrading to process redesign. The top-down strategy focuses on enhancing organisational capability, based on the development of new business ventures down to the consolidation of processes.



(Source: Venkatraman, 1994)

FIGURE 1. A Five-level Model of IT-enabled Change

All the prevailing evidence from the macro and micro viewpoints helps to explain why, over the past two decades, America's investment on IT has risen by 20-30% a

year, according to *The Economist's* survey of the world economy (Woodall, 1996). The survey reports that the share of IT's total investment in equipment has soared from 7% in 1970 to over 40% in 1996. In addition to the billion-dollar spending on software, the spending on IT exceeds investment in traditional machinery. Moreover, IT expenditures across the world are expected to expand from $800 billion (in 1992) to $2 trillion by the year 2000, representing 14% of the global economy (Alberthal, 1992). However, in spite of all the substantial benefits promised by IT-enabled change, Les Alberthal, a EDS Chief Executive, among others, points out that "businesses still don't know what to make of IT or how to realise its value." (Alberthal, 1992: 26)

1.2 THE BLACK BOX OF PARADOX

In theory, this enormous investment in IT should boost productivity growth in organisations. However, according to a survey in *The Economist* (Woodall, 1996), productivity gains in the digital economy have slowed down sharply since the early 1970s. This fact indicates that since the mid-1970s, the contribution to businesses from technological progress appears to be insignificant. This is an alarming message to businesses in every sector. The considerable investment in IT seems to contribute little to organisations and to society as a whole. The absence of a productivity growth

stemming from IT has come to be known among economists as the "IT productivity paradox" (Brynjolfsson, 1993, 1996; Brynjolfsson and Hitt, 1995, 1996, 1998).

If this economists' perspective does not seem convincing, evidence from an organisational level may surprise proponents of IT-enabled change. An estimated 60% (more than two-third) of organisations, both public and private, have reported failures in launching IT-enabled change (see the detailed discussion in chapter two). Although this IT productivity paradox has long been debated by journalists, economists and organisational theorists, the discussion tends to be limited to how productivity is measured, or to what factors of past success should be considered. Accordingly, there is little consensus, but one unanimous agreement is that effective IT-enabled change requires a consideration of the alignment of IT and business, as well as an in-depth understanding of the change unfolded in organisational dynamics.

Chapter two explores six potential answers as to why IT-enabled change may fail. The first answer is the dominant technical failure view, which assumes that the failure of IT-enabled change is due to ineffective use of IT. This perspective presumes that change requires a better method of system development. The second answer comes from journalists who criticise the practice of consultants, and is referred to as the "witch doctor syndrome" (Micklethwait and Wooldridge, 1996). This *witch doctor* viewpoint suggests that the IT productivity paradox arises because

of the inappropriate use of best practice. Consultants do not often consider the practical generalisability of their universal frameworks, and therefore neglect the context-specific problems of organisations. The third answer, management fashion, extends the argument, stating that these best practices are subject to the cycle of management fashions: when best practice is maturely developed, companies become converted to another fashion. The economists' argument (the fourth answer) is concerned with performance measurement, showing that the IT productivity paradox is due to the difficulties in measuring soft and intangible factors in change. Change measured solely on the basis of hard factors such as cost, cycle time and process efficiency will inevitably lose the organisational dynamics, thus leading to the paradox. The organisational behaviour (OB) theorists (the fifth answer) fill the intellectual gap left by the economists. One common thread in their findings is that the paradox is caused by the misalignment of organisational factors. Change should not just emphasise the particular aspect of organisational factors (e.g. culture or processes), but rather an integration of various factors at the individual and organisational levels. Furthermore, the contextualist view offers a sixth answer, maintaining that change should not be treated as a universal phenomenon. Rather, it should draw upon contextual influences and the specificity of organisations.

There are no certain answers to the paradox, but many explanations have been

attempted. It would be premature to claim that any one of these answers may resolve this long-standing debate. What is necessary here is to address the question: how can analysts understand the IT productivity paradox in a way that takes into account of the alignment and context-specific nature of change? The current studies underlie two converging themes. The first is *change alignment*, an acknowledgement of the integrated approach to change. This stresses the idea that IT-enabled change should focus not only on culture or strategy *per se*, but it should consider the alignment of IT and other organisational factors. The second theme is *change dynamics*. This requires analysts to reflect on the underlying assumptions of various practices in order to understand the guiding paradigms of change. Not until analysts can fully appreciate these paradigms can they break free of the conceptual constraints imposed by current thinking.

1.3 OVERVIEW OF TWO KEY THEMES

The first theme, change alignment, can be grouped into four schools of thought (technological imperative, strategic rationalism, strategic alignment, and dynamic learning). Each school has its own perspective on aligning IT and organisational change. It is not the purpose here to identify which school is the best or to suggest how these approaches can be improved. Rather, the analysis seeks to investigate the

alignment patterns of organisational change over time.

1.3.1 A First Inquiry: Change Alignment

Early thinking relating to change alignment can be traced back to the technological imperative school. This school (for example. Eason, 1988) argues that change can be accomplished through the advanced implementation of IT. The second school, that of strategic rationalism, stresses strategy-driven change where the role of IT is to support the guiding strategic initiatives (see, for example, Benjamin et al., 1984). The third school, namely strategic alignment, shifts the focus to the alignment of strategy and IT. It suggests that alignment is contingent, depending on which driver is used for organisational change (see, for example, Henderson and Venkatraman, 1993; Luftman et al., 1993; Earl, 1996; Luftman, 1996). Up to this stage, IT-enabled change is concerned mainly with the alignment between IT and organisational factors. This assumes that if companies can apply a planned approach to achieve appropriate IT-strategy alignment, organisational change should be effective. The fourth school, dynamic learning, examines the way in which change is introduced and assimilated in organisations (see, for example, Yetton and Sauer, 1997). Such a view opens a new window for change alignment, as change is conceptualised as an emergent approach; technology is no longer a driver, but an enabler to instigate gradual change. Learning

becomes a major factor in achieving the alignment of change.

Some problems emerge from this brief overview in terms of change alignment. First, the alignment behaviour of change does not have to be a static fitness, but may follow a dynamic path over time. Secondly, such a change alignment may offer some insights into how practitioners can manage the building of an integrated change agenda. Several questions may be raised: What factors drive change? What is the centre of change alignment? How can this driver affect alignment behaviour? Should the mode of change implementation be planned or emergent? Lastly, change alignment may present several alternatives, depending on the particular situation companies face, which may be better explained through various contingent models rather than one universal framework.

1.3.2 A Second Inquiry: Change Dynamics

The study of change paradigms is not a new subject. There are indeed many ways of classifying change paradigms (one such example can be found in Burrell and Morgan, 1979). However, there is little work on linking change paradigms to change practices based on different assumptions. A classical categorisation (mechanistic, organismic and social system as discussed in 2.3) suggests a tentative grouping that may be used for such a purpose. This study is mainly concerned with five perspectives:

programmatic change (under the mechanistic system paradigm), situated change, punctuated change, chaotic change (the last three are under the organismic paradigm) and contextual change (under the social system paradigm). This classification does not seek to present a chronological evolution, rather it attempts to illustrate the theoretical development of different attempts to conceptualise change and organisation.

The first perspective, that of programmatic change, dominates current change thinking. Based on the assumption of rationalism, programmatic change guides a planned approach of linear implementation of change in a plan-do-see-check model. Change is assumed to be static and subject to rational resolution by strategy-driven or technology-led initiatives. The next three perspectives (situated, punctuated and chaotic) are based on the organismic system assumption (Astley, 1985; Amburgey and Hayagreeva, 1996). Organisations are seen as living animals (or organisms) that are influenced by the natural selection of the environment. This environmental determinism viewpoint decides the fate of organisations, including how they should behave and how they could survive. The mission of organisational change, therefore, is to adapt to the environment. Under this assumption, organisations may encourage a response to the environment incrementally (situated change), radically (punctuated change) and in a real-time manner (chaotic change). Effective change is not chiefly

concerned with the application of strategy and technology, but with the adaptation to the environment.

The last perspective, contextualism (based on Pettigrew, 1987, 1988, 1990, 1992, 1997), seeks to offer a social-scientific emphasis. The human agency issue (interaction between human actors and their social structure) is the key to organisational change. The resolution of change depends on the recognition of contextual influences and conflicting frames (mental models) embedded in the organisation. However, although contextual change is a useful perspective, the concept is still empirically underdeveloped in practical change resolution, and this gap requires immediate attention.

Several key issues can also be derived from the overview of the three paradigms. As argued by Coomb (1997), IT-enabled change is a co-production of technology and organisation. Therefore, the conception of organisations will inevitably affect the way IT-enabled change is introduced. Although there is growing criticism of the dominant mechanistic system model as well as of the emergent organismic system model, little attention has been paid to the social system model. As more and more researchers devote themselves to contextual change, more questions remain unanswered: What alternative conception of change can the social system paradigm provide? What is the role of human actors? What is the effect of time in

organisational change? How can analysts relate the success of change to the four dichotomies: improvement vs. transformation, incremental vs. radical, divisional vs. company-wide, and determinism vs. voluntarism? For example, can it be assumed that the introduction of transformational, radical, company-wide change leads to successful change? In addition, is such change determined or voluntary? A quick resolution of these issues lies beyond the scope of this study. Rather, these problems are highlighted in order to explore different perspectives on change, in the hope that valuable insights may emerge, even if no breakthrough can be achieved. Equipped with these problems concerning IT-enabled change and its paradox, a research agenda can be proposed for this long-standing issue (see also the discussion in Astley and Van de Ven, 1983).

1.4 AN OLD QUESTION ASKED ANEW

In this research, the IT productivity paradox is re-examined from the viewpoint of change alignment and change dynamics. This concern can be expressed in terms of the following research question:

> How can the IT productivity paradox be understood with reference to the alignment of different organisational factors and the dynamic interaction between action and context?

The investigation requires a sophisticated approach. In accordance with the above

argument, this research will examine IT-enabled change in terms of the pattern of change alignment and the underlying logic of change dynamics. The ultimate concern is to explore an alternative way to conceptualise and implement change in relation to the planned approach to change. The research question can thus be related to two specific objectives: first, *to understand the alignment behaviour of organisational change*. The purpose is to adopt an integrative method of analysis in order to avoid an overemphasis on a particular change initiative (for example, process reengineering). By relating the data analysis to the MIT 1990s framework (Scott-Morton, 1991), the research seeks to investigate the alignment patterns of change implementation so as to understand better how key organisational factors are coordinated to achieve change. The second objective is *to investigate the dynamics of organisational change that generates hidden controversies in a context-specific situation*. The primary task is to explore the interaction of contextual influence and conflicting frames (mental models) that creates change in a context-specific organisational setting, and to investigate an alternative approach to change management that considers the dynamic complexity of change, in contrast to the planned approach generally used.

1.4.1 DEFINITIONS OF TERMS

The terms used in this study require some clarification. Some of the terms have been slightly redefined in order to enhance the coherence of the research, which consists of two parts. The first part employs five terms suggested by the MIT 1990s framework (Scott-Morton, 1991: 20, 21): strategy, structure, processes, people (individuals and roles) and technology. *Strategy* refers to the corporate strategy used in companies or the overall vision (mission) employed in organisations. This term also implies the course of change, which could appear in a planned or an emergent mode of change. *Structure* refers to both the formal and informal organisational architecture. In general, companies may employ a traditional hierarchical or matrix-based structure. Alternatively, companies may experiment with novel ideas such as network or virtual organisation. It should be noted here that "structure" is not equivalent to the term "social structure" used by structuration theory (Giddens, 1984). *Processes* refer to the "management processes" used in the MIT 1990s framework. A firm's process may include administrative processes within the supply chain or decision processes in the strategic planning line. *People* refers to the "individuals and roles" used in the MIT 1990s framework. The people factor used in this study includes culture, employee motivation, reward systems, education and training, job responsibility, and other people-related renewal initiatives. Lastly, *technology* is

mainly concerned with information technology, employed for effecting organisational change. The definition of IT ranges from traditional information systems to up-to-date applications (such as virtual reality technology).

The second part of the analysis is concerned with the term "contextual change". This term is related to contextualism (see, for example, Pettigrew, 1987, 1990, 1992, 1997; Steenbarger 1991, Thomas, 1996; Wilson, 1992; Leavy and Wilson, 1994), an approach which will be used throughout this study to investigate organisational change characterised by human agency and non-linear behaviour. Human agency refers to the interdependent relations between the conflicting frames (mental models) of social actors and the specificity of contexts (Schön and Rein, 1994). Non-linear behaviour refers to the reciprocal causal relationships exhibited in a problematic situation (see a series of discussions in Forrester, 1961, 1965, 1968, 1969, 1971, 1993, 1994).

1.5 OUTLINE

The main chapters of this study are arranged to treat the two research objectives in turn. Chapter 2 examines the current understanding of the IT productivity paradox in terms of change alignment and change dynamics. This review seeks to identify potential intellectual gaps in the current thinking about IT-enabled change. Chapter 3

explains the research design and methodology in terms of two phases (change alignment and change dynamics). Chapter 4 explains the phase one research, exploring the alignment patterns of IT-enabled change through a five-case analysis. Chapter 5 explains the phase two research and presents the empirical data of an in-depth case study through processual analysis and influence diagram modelling. Such a processual analysis enables this study to postulate a "reflective transfer" framework of change management. Chapter 6 synthesises the findings in the previous two phases and concludes with comments on the significance and limitations of the research, drawing lessons for future research directions.

Chapter 2: Literature Review

This chapter presents a review of the IT productivity paradox debate, beginning with an examination of the answers proposed by previous thinkers. Six existing viewpoints are considered: technical failure, management fashion, the witch doctor syndrome, the economist's view, the organisational behaviour (OB) theorists' argument, and the contextualists' insight (see section 2.1). Additionally, this review seeks to introduce the two major parts of literature, dealing with change alignment and change dynamics (see Figure 2), and present a critical analysis of the different methods of IT-enabled change to resolve the IT productivity paradox. The section on change alignment (2.2) investigates the alignment behaviour of IT-enabled change.

A comprehensive review of four main research streams (technological imperative, strategic rationalism, strategic alignment and dynamic learning) reveals different ways of understanding alignment behaviour. Subsequently, the section on change dynamics (2.3) has a further focus: to examine the underlying assumption that guides change practices. This involves a critical analysis of three change paradigms: mechanistic, organismic and social system. Within these three paradigms, five major change perspectives (programmatic, situated, punctuated, chaotic and contextual) are selected for further analysis. The review of these two themes seeks to suggest a list

of common concerns and problems underlying current change practices. In so doing, the review sets the scene for the empirical analysis (in chapters 4 and 5).

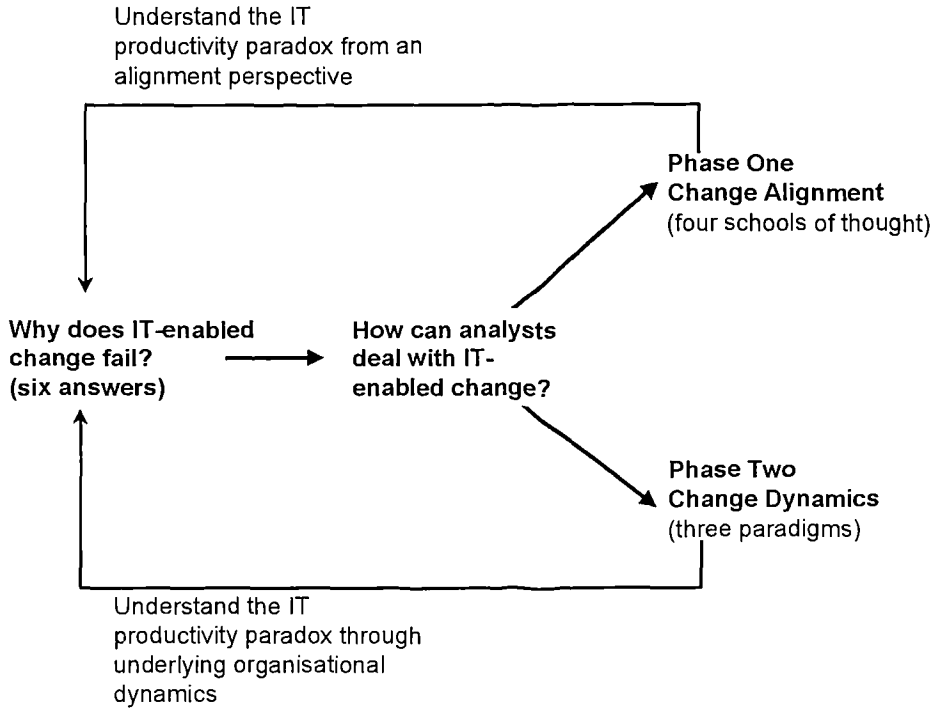


FIGURE 2. The Inquiry Framework of the IT Productivity Paradox

2.1 THE IT PRODUCTIVITY PARADOX: A RECONSIDERATION

In spite of vast investment in IT-enabled change, there is an alarming rate of outright failure or ambivalent success. In a study reported in Eason (1988: 12), 40% of IT-enabled change fail and another 40% only achieve marginal gains. Likewise, according to one widely quoted estimate (The Economist, 1994: 68), a higher rate of 85% failure is suggested. The study of Pascale et al. (1997: 139) traced the impact of change initiatives among the Fortune 100 and found that on average each firm

invested $1 billion in change programmes over a 15-year period (1980-1995). The study also indicated that only 30% of those initiatives produced any sign of improvement.

Examples of the paradoxical outcome of IT-enabled change including a number of failures examined by Robey (1997). In the case of Denver International Airport (DIA), a baggage-handling system was used to reduce cost and boost efficiency. However, once in place, the information system caused major disruption to DIA's operation. DIA had to adopt a concurrent manual system to resolve this problem, and in consequence it had to spend additional resources, while the baggage-handling operation was still interrupted. Another example is that of an IT consulting firm which attempted to introduce CASE tools to standardise the work of system development in order to deliver consultants' promises of timely technological implementation to clients (Robey, 1997). However, the introduction of CASE tools only caused more schedule delay and undermined consultants' ability to develop the system.

These two examples clearly illustrate the paradoxical nature of IT-enabled change. Of course, the IT paradox involves far more complicated causal forces. To appreciate these complexities, it is necessary to understand the development of various answers to the productivity paradox issue. The following explanations aim less to represent

these answers in chronological sequence, but seek to show the development of different kinds of thinking. A framework (shown in Figure 3) is used to guide the following literature review.

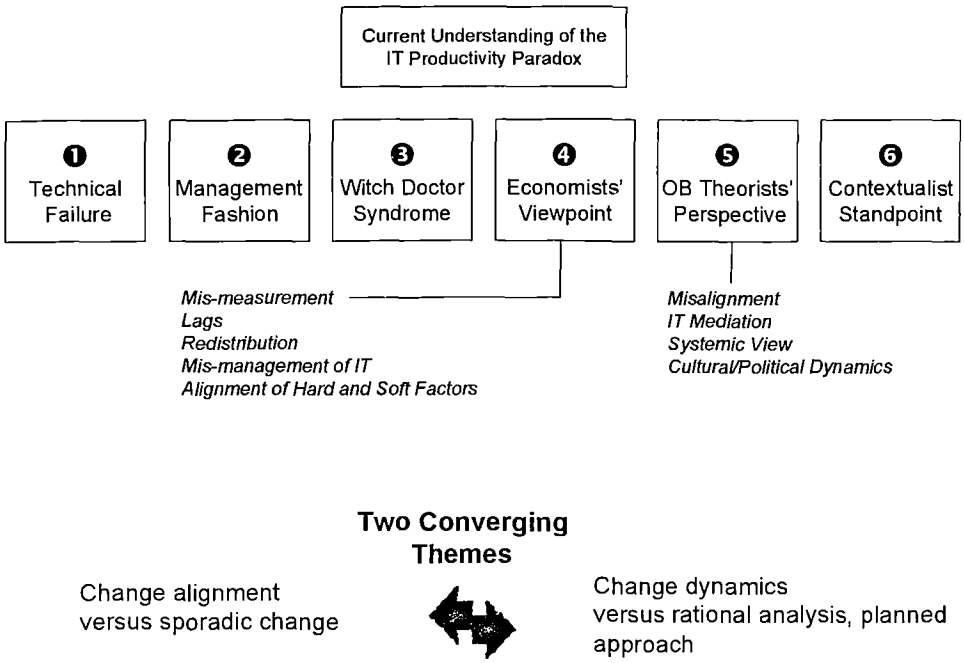


FIGURE 3. A Framework for Understanding the IT Productivity Paradox

2.1.1 COMMON SENSE VIEWS

Technical Failure

The first answer is concerned with solving the problem of IT implementation (Eason, 1988; Sauer, 1993; Martinez, 1995) by seeking a better way of introducing IT into organisations. In general, this thinking addresses three key actions. The first is proper

project management. Managers should define a clear vision and break down change projects into manageable parts. Occasionally they take into account soft factors, such as reducing fear (employees worry about losing their jobs) and turf-protection. The second requirement is the support of senior management. An unhesitant commitment from top management will ensure the success of the IT-enabled change initiative. The third recipe for success is the introduction of a user-centred system design. This requires system designers to collaborate closely with the user in the early stage of the development.

In this approach, technical people (IT managers or consultants) are presumed to play a leading role in change. As more and more companies outsource IT services, change is initiated through the best practice approach advocated by IT consultants. These dominant best practices (for example, total quality management, empowerment, reengineering) permeate into companies in the hope of bringing in better methods of IT-enabled change.

Management Fashion

This refers to the best practices, ranging from MBO (Management by Objectives), OD (Organisational Development), TQM (Total Quality Management) and Balanced Scoreboard to BPR (Business Process Reengineering), that attempt to create organisational change using pre-packaged products and technologies. According to

Pettigrew (1998), a common thread of such best practices can be traced. First, most of these fashions originate from USA-based management consultants. Secondly, these fashion providers extol the virtues of such frameworks by noting the successful experience of their prestigious clients. Thirdly, followers adopt the framework because of fear being different in the technical efficiency of such a method. As a consequence, imitators seize upon some forms of IT-enable change as a fashion. Fourthly, cycles of rejection follow as evidence accumulates about the framework's lack of effectiveness. At this stage, attempts will be made to customise the product to reflect to clients' specific needs. Finally, these management fashions are vulnerable to progressive adaptation and re-labelled as they move through the organisation. From high-profile hope to disillusion, another new fashion, reflecting a current managerial problem, will rise and repeat a similar cycle.

The IT productivity paradox can be attributed to the diffusion of management fashions (Gill and Whittle, 1992). The key idea is that these best practices are subject to the pattern of the fashion lifecycle, so that companies often fail to reap the benefits before these panaceas reach their maturity. Furthermore, these best practices emphasise only short-term solutions and ignore the soft (for example, cultural and political) factors and long-term implications. A more sympathetic view (Abrahamson, 1991, 1996) suggests that organisations may have no choice but to adopt and reject

many technically insufficient fashions while searching for a few efficient ones. Nevertheless, although different fashions emerge and disappear, there is still no clear understanding as to why competent firms are locked in the cycle of fashion.

Witch Doctor Syndrome

Consultants are often the perfect scapegoats. Recently, they have been nicknamed "witch doctors" (Micklethwait and Wooldridge, 1996) and criticised by practitioners for doing no more than suggesting different ways of repackaging jargon in order to translate common-sense ideas into obfuscated management fashions (Wooldridge, 1997). This dissatisfaction has now spread to the academic community, with the result that these management fashions are characterised as intellectually dead and methodologically sloppy, and are seen to cause a cycle of perpetual instability, subjecting employees to uncertainties and fears rather than revitalising organisations. The fundamental charge is that this cure-all approach ignores the significance of the human dimension. Furthermore, the value of best practice is dubious. The doubt is that if companies can buy such management advice openly in the market place, it is unlikely to confer any important productivity growth.

According to this view, the rationale for the IT productivity paradox lies in the role of these witch doctors (consultants). Often, consultants cannot afford to devote much time to a change project, and they use limited frameworks to analyse the situation.

The suggested solutions are usually based on intuition or on a series of quick interviews with the top team, representing only the opinion of authority. Change relying on such consultants' advice is grossly inefficient, because people do not trust anyone enough to tell the truth about how things really work. As a result, there is little deep commitment to change.

2.1.2 TOWARDS A SCIENTIFIC APPROACH

The Economists' Viewpoint

The above approaches to understanding the IT productivity paradox are based mainly on the impressionistic experience of practitioners. There is a lack of scientific foundation. Research launched by a group of economists in MIT Sloan School of Management sought to provide the first scientific investigation of the IT paradox (see Brynjolfsson, 1993; Brynjolfsson and Hitt, 1995, 1996, 1998; Hitt and Brynjolfsson, 1996). They offered a formal analysis through a statistical measurement of IT's value in relation to productivity in the American context. By applying economic theory, Brynjolfsson and his colleagues observe that there is no contradiction between IT investment and productivity growth on the organisational level. The IT productivity paradox is simply a matter of inappropriate measurement. Brynjolfsson's team offers four explanations for this paradox: *mis-measurement* (measurement error of output

and input), *lags* which are due to learning and adjustment, the *redistribution* and dissipation of profits, and the *mis-management* of information and technology.

The first explanation for the low measured productivity of IT is that output is not being measured correctly. This problem occurs especially when the productivity of IT in service sectors is measured. The conventional approach, used in manufacturing sectors, employing measurement such as defect rate, production gain and process efficiency, is inappropriate for information-based companies. Because information is intangible, increases in the implicit information content of products and services are likely to be underreported compared with the material content. The second explanation, lags, refers to the time delays in any payoffs to IT, since it may take several years to show the benefits of IT. The MIT research found that companies might spend two to three years on a learning curve before they benefit from investment in the infrastructure of advance technologies. Because of their unusual complexity, firms and individual users of IT may need experience before becoming proficient. The third possible explanation is redistribution, which observes that IT is used in "redistributive" activities among firms; that is, IT may be beneficial to individual firms, but may still be unproductive from the standpoint of the economy as a whole. In comparison to other goods, information is particularly vulnerable to rent dissipation, in which one firm's gain comes entirely at the expense of others,

instead of creating new wealth. A fourth possibility is that managers tend to misallocate and over-consume resources invested in IT, because of the lack of explicit measure of the value of information. The lesson is that more money spent on IT will not help unless these bottlenecks are addressed. Successful IT-enabled change must not simply overlay new technology on old processes.

While these four explanations provide insights into the IT productivity paradox, they still address only the economy-wide productivity rather than considering the implications on the organisational level. Their later research (Brynjolfsson and Hitt, 1998) addresses this problem by investigating the relationship between productivity and soft factors (such as the intangible factors of service quality). Brynjolfsson and Hitt (1998) maintain that soft factors should be included in the measurement in order to provide a more balanced evaluation of IT-induced productivity. Furthermore, they argue that the focus has shifted from measurement to implementation. Their research concludes that there is little evidence to prove that IT is unproductive; therefore, the question facing companies is not "does IT pay off?" but "how can we best use IT?" This highlights a need to integrate IT with other organisational factors (such as strategy, structure, processes and people). Effective alignment between IT and other organisational factors, is the key to resolving IT productivity paradox.

2.1.3 TOWARDS A SOCIAL-SCIENTIFIC APPROACH

OB Theorists' Perspective

None of the findings derived from the previous section (from economists' view) will surprise the OB (organisational behaviour) theorists, who address the IT productivity paradox from four perspectives: misalignment, IT-mediation, the systemic view, and cultural/political dynamics.

First, the *misalignment* proponents investigate how IT should integrate with organisational factors. For instance, Beer et al. (1990) argue that the IT productivity paradox results from the misalignment of employees' roles, responsibilities and relationships. The authors propose a "task alignment" model, arguing that corporate revitalisation lies in effective team coordination, deep commitment from the bottom line, and development of future competence. On the other hand, Harris (1994) holds that failure in IT investment is often due to of the lack of "organisational linkage", a misalignment between individual, group and organisational productivity. Companies should shift the focus of measurement to corporate behaviour in order to facilitate change. By enhancing such a linkage, individual productivity will propagate to the organisational level. In similar vein, Pascale et al. (1997) attribute the paradox to the misalignment of IT and employees' behaviour. They offer a "behavioural alignment" model, asserting that business transformation should implicate three major activities:

incorporating employees, leading from a distance (so employees can develop their competence) and instilling mental discipline (for example, to overcome employees' resistance to change).

A more complicated view is proposed by Sauer and Burn (1997), where they explore the concept of alignment pathology (also see Burn, 1993, 1996, 1997). They highlight three types of alignment pathology: misalignment, IT stagnation and globalisation. Misalignment refers to the situation where an organisation lacks internal fitness before IT is introduced. Therefore, the productivity paradox occurs because IT is placed into a misaligned organisation. IT stagnation happens when IT is out of phase with businesses, that is when IT capability does not grow with businesses. There are three possibilities. (1) IT's capability exceeds organisational needs (i.e. the capability of IT is more mature than that of organisations). (2) Although IT is in alignment with the organisation, the internal fitness does not align with the industry (i.e. there is a lack of external fit). (3) IT is unable to innovate and catch up with the growth of the organisation. Furthermore, in a global context ("globalisation"), firms may encounter alignment conflict (for example, local fitness does not align with global fitness) and alignment confusion (that is, when there are different stage of growth in the same company between different departments). Sauer and Burn (1997) maintain that all these three types of alignment problem can lead to

the IT productivity paradox.

Secondly, proponents of *IT-mediation* are concerned with the problem underlying the introduction of IT and the resistance of human actors. Zuboff's (1988) classical study of the impact of IT-enabled change attributes the paradox to three major dilemmas in the IT-mediated workplace (also see Strassmann, 1985; Hoffman, 1994). (1) Managers fail to recognise a transition in managerial control: from managing the division of labour to developing the division of learning. Thus, successful IT-enabled change needs to take into account a post-hierarchical relationship that emphasises the shaping and influencing worker's behaviour. (2) This post-hierarchical relationship results in a new role for managerial authority: managers need to control knowledge rather than routine tasks. (3) Because of the introduction of IT, employees' performance of tasks becomes an abstract concept. There is a fundamental effect on the social-psychological aspect of employees' performance of work. To capitalise on the benefit of technology, firms need to develop a learning organisation in which human actors can develop new skills to cope with the abstraction of work.

Another view of the IT-mediation argument is suggested by the perspective of the "social construction of technology", which explores the IT productivity paradox from the viewpoint of cognitive constraints within organisational members (see, for example, Orlikowski, 1992; Scarbrough and Corbett, 1992; Bloomfield and Coombs,

1992, 1997). According to this view, technology and organisation are closely intertwined through the flow of knowledge reinforced by individual interests. Thus, the introduction of IT-enabled change seeks to bring about a reconstruction of the social and power structure. Without acknowledging the embedded power influence, IT-enabled change will inevitably end in a failure.

Thirdly, the *systemic view* addresses the interrelated nature of organisational systems in terms of their reciprocal causal mechanism (see, for example, Forrester, 1968, 1971, 1994; Senge, 1990; Senge et al., 1994; Morecroft and Sterman, 1994). This view examines the pathology of the IT productivity paradox in terms of feedback loops in order to avoid breaking organisational systems down into independent causes generating independent effects. For example, in a study of the improvement dilemma, Sterman et al. (1997) explore the paradox of a TQM programme in Analog Device (a leading integrated circuit manufacturer). Analog's TQM programme was a dramatic success: yield doubled, cycle time was cut in half, and product defects fell by a factor of ten. However, its financial performance worsened. A systemic view helps to reveal part of this puzzle by building a system dynamics diagram to understand the multiple causality of problems. The company adapted its entrenched behaviour to achieve success and attempted to transfer this success when it subsequently experienced a similar decline in financial performance. But, this new

situation was caused by other contextual factors (in this case, the pricing mechanism in the market) rather than by a dysfunction of internal processes. Sterman et al. (1997) maintain that the neglect of this non-linear causality often leads to hidden resistance, thus bringing about inappropriate changes and causing a potential IT productivity paradox.

Fourthly, proponents of *cultural/political dynamics* explore the IT productivity paradox in terms of the soft dimension (as expressed, for example, in political, cultural, social and psychological factors). Thus, Pfeffer (1996) identifies four prohibiting barriers that cause the IT productivity paradox: strategy and financial barriers, social barriers, power and political barriers, and hierarchical barriers. In the first dimension, the IT productivity paradox may stem from ineffective strategy implementation or inappropriate financial measurement. Companies often treat organisational change efforts as expenses, with no corresponding returns that can be measured by conventional means. The temptation to cut these costs for reasons of financial stringency is overwhelming. The social barriers (the second barrier) refer to the social influence and pressure to imitate organisational actors. Pfeffer advocates a need to look beyond the romanticised role of leadership in change in order to understand how the socially shared mental model can affect IT-intervened change. The third factor explains the power/political barriers. Few managers are politically

secure enough to risk their careers to confront the existing political interests. IT-enabled change thus becomes a superficial act, bringing no real benefit to the organisation. Finally, there are two sources of hierarchical barrier inhibiting change: human resource executives and middle managers. Organisational change frequently requires the effective deployment of human resource programmes. However, in the traditional hierarchical structure, human resources executives have narrow career paths and a low power base. Therefore, they do not emerge as effective advocates of organisational change. In addition, the introduction of IT often involves the participation of middle managers and the reduction of layers. Participation means that power shifts from middle managers to the bottom line of the hierarchy, and the reduction of layers means the elimination of middle managers. This all adds up to resistance to change by middle managers, many of whom resent the loss of status and fear job insecurity. Similarly to Pfeffer's findings, other researchers also highlight the impact of political (Pettigrew, 1973, Davenport et al., 1992; Pfeffer, 1992), cultural (Tichy, 1983; Johnson, 1987, Hatch, 1993; Schien, 1996), social (Keen, 1981) and psychological (Isabella, 1990; Barr et al., 1992; Prahalad and Bettis, 1986; Stace, 1996) factors.

Another noteworthy contribution to the understanding of cultural/political dynamics is the study by Kets de Vries (1980) in the area of organisational paradox seen from

the viewpoint of psychoanalysis. This represents a clinical approach to the study of organisations. Kets de Vries (1980) examines the paradox from the perspective of the managers' irrational behaviour in the implementation of change. His research points out that organisations are not only shaped by the rational objectives of managers, but also by the unconscious concerns of the organisational members. The paradox of change needs to be understood not only in terms of conscious concerns within the process of decision making but also from the standpoint of human actors in situations of conflict, constrained on one side by environmental realities and on the other side by irrational motivation. For example, the study of Kets de Vries (1980) identifies salient patterns of irrational behaviour known as *folie-deux*. *Folie-deux* is a term originally referring to the adoption of mental processes from one person to another, but it can also be regarded as a collective phenomenon whereby entire groups of individuals become influenced by the delusive ideas of the affected person. The implication is that organisational change might be undermined by deluded managers who force the sharing of initiatives on to other members, thereby causing distrust, fractional struggles and frustration. An earlier concept, "groupthink", also embraces a similar view and explores such a paradox from a social-psychological perspective in the context of policy making (Janis, 1967).

Robey (1997) also offers a synthetic view to counter the rational view of

organisational dynamics, criticising the ideal conception of change leadership. In contrast to the "logic of determinism" (which refers to the rational view of change), he suggests an alternative way of thinking – the "logic of contradiction" – to analyse the change paradox. This contradiction logic stems from four branches of theory: organisational politics, organisational culture, institutional theory and organisational learning. These four theories view organisational change as a process in which transformation activities are opposed to a persistent structure (Robey, 1997: 216). By understanding this logic of contradiction, managers' change competence may be significantly enhanced.

Robey begins by stressing the "organisational politics" theory, a focus on conflicting interests in organisations. IT is used as a resource, grouped with opposing interests engaged in political activities, from which organisational change emerges. Organisations are embedded in a structure in which incentives of multiple parties are permanently misaligned. To resolve the IT productivity paradox, firms need to overcome political resistance to IT-enabled change through negotiation and comprise. The second logic is "organisational culture" theory, with its emphasis on cultural inertia. IT is produced and interpreted as a cultural artifact that may symbolise a variety of values and assumptions. Although IT is introduced into the firm, members may still cling to old values and stick to conventional working behaviour. Therefore,

technological intervention may cause cultural resistance that in turn undermines change. The third logic is the "institutional theory" addressing the legitimacy issue. Institutional practices, evolving over time, sustain an organisational legitimacy which is unlikely to change quickly. On the basis of this assumption, organisations tend to conform to institutional models, while seeking minor variations that can produce change. Therefore, IT may not be able to reform institutional practices, but can at least be adapted to them. The fourth logic concerns "organisational learning" theory. This view holds that change is a revision of organisational memory (i.e. individual cognition), consisting of understanding organisational identity, mental maps and stored routines for guiding members' behaviour. The existing memory often refuses to be eradicated, despite the infusion of IT, thereby causing resistance to IT-enabled change. These four theories, again, reaffirm the importance of organisational dynamics for an understanding of the IT productivity paradox.

Markus and Benjamin (1997) take the "logic of determinism" one stage further by examining the paradigmatic problem embedded in such a perspective. They maintain that an overemphasis on the use of technological innovation will invariably neglect the development of social innovation. Consequently, technology and social interaction may induce a new kind of IT-induced social behaviour which, if it is not coped with appropriately, may result in a socio-technical imbalance. Such an

imbalance, they suggest, is the primary suspect of the IT productivity paradox. They highlight a new direction to the investigation of the IT productivity paradox by examining the underlying assumptions implicitly embraced by human actors.

The Contextualists' Argument

An embryonic contextualist argument can be found in the study of Baskerville and Smithson (1995), which highlights three sources of problems in rationalism: the reliance on a single experience, the use of universal formulae, and the neglect of context-based factors. The first problem concerns the reliance on a single experience, which involves an overemphasis on one particular aspect of change implementation. Usually, the success of a single experience cannot be extended to other organisational settings without considering the appropriateness of such an experience. The second problem concerns an integrative use of universal formulae in order to implement change (see, for example, Peters and Waterman, 1982; Felkins et al., 1993; Eccles, 1995). This approach also advocates a packaged programme that incorporates key organisational factors such as strategy, structure, processes, technology and people. It invariably assumes that uncertainties can be minimised through definable goals; managers can control the factors to attain desired outcomes and to provide a cure-all solution. However, the linear and static nature of these universal formulae will inevitably fail to capture the dynamic complexity of change, and this therefore results

in the IT productivity paradox. Baskerville and Smithson (1995) suggest that both the previous elements (single experience and universal framework) fail to address the impact of contextual factors embedded in the organisation. They both presuppose that learning from one specific situation can be generalised to different settings without considering the contextual influence stemming from internal factors (such as political, social and cultural barriers) or external factors (such as the industrial life cycle). This warrants further investigation, and the challenge is taken up by the contextualist view (see, for example, Pettigrew, 1987, 1990, 1992, 1997).

The contextualism view maintains that organisational change cannot be understood simply in terms of skill-based approaches (i.e. by enhancing individual skills to master change) or ready-made models of best practices. Analysts need to "understand the complexities of the processes and the nature of change in order to steer their organisations through the dynamics of change" (Wilson, 1992: 122). Hence, the key to managing organisational change is to understand the contextual influences and thereby to predict the likely outcome of dysfunction.

To extend the organisational theorists' view, contextualism considers social influences stemming from both the internal and external contexts. The former refers to the social, political and cultural channels within the firm through which change proceeds. The latter refers to the social, economic, political and competitive

environments in which the firm operates. Furthermore, context is given a deeper meaning in order to explain the impact of organisational change, as Pettigrew explains:

> Context is not just a stimulus environment but a nested arrangement of structure and processes where the subjective interpretations of actors perceiving, comprehending, learning and remembering help shape [change] process. (Pettigrew, 1990: 270)

On the basis of this assumption, change processes should not be perceived merely as snapshots influenced by independent factors, but rather as a continuous, interdependent sequence of actions and events that can be used to explain the origin, continuance and outcome of change. As such, change processes are a sequence of individual and collective events, actions and activities unfolding over time (Pettigrew, 1997: 338). This standpoint extends the contextual factors through the introduction of two important concepts: human agency and reciprocal causation. First, human agency refers to the interaction of context and organisational actors, and is concerned with the dual qualities of action and context (that is, contexts are shaping and shaped, actors are producers and products). Secondly, context is a shifting concept in which social processes are inherently discontinuous and open-ended. Therefore, the outcome of change processes is a result of convergent interaction and interconnected loops rather than a consequence that may be attributed to single causality. Therefore, the issue of human agency is concerned with the interdependent nature of human

actors and contexts. Without realising the impact of multiple causality in human agency, the IT productivity paradox, from a contextualism angle, can be seen to arise from the failure to recognise the significance of non-linear behaviour.

2.1.4 Two Converging Themes

There are two converging themes that emerge from the review presented above (see Figure 3). First, there is a growing recognition of change alignment, highlighting the importance of an integrated change agenda rather than sporadic changes. Organisational change should not emphasise only one of the underlying factors, such as culture, processes, strategy, structure or technology. Rather, change requires a consideration of both technical and social elements, an integrative scheme to involve the whole range of organisational factors. Secondly, the dissatisfaction stemming form OB theorists' perspective indicates a prevailing recognition of the insufficiency of the rational analysis approach. OB specialists argue that organisational change should not be subject to the planned approach. In reality, it involves a large amount of interaction between human actors, producing cultural, political and social problems alongside technical problems. To transcend the limits of rationalism, firms need to understand the underlying assumptions of those change practices. This requires a re-conceptualisation of the organisational model that can facilitate a new

way of perceiving change.

These two converging themes help to establish the parameters of this study. In the next two sections, the issue of the IT productivity paradox is examined from two dimensions related to the current understanding with regard to change alignment and change dynamics. A focus on change alignment, the first dimension, will involve a review of four schools of thought to uncover theories proposed by various researchers, exploring different ways of aligning organisational factors to achieve effective change. A focus on change dynamics, the second dimension, involves a review of three change paradigms (mechanistic, organismic and social). The purpose of this part is to explore the problems underlying the dominant thinking of programmatic change, and to highlight the usefulness of other emergent perspectives of change.

The literature review does not seek to describe a "best" way of aligning change, nor is the aim to advocate a better perspective for conceptualising organisational change. Rather, the purpose is to understand the strengths and weaknesses of current thinking, thereby suggesting areas of enhancement. This may not in itself warrant a more effective way of change, but it will certainly provide an alternative way to stimulate new thinking about change, whilst challenging the fundamental assumptions embedded in current management thinking.

2.2 CHANGE ALIGNMENT: FOUR DOMINANT SCHOOLS

The first review is concerned with the alignment behaviour of organisational change. This includes four schools of thought: technological imperative, strategic rationalism, strategic alignment, and dynamic learning (as shown in Figure 4).

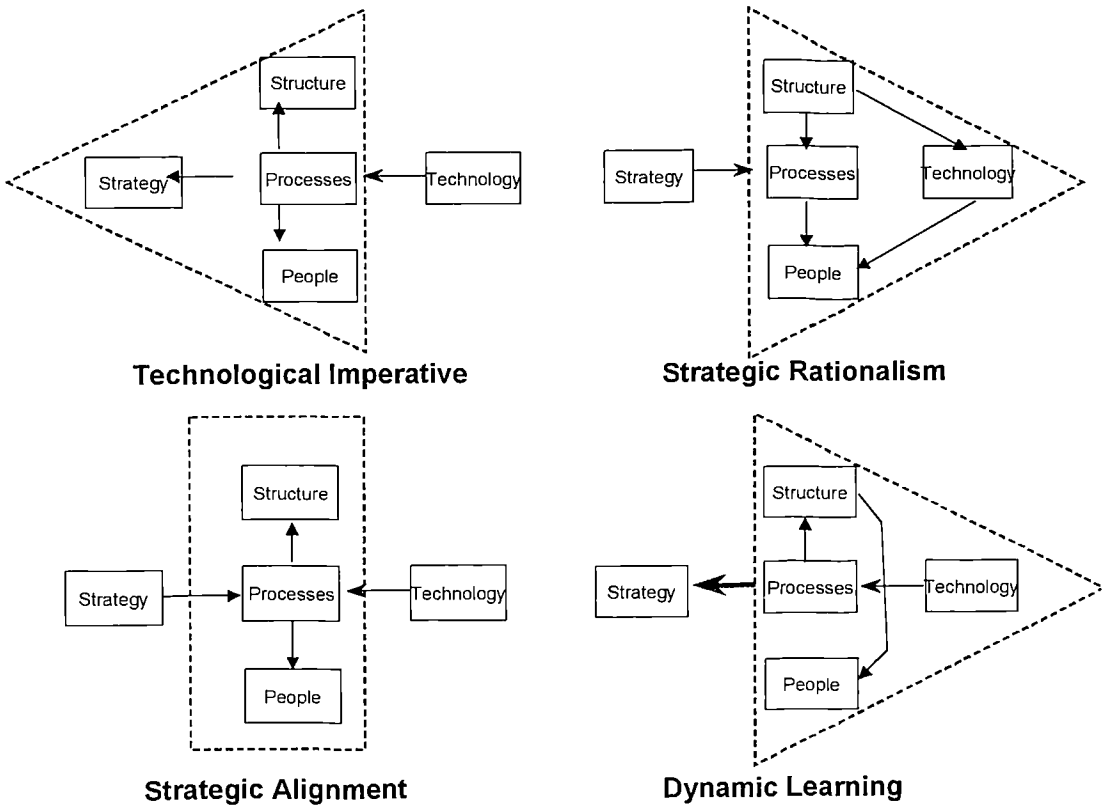


FIGURE 4. Four Types of Change Alignment

The analysis will consider each school of thought under scrutiny by examining its underpinning propositions. In particular, an analysis of the change pattern, based on the MIT 1990s framework, is used as a platform to illustrate the variation of different change strategies underlying each school (see the application in Craig and Yetton,

1994, 1997; Yetton and Sauer, 1997).

2.2.1 THE TECHNOLOGICAL IMPERATIVE

The first school, namely the technological imperative, emerges from the early use of IT. Change means the effective implementation of IT in functional areas, ranging from its traditional use in marketing, accounting, manufacturing, innovation and human resource systems to the advanced use of strategic information systems, computer graphics, expert systems, enterprise resources planning, and global information systems (see, for example, McFarlen, 1984; Wiseman and McMillan, 1984; Ghoshal and Kim, 1986; Synnott, 1987; McNurlin, 1991; Rockart et al., 1996; Rodriguez and Ferrante, 1996). The early focus is on the implementation of IT projects to automate processes, with the aim of achieving better performance in process efficiency, cost reduction and time to market. The central concern is about building the technical architecture, implementing systems and evaluating effectiveness.

A typical example of such IT-enabled change can be found in the study of Rockart and Hofman (1992). The focus of change is on building and delivering an effective information system characterised by two stages. Stage 1 is concerned with the envisioning of future environments that include the business, systems and

development environments. Stage 2 emphasises the building of systems in terms of tools, methods, system infrastructure, IT organisation, IT management processes, and IT staff. The overemphasis on IT inevitably raises organisational issues, especially those concerning people. The emphasis on system development and technical application does not fully register the concern of human factors. Therefore, the development of IT-enabled change begins by introducing user-oriented designs in order to incorporate employees (human actors) into the process of technological development. Change in organisational aspects such as job design, user acceptability, user friendliness and human requirement becomes a set of important soft issues that must be addressed (see, for example, Eason, 1988).

Another important development in the technological imperative school of thought is to align IT with business strategy. For example, Kovacevic and Majluf (1993) suggest a six-stage approach for such an alignment: (1) strategic requirement of IT, (2) an external analysis of the IT market, (3) the internal scrutiny of the IT platform, (4) the formulation of IT programmes, (5) the assessment of financial needs, and (6) the internalisation of the IT strategy. This six-stage model imitates project management procedures, stressing a technical alignment of IT and business strategy. Similarly, Martineż (1995) maintains that both business and IT should agree on where IT is expected to provide leadership and vision, and where IT is expected to

support business growth. In the same way, he suggests five prescriptions for building an IT and business partnership: redefining the role of IT in order to address the business agenda, assess current IT capability, develop a strategy-oriented IT architecture, develop an execution plan, and to ensure the execution.

The technological imperative school provides a typical planned approach to organisational change. Managers evaluate the critical success factors and devise a set of goals to resolve the problems. IT is used as a tool to support the goals and is imposed on the problem-solving. From this point of view, IT is used to facilitate a more productive way of working. The responsibility of IT specialists is to initiate, design and build powerful IT systems. However, guided by this thinking, managers tend to concentrate on technological use and distance themselves from the support needed to help people change. The underlying thinking presumes that when technology is in place, people will use the system properly, thus leading to desirable organisational change. As a consequence, people's resistance to change often cannot be overcome and IT can only be exploited as an automating tool.

To employ IT as an automating tool is bound to have a far-reaching impact on people. People may acquire unproductive behaviour instead of the desirable new working behaviour. For example, although the introduction of an information system may bring in a more efficient way of organising tasks, it may also prohibit people's ability

to learn and result in deskilling (Keen, 1991). On the one hand, employees gradually rely on IT to perform their tasks and also transfer their responsibilities to IT. Employees may detach themselves both from the real job and from developing the ability to use technology in order to support business growth. The consequence is that IT leads to even more entrenched working behaviour. As Markus and Benjamin note:

> When you have the elixir and tool of wisdom, people forget to think, to learn and to remember; and therefore they lose their wisdom. (Markus and Benjamin, 1997: 57)

The alignment pattern of change in technological imperative thinking signifies an IT-driven change in strategy, structure and people (see Figure 4), centred on the "processes" factor with a planned mode of change. The focus of this alignment is on developing the system and exploring better methodology to facilitate IT implementation. The role of IT is to impose organisational change and to force people to develop behaviour to suit IT's functions. This technology-based thinking corresponds to the above mentioned technical failure perspective of the IT productivity paradox. The central problem is the overemphasis on IT and the lack of strategic alignment, which is the core of the next discussion.

2.2.2 STRATEGIC RATIONALISM

The second school, that of strategic rationalism, places an emphasis on the use of IT to support strategic intent. The aim is to sustain competitive advantage through IT's ability to improve significantly a business's performance. The underlying rationale is that IT, in and of itself, does not assure corporate survival and cannot be used simply to overcome a poorly managed business. Rather, the success of IT-enabled change is dependent upon the merging of technology and business strategy. IT, in this respect, becomes a primary strategic concern rather than merely an administrative convenience.

The alignment of strategic rationalism can be illustrated through different methods of achieving IT-induced competitive advantages (see, for example, Parson, 1983; McFarlan, 1981; Benjamin et al., 1984; Ives and Learmonth, 1984; Cash and Konsynski, 1985; Clemon, 1986; Sass and Keefe, 1988; Tapscott and Caston, 1993; Ross et al., 1996). One approach is to apply IT to three levels of strategy: the industry, inter-firm and organisational (Parson, 1983). At an industry level, IT can be used to shorten the overall product life cycle and balance the trade-off between standardisation and flexibility. At an inter-firm level, IT can be used to support the network between buyers, suppliers and customers in order to confront competition. At an organisational level, IT can support three generic strategies: low cost

leadership, product differentiation and concentration on market or product niche (see also Porter, 1985; Clemon, 1986).

A second approach is added by McFarlen's (1981) study, namely a strategic IT positioning matrix consisting of four dimensions of change: support, factory, turnaround and strategic position (also see an extended version in Ward and Griffiths, 1996). This matrix positions IT strategy in relation to the impact of business operations according to a firm's condition. For instance, if a firm needs to support only administrative tasks, it may choose the "support" dimension, where the impact of operation is low and the exploitation of IT is minimal. On the other hand, if a firm requires entry barriers to be built, it may want to move toward the strategic position dimension, in which the impact of business operation is high and the exploitation of IT is maximal.

Furthermore, IT can be used to establish strategic advantages by enhancing the key resources embedded in organisations over time. This resource-based view emphasises the ability of IT to leverage key resources of firms (Feeny, 1988; Feeny and Ives, 1990; Mata et al., 1995). These key resources provide a main source of core competence within the organisation, characterised by two key features: (1) resource heterogeneity (resources that are different and distinctive from other firms) and (2) resource immobility (the difference between these resources may be long lasting).

The implication for IT-strategy alignment is to use IT to enhance these key resources in order support the viability of organisational growth.

Strategic rationalism complements the IT-strategy alignment discrepancy in the technological imperative school. However, it overemphasises the role of strategic leadership in effecting change. Most indicative of this is the study of IT-induced business evolution by McKenny and his colleagues:

> [IT-enabled changes] were led proactively by a management team driven to change its processes through the means of information technology. In most sagas, the CEO soon created a vision and pursued this vision in practical steps that changed their procedures and gained perspective on the potential use of IT. (McKenny et al., 1995: 210)

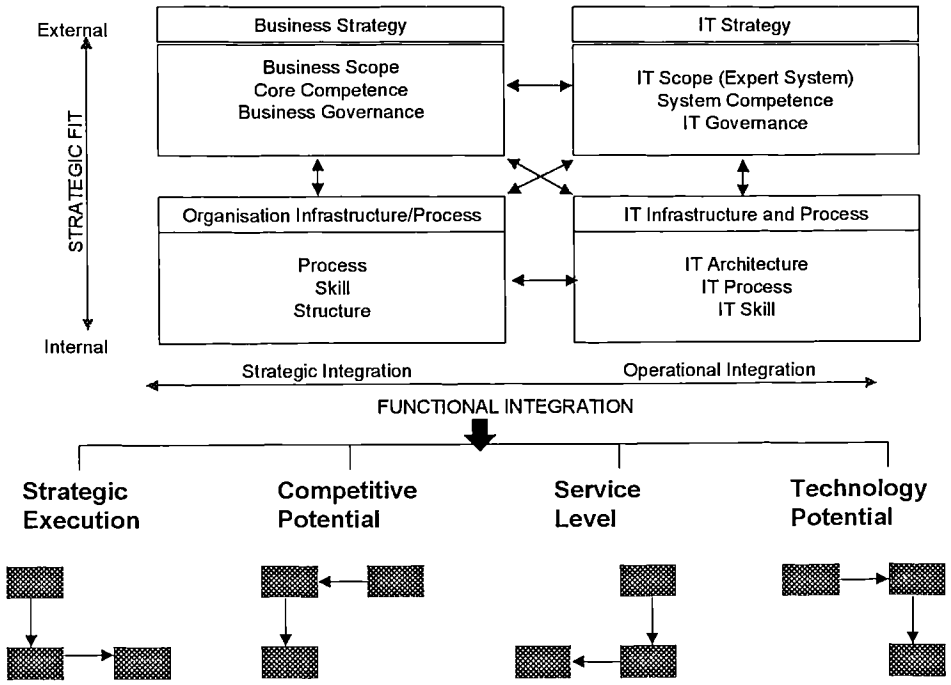
In contrast to the technological imperative, the alignment of IT and strategy relies mainly on heroic CEOs (or a top management team) who define a goal based on their insights for developing IT architecture, and in consequence, for sustaining a competitive advantage. Characteristically, guided by such a goal, IT-enabled change begins with an alteration in organisational structure, followed by changes in technological application and process redesign (see, for example, Child, 1987; Sampler, 1996). People then adjust their working behaviour accordingly in order to adapt to the overall organisational change. Such a change is guided by organised strategic planning, which is centred on structure to introduce an IT-enabled change. To this end, the role of IT is to support business strategy in order to achieve

competitive advantages in the market.

2.2.3 Strategic Alignment

Although strategic rationalism proposes an alternative method of IT-enabled change focused on IT-strategy alignment, it limits itself in scope to a single planned approach. Neither of the previous schools takes into account the contingent situation faced by a firm. The third school, strategic alignment, extends the planned approach of the previous two schools, and offers four contingent ways of aligning strategy and IT (see Figure 5). The strategic alignment viewpoint emphasises the coordination between IT and business strategy, and their integration with organisational structure/processes and IT infrastructure/processes (Scott-Morton, 1991; Allen and Scott-Morton, 1994; Henderson and Venkatraman, 1993; Luftman et al., 1993; Luftman, 1996; Parker, 1996: 375). From the MIT framework viewpoint, structure, processes and people are separated into the dimension of strategy and IT. Thus, the organisational structure/processes element includes the internal structure, processes and people, while the IT infrastructure/processes element contains the IT department's structure, processes and people. The benefit of this separation is to develop an alignment aimed at integrating the IT department and company-wide activities. The role of IT is mainly to align strategy in order to support change.

This model stresses two types of correspondence: the strategic fit between the external and internal environments, and the functional integration of operational and strategic activities. Moreover, it identifies four generic types of change alignment: strategy execution, competitive potential, service-level technology, and transformation alignment. Each represents a distinct, contingent situation that companies face. Strategy execution alignment employs an explicit business strategy to drive internal reorganisation which provides an execution plan for the IT department. Competitive potential alignment is preceded by an explicit IT strategy to develop a business strategy in order to guide firms' internal change. Service-level alignment applies an explicit IT strategy to consolidate internal IT operations and the subsequent organisational adjustment. Technological transformation alignment begins with an explicit business strategy intended to drive an articulated IT strategy, which in turn permits a corresponding preparation in the IT department to be set up. The strategic alignment perspective integrates the previous two schools of thought (technological imperative and strategic rationalism) by taking into account both IT and business strategy. But it provides only principles rather than practical guidance. More particularly, the concept of fitness among organisational factors is introduced in this school. The implication for IT-enabled change is concerned with fitness and contingent alignment that involves two extensions from previous thinking.



(Source: Adopted from Luftman, 1996: 390)

FIGURE 5. The Strategic Alignment Model

First, this model shows that strategy or technology can be drivers of IT-enabled change. Second, the two different type of driving behaviour can lead to four contingent planned modes of change. However, there are two problems that require further investigation. The first problem is that the organisational factors (structure, processes and technology) are aggregated into two dimensions: organisational infrastructure vs. processes and IT infrastructure vs. processes, and their dynamism in change may thus be neglected. The second problem is that this strategic fit model still employs a universal framework approach and does not consider the sequencing effect of alignment (i.e. how change may evolve over time).

2.2.4 DYNAMIC LEARNING

The dynamic learning school explores alignment by incorporating a social perspective. The dynamic nature of change alignment can be explored through the research of the Fujitsu centre (at the Australian Graduate School of Management). Yetton and his colleagues (see Yetton et al., 1994; Craig and Yetton, 1994, 1997; Johnston and Yetton, 1996; Yetton, 1997; Yetton and Sauer, 1997) propose a concept of "change path", though which they trace the development of an IT-based change initiative unfolding over time. There are two major aspects of this thinking. First, change is no longer considered as a planned activity, but rather, as an emergent one. Second, technology is treated as an inseparable part of social contexts. Change alignment should be neither technology-driven nor strategy-driven. Rather, the people factor should be placed at the centre of change, and the influence of learning and power dynamics should be seen to be as important as strategic planning or technical implementation. Additionally, the role of IT is to enable learning so that strategy, structure, processes, people and technology will cohere naturally.

The emphasis of the analysis is the sequence of a firm's change implementation. This helps to explain the different roles which organisational factors play in change alignment. For example, in a study of an architectural firm's IT-enabled change (Yetton et al., 1994), the firm employed IT as a driving force to change process and

structure, and emphasised organisational learning through which to experiment with the new technology. Therefore, change grew out of incremental investment, integration, and experimentation with IT. Gradually, people started transforming their behaviour by using technology and developing new working habits. This subsequently developed the firm's strategy in an emergent fashion to complete an effective change.

This change path concept offers a sequential way of thinking about change alignment. Change alignment in this sense is dynamic and reduces the risk of implementing everything at the same time. In the architectural firm example, the firm adapts IT and develops its competencies to use the technology before getting into major structural change. On the basis of this thinking, strategy does not align with IT directly, rather the alignment emerges through the learning process of using IT. IT has a different role: to build organisational capability through the learning process.

The findings of PICT (Programme on Information and Communication Technology) research support this dynamic, emergent and learning-centred approach of change alignment, extending the analysis to incorporate the concept of power to understand alignment behaviour (Bloomfield et al., 1997; Bloomfield and Vurdubakis, 1997; Knights et al., 1997). An example is that proposed by Knights et al. (1997), where the failure of IT-strategy alignment in a financial service firm is examined. They

maintain that organisational goals are not unitary, but should be seen as a conflicting, unclear political process. Change alignment may be associated with an implicit, incremental and emergent process in which individuals strive to legitimate the position of IT and to secure their own identities and interests in the organisation. Effective change alignment, thus, seeks to involve organisations in a dynamic process of learning, where managers take adequate account of power influences. The researchers argue that a successful model of change alignment should resemble the picture below.

> Decision-makers proceed cautiously, testing the waters, building on their competencies, adapting to their interpretation of the environment, while maintaining internal cohesion so far as possible (Knights et al., 1997: 28).

The key point here is the shift in IT-strategy alignment. The dynamic learning school promotes the awareness of IT's social impact. Change alignment, in this view, is concerned not with the IT-strategy fit, but rather with IT-organisation assimilation. This highlights the constitutive role of social relations in the development of technology, a standpoint that perceives technology as an integral part of social life. The implementation of IT is not just a technical issue, but requires also the involvement of human actors in parallel (Bloomfield and Vurdubakis, 1997: 85). The major implication is to separate the strands of the socially constructed meaning in developing and implementing IT through an emergent understanding of an actor-

power network. The alignment of IT-Strategy is therefore not a cause but a result of realising the impact of power dynamics stemming from social interaction. To achieve effective change alignment, managers need to appreciate fully the impact of the socially constructed meaning that is implicitly embedded in the process of rational analysis and technical implementation.

2.2.5 THE EMERGENT ISSUES

The above review is summarised in Table 2, where the underpinning factors are highlighted in terms of change practice, pattern of change, the role of IT, the approach to change, and the socio-technical aspect. Three major implications may be derived from this table.

Schools	Technological Imperative	Strategic Rationalism	Strategic Alignment	Dynamic Learning
Change Practice	System development	Strategic planning	Strategic planning	Learning and power
Pattern of Change	IT-driven, centred on processes	Strategy-driven, centred on structure	IT/Strategy-driven, centred on fitness	IT-led, centred on people
Role of IT	Imposed change	Support strategy	Support strategy	Enable learning
Approach	Planned	Planned	Contingent planned	Emergent
Socio-technical aspect	User-oriented design	Top management support and people empowerment	Organisational fit	Human-oriented influences

TABLE 2. Change Alignment: A Summary of Current Understanding

First, the role of IT has shifted from a deterministic role to a supporting role, and has been gradually transformed into an enabling role. This signifies a growing recognition of learning in terms of the people element. Secondly, the approach to

change has also shifted from the planned approach to the contingent planned and then emergent approach. Thus, change is no longer a universal, cure-all formula that managers can apply to the resolution of problems. Firms should no longer consider change alignment as a purely rational planned activity. Rather, they should take into account both the planned and the emergent aspects of change alignment.

Thirdly, there is a further noteworthy transition underlying the socio-technical consideration. For the technological imperative school, the focus is on user-oriented system design, stressing the need to consider the user's operational concern rather than designing a system based on the IT department's technical preferences. For the strategic rationalism school, the chief concern is with strategy-driven IT alignment. The socio-technical concern is with top management commitment and employees' participation. For the strategic alignment school, the socio-technical concern becomes a search for fit between strategy, IT and other organisational factors. The key consideration is to find a fit between these organisational factors so as to achieve a socio-technical balance. As for the dynamic learning school, the emphasis has shifted to learning and power with regard to the "people" factor. Firms need to achieve a socio-technical equilibrium by assimilating employees with the application of technology (by learning) and carefully resolving the political struggle that is likely to be embedded in the process of technological assimilation.

The above review of various schools of change alignment highlights at least three important lessons for the IT productivity paradox. First, change is an integrative act that takes into account all key organisational factors. Secondly, the resolution of the IT productivity paradox requires consideration of change alignment as a planned, contingent and emergent activity. Thirdly, some fundamental questions must be raised: How is change driven (i.e. what is the driver of change)? How is change controlled (i.e. what is the centre of alignment)? How should change be implemented (i.e. as planned or emergent mode of change)? Moreover, if analysts can find a better alignment framework that incorporate all the above questions, can the IT productivity paradox be resolved?

These questions defy any easy answers. However, they pave the way for the empirical study in chapter 4 that re-examines the various issues of change alignment. Moreover, a review of the change alignment literature leads to a recognition that change requires not simply a rational analysis that breaks down problems into components and tackles them individually. Rather, it is necessary to consider the interaction of action and context. This requires a comprehensive review of various change paradigms to unravel the underlying assumptions of organisational change and their influences on practices.

2.3 CHANGE DYNAMICS: THREE GRAND VISIONS

The way managers conceptualise their models of organisation will invariably affect how they implement change. Therefore, to investigate the underlying assumption of change, one has to study different organisational models. There are various typologies to investigate change paradigms that explore the fundamental assumptions guiding different change practices. However, these typologies tend to be normative, and this makes it difficult to trace the development of change paradigms. For instance, Pava (1986) proposes a matrix-based typology to study change from a system method angle. Nadler and Tushman (1989: 196) offer a matrix that classifies four types of organisational change (turning, adaptation, reorientation and recreation) based on a distinction between proactive and reactive change, and incremental and strategic change. Konsynski (1993) suggests another matrix-based typology to understand the dynamics of change from the product and process perspectives. McWhinney (1992) explores change typology through the interactive path of change (another matrix). The review here employs a classical grouping of three paradigms (see, for example, Gharajedaghi and Ackoff, 1984; Chaffee, 1985; Sheldon, 1986; Sztompka, 1993; Tsoukas, 1994): mechanistic, organismic and social system (see Figure 6).

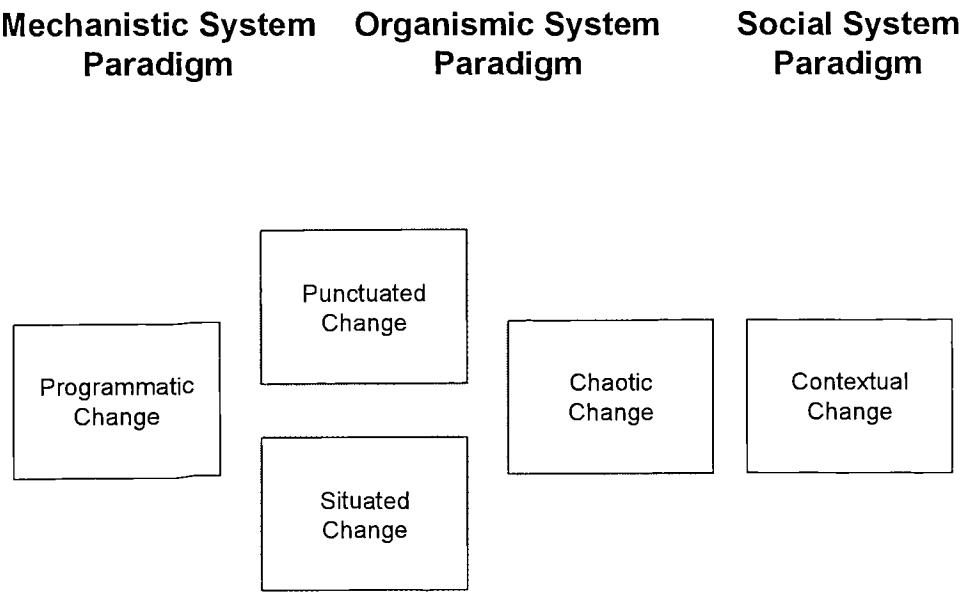


FIGURE 6. Three Change Paradigms

This arrangement has two purposes. The first is to contrast the predominant conception of change (the mechanistic system) and highlight the emergent thinking (organismic and social system). By doing so, this study extends this three-paradigm typology into five perspectives of change: programmatic, punctuated, situated, chaotic and contextual. This grouping seeks to explore the influence of different assumptions on current practice, thus providing a more sophisticated understanding of the IT productivity paradox. Such an analysis leads to the second purpose: to trace two important transitions in the development of change theory. This typology may be used to explore the transition of the causality of change and the determinants of

change within each perspective. The aim is to analyse two factors: the role of human agency and non-linear behaviour in existing organisational change theories. These two factors (as suggested by Gharajedaghi and Ackoff, 1984) are crucial in understanding the behaviour of change within a framework of growing uncertainty and increasing complexity (Cohen and March, 1976; Denis, Langley and Cazale, 1996).

2.3.1 The Mechanistic System Paradigm

The current literature on change is dominated by the mechanistic system paradigm with its emphasis on *programmatic change* employing a planned approach (see the discussion of this term in Pettigrew, 1998; Robertson et al., 1993). As suggested by Gharajedaghi and Ackoff (1984), a mechanistic model conceptualises the organisation as a machine that works with a regularity dictated by the causal laws of nature. There are two assumptions behind this view: first, the concept of change can be completely understood; and secondly, such understanding can be obtained by rational analysis. This rational analysis generally consists of two steps: (1) it separates the components and explains the behaviour of the parts individually; (2) the analysis can then aggregate the understanding of the various parts into an explanation of the whole. As a result, this mechanistic model becomes, in practice, a hierarchical

structure that is centrally controlled by a completely autonomous authority. The latter can influence the whole system. Frequently, members of the system (other than the authority) are deprived of information, except those who are required to do their jobs. Instructions from the authority are often not explained, justified or challenged.

Tsoukas (1994) refers to this mechanistic model as "social engineering" and offers a more complicated account of its nature. He concludes that the mechanistic model equates with management through control, conceiving managerial activity as a regulatory process consisting of four elements. First, the objective of the organisation must be specified. Secondly, the outcome of organisational change must be measurable and consistent with the specified objective. Thirdly, these measurements must exist in certain causal relationships through which managers can adjust their actions in case the objective is deviated. Fourthly, these deviations will subsequently be corrected through intentional actions. According to Tsoukas (1994), there are three key assumptions embedded in this social engineering conception. (1) Organisations are viewed as orderly entities that can be rationally designed so that their internal and external coherence matches their environments (see, for example, Galbraith, 1977; Mintzberg, 1979). Organisational order is empirically manifested as a set of stable regularities that are expressed in the form of prepositional logic (for example, *if* condition A, *then* consequence B). The implication is that managers have

to understand these regularities in order to influence at will certain desirable outcomes. (2) The mechanistic model assumes the interdependent relationship between individual members and the organisational system. Individuals can analyse rationally the organisational system without being affected by their relationships with it. Similarly, regularities (e.g. company goals) can be imposed from outside the organisation in a way that is independent from individuals' beliefs and interpretation. (3) This orderly nature thus allows managers to accumulate predicative knowledge of these regularities (e.g. how to set up a production line). Such knowledge can then be used to guide managers to achieve desirable goals in the future. Furthermore, this knowledge should be justifiable scientifically (based on rational analysis) in order to produce viable management principles, and should seek to search for regularities, establish their validity and codify them in the form of rules. To this end, practitioners can then apply these rules to manage change with confidence.

Mintzberg (1994) examines this mechanistic model and explains the derived planned approach of change. He maintains that this mechanistic view presumes that organisational members have no free will of their own. It is the top management who is privileged to think, direct and provide purpose for employees from above. Therefore, the mechanistic system assumption advocates a planned approach, a quest to prepare for all contingencies (to miminise surprises), reduce risks and bring order

to change implementation. This planned approach, in other words, seeks to provide a prescribed universal framework through which the top management can effectively steer the organisation and resolve virtually any problems.

Three Forms of Programmatic Change in Practice

The programmatic change perspective can be examined in terms of three major forms of framework: matrix, recipe-driven and static. The first approach, the matrix framework, typically positions organisational change within a two-by-two matrix. For example, in a study of a mature business renewal, Baden-Fuller and Stopford (1992) use a matrix to position the critical path for corporate renewal within a matrix consisting of two dimensions: simple/complex business and static/dynamic organisation. They argue that change involves rejuvenating firms into entrepreneurial organisations and thus maintains strategic innovation. According to this matrix, there are four stages for rejuvenation: (1) galvanise the top team -- create a top management team dedicated to renewal; (2) simplify the tasks -- cut complexity; (3) develop new capabilities; (4) maintain momentum and extend the advantage. This matrix-based framework offers a positioning approach to strategic change. Generally, managers can rationally analyse and plan their change by positioning the solution in such a matrix. Other exemplary matrix frameworks can be seen in the studies of Dunphy and Stace (1988), Ghoshal and Barlett (1996), and Charkravarthy (1997).

The second approach exists in a recipe-driven framework, adopting the "plan-do-see-check" model to provide a blueprint for change implementation (see, for example, Quinn, 1980; Beckhard and Harris, 1987; Nadler and Tushman, 1989; McCalman and Paton, 1992; Felkins et al., 1993; Hardy, 1994; Carnell, 1995; Hambrick and Nadler, 1998). Typically, the recipe-driven approach views an organisation as an input-output system in which components can be decomposed into individual functions. Change management signifies a sequence of setting vision, identifying goals, implementing change plans and measuring performance. Moreover, managers can direct successful change management through selected key factors. For instance, Hardy (1994) proposes a three-step approach (strategic intent formation, alignment and convergence) to achieve change. Spector (1995) suggests a cyclical sequential path for corporate revitalisation. Although he acknowledges the complexity of change, he maintains that change should be implemented sequentially through six phases: shifting market demand, acquiring visionary leadership, building a shared diagnosis of top management team, redesigning customer-focused processes, diffusing learning across boundaries, and realigning systems and structure. Beckhard and Harris (1987) advocate a more comprehensive list consisting of eight "must-do" factors: devising goal-oriented future, decentralising power to the bottom line, facilitating employees with information, designing a performance-related reward

system, establishing an open communication climate, encouraging collaboration rather than competition, reinforcing the value of employees, and introducing continuous learning.

The third static approach to change is represented in universal frameworks characterised by key organisational factors. Often, this approach aggregates the key successful factors into major components and draws prescriptions from such an all-embracing model. For example, the framework suggested by Tushman and O'Reilly (1997) stresses that successful change needs to balance the factors of strategy, people, structure, technology and processes in order to achieve innovation. Similarly, Burke and Litwin (1992:526) suggest another universal framework based on two sets of factors: transactional and transformational. Managers need to initiate new behaviour from people in order to effect these factors. Other frameworks may include more detailed factors such as staff motivation, culture, empowerment and leadership, but they simply provide either a functional-focus (e.g. process-oriented) model or an all-embracing framework (see, for example, Nadler, 1981; Peters and Waterman, 1982; Goulillart et al., 1995; Pendlebury et al., 1998; Taffinder, 1998).

Reflections on the Mechanistic System Paradigm

Although these three forms of rational analysis may not necessarily be false, they are certainly one-sided. As explained in section 2.1, more and more dissatisfaction is

mounting regarding this programmatic approach. As Gharajedaghi and Ackoff note:

> Commonly prescribed remedies are increasingly ineffective and often make thing worse. The growing number of social crises and dilemmas that we face should be clear evidence that something is fundamentally wrong with the way we think about social systems (Gharajedaghi and Ackoff, 1984: 290).

The authors observe that the programmatic model can operate effectively only if the environment is static. Usually, it forms a vicious cycle that reinforces rigidity and excessively close adherence to rules and authority. Such a rational approach is also criticised by other key thinkers. For example, March and Simon (1958) explain the problematic nature of programmatic change through the concept of "bounded rationality". They note that

> Because of the limits of human intellective capacities in comparison with the complexities of the problems that individuals and organisations face, rational behaviour calls for simplified models that capture the main features of a problem without capturing all its complexities. (March and Simon, 1958: 169)

In their view, programmatic change is unachievable and invariably naïve. People are imperfectly rational due to the limits of human information processing and communication. This bounded rationality varies from one discipline to another, but it can always be reduced to one important message: *control.*

Tsoukas (1994) explains that the illusion of control is caused by the neglect of the time-dependent nature of change. He argues that rational control simply ignores the

organisational dynamics and their change over time. It is not possible to manage such a dynamic nature of change through a universal framework based on a timeless and linear causal logic. In addition, Knights et al. (1997) analyse the illusion of control from a socio-scientific viewpoint. They call this programmatic change an "excessive rationalism" (p. 19) that assumes that organisations can produce an explicit strategy to steer the course of change. They maintain that although people, technology and structure are all subject to managerial control, this perspective takes inadequate account of the politics and power configurations within an organisation and the dynamic process of ongoing change. As a consequence, it prescribes remedies that are destined to fail. Furthermore, Pettigrew (1998) highlights the potential danger of programmatic change. He points out that change may be endangered by the heavy hand of the past, and that the processes of change are contextually embedded. Programmatic change, failing to consider these dynamics, often proposes a solution in search of a problem. According to Pettigrew (1998), such programmatic change will only encourage representational learning (through jargon) rather than behavioural change at the fundamental level.

To reflect upon programmatic change, two theoretical lenses, *technological determinism* and *managerial voluntarism,* may be used to understand their common threads. From the viewpoint of technological determinism, technology is the

instrument for steering change. This approach seeks to set clear objectives and introduce new technologies, and it expects problems to be resolved. Better procedures, methods and tools are the key to successful change management. From the standpoint of managerial voluntarism, programmatic change assumes that the top management team is the main source of initiating changes. This treats the change process as a series of discrete events to be managed independently of the continuous process of organisational activities through which human actors are seen as mechanistic entities to be manipulated at will (Wilson, 1992: 12; Orlikowski, 1996: 64). As a result, the involvement of human actors and contextual influences is assumed to be minimal and to have little effect on change. This approach in fact romanticises the role of leadership: effective change needs a visionary leader who can establish clear goals, motivate people and achieve a desirable outcome. The two approaches result in a goal-directed behaviour of change implementation. Obviously, they will be useful only in cases where there is a minimal influence of people and the embedded contexts. When a situation involves sophisticated interactions of human action and context, programmatic change becomes insufficient to support the resolution of change.

In summary, although programmatic change seeks to provide a prescriptive solution through different forms of generalisable frameworks, there are two fundamental

problems. First, programmatic change perspective describes change in terms of discrete events influenced by individual organisational factors. This invariably fails to explain fully the dynamics of change. Secondly, the programmatic change neglects the context-specific impact and time effect of change. Each firm has its unique problems embedded in specific contexts over time, and therefore it is difficult to use one particular framework to provide a cure-all remedy.

2.3.2 The Organismic System Paradigm

The organismic conception is borrowed from biology and physical science. In contrast to the mechanistic system paradigm that sees organisations as machine-like entities, the ecological viewpoint emphasises the importance of seeing organisation as a living organism (see, for example, Barnett, 1990; Mezias and Glynn, 1993; Baum and Singh, 1994; King, 1995). Although this conception offers a new window to understanding change within organisations, it would be inappropriate to treat the organismic paradigm as an umbrella term. To understand the ecological view and its implications for organisational change, it is necessary first to trace the theoretical development of this paradigm in terms of three perspectives: situated, punctuated and chaotic change.

Three Perspectives: Situated, Punctuated and Chaotic Change

The *situated change* perspective relates to the emergent type of change which progresses in an incremental way (see, for example, Suchman, 1987; Orlikowski, 1996). This perspective conceives of change as a stream of small mutations, gradually shaped by natural selection into novel forms, and refers to a kind of change that is subtle and smooth, grounded in the continuous practice of organisational actors. Change, in the situated perspective, emerges from organisational assimilation to everyday activities and their unintended (often tacit) consequences. As Orlikowski notes:

> Such organisational transformation is grounded in the ongoing practices of organisational actors, and emerges out of their (tacit and not so tacit) accommodations to and experiments with the everyday contingencies, breakdowns, exceptions, opportunities, and unintended consequences that they encounter. (Orlikowski, 1996: 65)

According to this view, change is seen to be an improvisational process in which organisations assimilate problems rather than a programme staged by managers (Orlikowski and Hofman, 1997). The nature of the change process is, hence, emergent and incremental, exhibiting similarities to the concept of qualitative "metamorphosis". This idea refers to a kind of change that, through the evolution of time, emerges variation gradually and continuously by a series of situated accommodation, assimilation and adaptation. As a result, fundamental change is

achieved through incremental modifications enacted over time.

In exemplary practice, situated change is demonstrated by the incremental transformation of organisation through groupware systems (see Orlikowski, 1996; Orlikowski and Hofman, 1997). In Orlikowski's study, the introduction of IT-enabled change adapted different evolving stages of planned and emergent change in Zeta Corp, a top-fifty software company in the USA. At the outset, Zeta introduced an information system to handle entering calls and documenting processes. This technology was then assimilated through a quality improvement programme in an emergent process. Later, when Zeta gained better experience and ability in using such a system, they moved on to a second structural change, involving the separation of two lines of reception in order to redistribute call loads. A crisis emerged from this restructuring, and Zeta thus redesigned the job function in order to achieve synergy between people and technology. This gave rise to another new method of working that enabled employees to collaborate in a proactive way. As Zeta extended its global ambition, the information system again served as a training mechanism for supporting this expansion.

Other practical implications of the situated change perspective can be found in incremental adaptation (Quinn, 1978; Mintzberg and McHugh, 1985; Burgelman, 1991; Rajagopalan and Rasheed, 1995; Greiner, 1998). The formation of change is

an interactive learning process in which managers gradually work out a strategy in their minds and orchestrate acceptance within the organisation. Often, organisations do not know where the goal of change is anchored; change is a series of decisions resulting from improvisation. This improvisation process consists of both planned and emergent approaches, a term called "logical incrementalism" (Quinn, 1978), which involves an ongoing change characterised by rationality-unfolding (Johnson, 1988) and discovery-driven (McGarth and MacMillan, 1995) fashions.

In contrast to the gentle approach of situated change, the *punctuated change* perspective adds a revolutionary view of change. Based on a concept derived from punctuated equilibrium (see Kuhn, 1970; Abernathy and Utterback, 1978; Miller and Friesen, 1980; Miller, 1982; Tushman and Anderson, 1986; Gersick, 1991; Romanelli and Tushman, 1994; Greenwood and Hinings, 1996; Sastry, 1997), this perspective proposes a radical and drastic method of organisational transformation. This change perspective states that systems evolve not through gradual progression but abruptly through a sudden, revolutionary punctuation of rapid change. Although there are various tenets of punctuated change, in principle they contain three important concepts: deep structure, equilibrium period and revolutionary period. In order to understand punctuated change, these three key concepts need to be synthesised.

Deep structure is the underlying configuration in which a system's components are organised. It consists of the basic forces which control the behaviour of the system. The premise is that the evolution of a system maintains the path influenced by its deep structure. When a system enters the *equilibrium period*, change proceeds at a pace so slow that it is not noticeable on a human time-scale. However, when the system enters a period of punctuated equilibrium (i.e. a *revolutionary period*), using ecological terms, the environment suddenly changes, and what has been the dominant species rapidly dies out to be replaced by some other species. Evolution in this period is revolutionary and takes a quantum leap (Miller and Frisen, 1984). Natural selection suddenly alters the core of the system and destroys the existing deep structure. During the period of punctuated equilibrium, uncertainty reigns, and, towards the end of this period, a set of new, totally different deep structures slowly evolve. Examples drawn from the application of this punctuated equilibrium concept include the extinction of dinosaurs and the industrial revolution.

The practical implication of *punctuated change* involves a consideration of change as a discontinuous and radical process triggered by the environment. The change practices affected by this thinking include, for example, business process reengineering (Davenport, 1992; Hammer and Champy, 1993), creative destruction (Biggart, 1977; Nolan and Croson, 1995; Nadler et al., 1995), retrofit (Neal and

Tromley, 1995) and revolutionary strategising (Hamel, 1996). This punctuated change seeks to abandon existing systems and to implant completely new systems (such as a revamped business process or a subversive strategy). This radical approach to change may work for firms with ingrained inertia, and the abolition of some particular part of the system will not produce disruption to the overall operation. For firms that cannot afford a complete halting of their business operations, such a punctuated change often generates confusion and may lead to an interruption of business.

The third, *chaotic change* perspective, emerges from the science of complexity (see Stacey, 1995, 1996; Parker, 1995; Thiéart and Forgues, 1995). Organisations are viewed as complicated, interconnected systems composed of many feedback loops. These feedback loops can be used to capture a system's non-linear interaction with the environment. Although there is a variety of definitions, six principles may be summarised to facilitate the understanding of chaotic change.

First, the chaotic change perspective sees organisations as complex adaptive systems characterised by non-linear behaviour in which the results of small changes may escalate into major changes. Non-linear systems do not exhibit an additive property; rather they exhibit synergy in the sense that they are more than the sum of their components (Parker and Stacey, 1994: 12). In a chaotic system, small changes in one

part of the system may reinforce or balance themselves to create unexpected consequences. Secondly, these non-linear changes are a result of self-organising interactions which produce random results. When non-linear feedback systems are pushed far from equilibrium into a state of chaos, they are capable of spontaneously producing unpredictable, complex forms of behaviour through a process of self-organisation. Thirdly, the self-organisation will result in an interdependent situation where organisations interact actively with their environments. However, the energy of self-organisation will stem mainly from informal networks rather than formal organisational structures. Fourthly, effective change depends on operating in the domain of "bounded instability", a state which exists between stability and instability. Informal networks are formed randomly by chance encounters or organisational interactions. They produce unstable dynamics and contradict the formal system (i.e. the formal organisational structures) in order to provide the force to maintain stability. The interaction of formal and informal systems is characterised by conflicts, and results in innovative chaos. In consequence, this chaos provides the essential force for organisational transformation. Fifthly, bounded instability creates a new order out of the old order through dissipative equilibrium. Dissipative equilibrium is capable of amplifying fluctuation in the environment so as to disrupt existing patterns of behaviour. In this way, organisations evolve in an unexpected and sudden

fashion into a more complex mode of change. As a result, they become more capable of renewal by means of the persistent exchange of instability and stability (i.e. by operating in the realm of bounded instability). Sixthly, according to this chaotic behaviour, the periodic and unheralded phases of chaos result not from external factors but from some underlying structures of the system. Therefore, change depends mainly on the different features of internal structures within informal networks rather than on environmental forces.

This chaotic change perspective has four major implications for the management of change (see, in particular, Stacey, 1994; Parker, 1995). (1) In order to produce innovative behaviour, systems must operate through a dissipative equilibrium which simultaneously maintains the continuous provision of stability and instability. In other words, effective organisational change requires the avoidance of an equilibrium between total instability (which leads to confusion) and complete stability (which means that the system fails to adapt). (2) The change process depends on internal, spontaneous and self-organising agents, and is provoked by instabilities. It leads potentially to an emergent order. (3) Systems that are incapable of spontaneous self-organising will be weeded out through competition (i.e. natural selection by the environment). (4) The preferable condition is thus one of "bounded instability", which encourages dissipative equilibrium behaviour as an input of energy for

organisational change.

One example of the application of this chaotic perspective is the concept of "competing on the edge" (Eisenhardt, 1989; Eisenhardt and Tabrizi, 1995; Brown and Eisenhardt, 1997; Eisenhardt and Brown, 1998; Conner, 1998). In particular, in the work of Eisenhardt and her colleagues, five features of chaotic change (improvisation, co-adaptation, regeneration, experimentation and time-pacing) are proposed as guidelines for managing change (see Table 3). The third column (Edge of Chaos) shows that firms should operate between two polar modes of chaos, maintaining bounded instability in order to remain viable for complex change. However, although this chaotic change concept provides an elegant theoretical conceptualisation, its practical implications for change management are not yet clear.

Chaotic Change	Organisational Implications	Edge of Chaos	
Improvisation	Adaptive innovation via semi-structures Real time communication	Chaos trap	Bureaucratic trap
Co-adaptation	All businesses are unique Focused collaboration	Lockstep trap	Star trap
Regeneration	Exploitation of the past Modularity	Overconnect trap	Disconnect trap
Experimentation	Flexibility of options Learning to be proactive	Foresight trap	No-sight trap
Time-pacing	Choreographed transitions Rhythm in chaotic order	Event pacing	Rhythm

TABLE 3. Organisational Change from a Chaotic Change Perspective

(Source: excerpted from Eisenhardt and Brown, 1998)

Reflections on the Organismic System Paradigm

Thus far, the organismic system paradigm has been understood in terms of five major theoretical positions (see Gharajedaghi and Ackoff, 1984: 292; Chaffee, 1985: 93; Morgan, 1986: 46-47; Tsoukas, 1994: 769). First, the organismic system paradigm presumes an "environmental determinism" mode of thinking in contrast to the technological determinism and managerial voluntarism characteristics of the mechanistic paradigm. In the organismic paradigm, an organisation is conceptualised as an organism whose survival can only be ensured by growth. Like living organisms, organisations depend on their environment for resources, and they have to adjust their behaviour in order to maintain effective adaptation. In this way, the environment has a predominant relationship with its inhabitant organisations. Although organisations in various ways may be able to adapt proactively through some effective strategies, the environment still plays a key role in determining how organisations should change and respond.

Secondly, the organismic paradigm does not suggest any one best method of adaptation; rather, it assumes a contingent approach which stress the need to adapt according to the environment.

Thirdly, the organismic paradigm assumes the process of change to be a process of evolution in the natural world. This implies the dynamic, time-dependent nature of

change based on Darwinian rules of evolution. Change is similar to a life-cycle model of the "survival of the fittest".

Fourthly, the open system concept of the organismic paradigm assumes that change is non-linear (in the chaotic change perspective). This is an important break from the mechanistic paradigm, which regards change as a type of linear behaviour. The open system concept implies that organisations and their environments must be understood to be a state of interaction and mutual dependence. On the basis of this assumption, "living" organisations seek to adapt to the rules of environment by maintaining a continuous exchange with the environment (Morgan, 1986: 46). This ecological concept is also known as "homeostasis": the whole system is regulated through a feedback loop control where deviation from some norm initiates actions to correct the deviation. This is contrast to the closed system assumption in the mechanistic paradigm, where system relations are represented in terms of fixed patterns of cause and effect. The non-linear mode of change, also known as "equifinality", stresses a type of behaviour that is based on reinforcing or balancing feedback loops.

Fifthly, the organismic paradigm advocates an improvised method of change. While organisations seek goals defined by the complex environment for sustaining their survival, they have to improvise their adaptation according to the specific environmental challenges. This requires not only a choice of adaptation strategies but

also a spontaneous reaction in a real-time manner.

Although the organismic system paradigm offers a new conceptualisation of organisation and change, it still does not fully address the human actors' role in the "social" context of change. The living organisms may autonomously interact with their environments, but autonomous agents cannot equate with intelligent human beings who are capable of exercising free choice. The latter implies a complex social interaction that may result in human actors behaving in a self-interested manner in various social, political and cultural contexts (rather than in the natural environment). This deficiency is also criticised by Keeley's "social contract" analogy:

> Organisations should be like contracts – agreements on behaviour satisfying the separate interests of the participants...the individual person is the ultimate object of value in the contractual view... Social systems are seen to exist for people, not the reverse; and organisations are well-ordered to the extent that they facilitate attainment of "organisational" goals, which may only reflect the goal of some individuals. (Keeley, 1980: 355, 356)

Therefore, the individual human actor should be at the centre stage of organisational change. It is the individual person who provides the source of innovation and, at the same time, creates the source of dysfunction as a result of social interaction. The organismic system paradigm undervalues the power of intelligent human beings. Its assumption is dubious in maintaining that the provision of the right kind of organisational adaptation, whether it is situated, punctuated or chaotic, will naturally

lead to effective and sustainable change. Moreover, this organismic paradigm supposes successful environmental adaptation but ignores the unique content, context and processes of change arising from an organisation's specific social dynamics. As Morgan (1986) warns, there is a real danger in this social Darwinism because:

> When we take the parallels between nature and society too seriously, we fail to see that human beings in principle have a large measure of influence and choice over what their world can be. (Morgan, 1986: 76)

2.3.3 THE SOCIAL SYSTEM PARADIGM

The key problem stemming from the above discussion of the mechanistic and organismic system paradigms is the neglect of the role of human actors within organisations. In terms of social systems, human behaviour in an organisational setting operates according to how social actors perceive their position within an organisation, and their relationships with other members. In other words, social actors depend largely on how they understand their place in the organisation, and on how they perceive their circumstances. Thus, social actors do not behave in accordance with a given objective reality, but rather in accordance with how they subjectively perceive that reality.

The above assumptions form the basis of the social system paradigm. Although different theorists have developed different concepts to account for this socially

oriented conceptulisation, their common message is that social actors interpret meaning subjectively. For example, Chaffee (1985) and Daft and Weick (1994) suggest that organisational activities can be perceived as a process of interpretation, in which managers make sense of internal and external events, and translate cues into meaning for organisational participants. Such an interpretation is a "discovery-oriented" process through which information is given, and actions are chosen (Daft and Weick (1994: 86). Moreover, organisations can also be seen as distributed knowledge systems (Tsoukas, 1996). Since organisations consist of socially interacted human agents, it may be argued that the major activities and changes within an organisation involve precisely the knowledge base of these human agents, who are active co-producers of their surrounding reality. Therefore, interpreting meanings always depends on how individuals attach meaning to their activities and accumulate knowledge.

Another important dimension of the social system assumption is that of the purposive system, as explained by Gharajedaghi and Ackoff (1984). To understand a social system, one must consider the free choice of the human agents who interact with the wider social context. There are two important factors to be considered. The first is concerned with individuals. In any organisation, human actors are capable of exercising free choice according to how they perceive a situation. The implication is

that although organisational members can reach a consensus, for example, in a meeting, they may still have hidden agendas outside the meeting, and these can create unseen problems (e.g. political conflict). The second factor is the context-specific problem in an organisation. Organisations are situated in unique environments within which unique individuals interact with problems and undertake actions. These two factors characterise the purposive nature of the social systems, which must be taken into account whenever organisations are dealing with change.

Equally important is the role of reflection. Here the assumption of social system paradigm disagrees with that of the mechanistic and organismic system paradigms. Acknowledging the subjective nature of human perception and the complexity of social interaction, the social system conceptualisation stresses the significance of social actors' subjective interpretations. The key implication is that organisational change is less a matter of formulating of a rational plan, and more about the reflection of the mental model within self. Such a concept implies that change requires a conscious examination of human perception. This examination, in turn, requires reflection on self, context and their interaction.

Two Sociological Ideas

The present study is based mainly on the contextualist perspective suggested by the work of Pettigrew (1973, 1985, 1987, 1990, 1997; Zan and Zambon, 1993). However,

it also takes into account the role of social contextualism, as suggested by Steenbarger (1991) and Thomas (1996) in the psychology field in order to address holistically the role of human actors and their interactions in specific contexts. Before analysing the key features of contextualism, an introduction to its theoretical roots may be helpful. Basically, contextualism stems from Pepper (1942) and can be examined in terms of two sociological ideas: namely social construction (Schutz, 1962) and social becoming theory (Sztompka, 1991, 1993). The former is concerned with the influence of human perception in constructing reality-guiding actions; the latter refers to the social interaction with the wider contexts in which social actors are situated.

The social construction concept originates with the theory of social construction of reality, or the sociology of knowledge (Schutz, 1962; Berger and Luckman, 1966; and Searle, 1995). It attempts to explore the influence of subjective human interpretation on the generation of knowledge. The basic idea is that human actors perceive "reality" in terms of their own "biographic situation" that defines the way in which they interpret situations, engages challenges and locates their social actions (Schutz, 1962). Thus, individuals define the reality they encounter according to their biographic situation. The implication of this conception is that all organisational systems, whether social or technical, are socially rooted, socially distributed and

socially informed.

The social construction concept originates with the theory of the social construction of reality, or the sociology of knowledge (Schutz, 1962; Berger and Luckman, 1966; Searl, 1995). It attempts to explore the influence of subjective human interpretations on the generation of knowledge. The basic idea is that human actors perceive "reality" in terms of their own "biography situations" that define the way in which they interpret situations, engage with challenges and locate their social actions (Schutz, 1962). The implication of this concept is that all organisational systems, whether social or technical, are socially rooted, socially distributed and socially informed. One important application of the social construction concept is in the social construction of technology, which involves the study of the social impact on technological applications (see, for example, Zuboff, 1988; Orlikowski, 1992; Scarbrough and Corbett, 1992; Bloomfield et al., 1997). For example, Orlikowski's study of IT-enabled change explores this concept through "technological frames" (Orlikowski and Gash, 1994). This study analyses the cognition and values of users and designers, explaining how the technology (groupware) was interpreted by the various perceptions (frames) of internal stakeholders. In this example, technology can be seen to embrace the non-human agents which organisations choose to employ; alternatively, technology can also be viewed as a social force which can facilitate or

undermine organisational change.

The second idea, social becoming theory, originates from the sociological concept suggested by Sztompka (1991, 1993) in exploring the nature of social change and relates to the concept of structuration suggested by Giddens (1984) in his analysis of what he calls "the constitution of society". The focus here is on the understanding of human agency and social institutions. Under this perspective, the regular interaction of human actors with one other in organisations is the foundation of social structure. The purpose of this concept is to examine the stability of social structure and to reveal the underlying dynamics by which organisations are sustained in a specific structural form. As Giddens notes, the key issues of "structuration" relate to "the nature of human action and the acting self; with how interaction should be conceptualised and its relation to institutions; and with grasping the practical connotations of social analysis" (Giddens, 1984: xvii)

The principle concept is the "duality of structure" which assumes that structure is formed by the social interactions of human actors, whose activities are both enabled and constrained by structure. The analysis of social systems suggests that organisational change is an ongoing process which is grounded in the knowledgeable activities of situated actors who draw upon resources in a diversity of action contexts. The argument maintains that the social structure of organisation places limits on how

human actors perform their activities, but at the same time the social structure is created by these activities. At the heart of this theory, social structure is not merely to be seen as a constraint, but rather it is both constraining and enabling. Social structure is seen as an interactive and changing activity, sustained by human actors at particular places and specific moment in time.

This concept provides management theorists with an important idea for conceptualising the relationship between social interactions and their structural context (see, for example, Ranson et al., 1980). In addition, the concept extends the intra- and inter-personal dimensions of social construction to a broader view of the interaction of people and their situated environments. This also enables us to address the unique characteristics of social systems in terms of their context-specific and time-dependent nature. In summary, according to the assumption of the social system paradigm, human actors conduct individualistic actions within a specific context where these actions are influenced not only by the conditions of the present but also by those of the past.

All the World is Not a Stage

In consideration of these two sociological ideas can provide useful insights into the contextualist perspective on of organisational change (see, in particular, Pettigrew, 1987, 1990, 1992, 1997; Steenbarger, 1991; Thomas, 1996). The main tenet of

contextualism is that organisational change must take into account continuity and change, actions and structures, internal and external contexts, and the interpretation of contextual factors by human actors. The contextual change perspective considers the dominant approaches to organisational change to be ahistorical, aprocessual and acontextual in character, thus failing to address the "underlying logic" through which change is created. Orthodox studies of organisational change are seen as being too preoccupied with rational analysis rather than with the holistic and dynamic analysis of "changing" (Pettigrew, 1987: 655).

This contextualist perspective assumes that an organisation may be explored as a continuing social system, with a past, a present and a future, in order to explain the origins, continuance and outcome of social phenomena (Pettigrew, 1987). In other words, social reality is not a steady state but a dynamic process. In this way, change should be addressed through the knowledge of human actors, as well with reference to their day-to-day struggles in an environment. The concept of contextual change can be summarised into at least four guiding principles (based on Pettigrew, 1987, 1990, 1992, 1997; Steenbarger, 1991; Thomas, 1996).

First, *the embeddedness of actor and context*: Change processes are deeply embedded in the contexts that produce and are produced by them. The study of change needs to address how the outer and inner contexts are formulated so that the

trajectory of the change processes can be adequately examined. A context may be seen as a structure within which the subjective interpretations of actors come to shape the process of change. Thus, change processes are both constrained by, and also shape, the context. In the same way, actors in any given context mutually influence one another, and are thus involved in a continuous process of change. Change is thus mediated by social interaction, a ceaseless stream of communication that human actors convey to one another verbally and non-verbally. As a result, organisational change is not consistent and structured but is dynamic and shifting. Furthermore, it never becomes anything, but always is "in the state of becoming" (see the original concept in Sztompka, 1991, 1993).

Secondly, *the temporal interconnectedness*: Change processes need to be studied in past, present and future time. History is not just a chronology series of events, but is carried forward in human consciousness. A time-series investigation can facilitate the understanding of recurrent patterns in the change process, explore historical influences on events, and reveal the underlying dynamics of change. On the other hand, time is also a product of social construction, which sets a frame of reference for what changes are seen and how those changes are explained. The further analysts explore back in time, the easier it is for them to appreciate the underlying dynamics of how problems evolve and accumulate.

Third, *reciprocal causality:* Organisational change consists of multiple causal mechanisms and should not be reduced to oversimplified linear causal effects. There is no simple chain of cause-and-effect in social systems, merely reciprocally determinant patterns of influence. A holistic study of change involves exploring the interdependent relationships and circular causation of problems. In so doing, it is possible to explore the non-linear behaviour resulting from social interaction. Thus, organisational change represents a confluence of mutually supportive and destructive multiple forces. Outcomes cannot simply be related to the idea of linear causal effect. Rather, the key task is to explore how outcomes are related to recurring patterns and are produced by the underlying logic. The latter is not simply a multiple causal mechanism, but involves a reciprocal causality for understanding context-specific change across time.

Fourth, *frame reflection*: Human actors construct meanings to organise their perceptual world and direct actions. These meanings mediate at the interface of human actors and contexts. Thus, human actors do not passively acquire perceptions that are generated by their sense-making process, but they actively construct their views of the world. As a result, their mental models (frames) actively absorb new experiences, thereby determining what the individual will perceive as "real". A key lesson of this concept is that fundamental change occurs when a problem is re-

framed. The implication is that change can best be achieved by reflecting on complex social interaction in order to reframe the meaning of problems.

Reflections on the Social System Paradigm

Unfortunately, most contextualism-based studies are largely descriptive and fail to explore the full concept of contextualism (see, for example, Sutton, 1987; Brosio, 1993, Dawson, 1994). In particular, they do not to give sufficient attention to the reciprocal nature of change in social interaction. This means that contextual change has not been examined in the depth required to account for complex social phenomena. Most research on contextualism seems to focus on the processual analysis of sequential events rather than on the underlying logic (see the critique in Van de Ven, 1988). Except for a few noteworthy efforts (Pettigrew, 1990, 1997), the majority of research still concentrates on narrative analysis or normative frameworks to represent the concept of underlying logic, and is thus unable to address the reciprocal causality issue. While most researchers appreciate the appropriateness of this social system paradigm, they also recognise the difficulties inherent in the viewpoint of contextualism. What is needed is a practical method whereby managers can exploit this theoretical concept in change management. Equally importantly, there is a need to explore the way in which contextual change may complement the traditional change approaches.

2.3.4 THE UNDERLYING THEMES: ALIGNMENT AND DYNAMICS

The above discussion allows us to examine the three models of change (mechanistic, organismic and social system) in terms of five dimensions: the process of change, the approach to change, time effect, the causality of change, and the capability of change. Table 4 offers a summary of the underpinning propositions in each paradigm in order to identify the emergent issues that need to be addressed.

	Mechanistic System	**Organismic System**	**Social System**
Perspectives of change	Programmatic change	Situated, punctuated and chaotic change	Contextual change
Process of change	Rational	Evolutionary, discontinuous, and dissipative.	Ongoing processes as a result of the interaction of action and context
Approach to change	Goal-directed	Goal-seeking	Emergent
Time effect	Snapshot	Life-cycle (incremental, radical and real-time)	Historical influences
Causality of change	Linear causality	Linear (situated and punctuated) and non-linear (chaotic)	Non-linear (in socially reciprocal manner)
Capability of change	Managerial voluntarism or technological determinism	Environmental determinism	Human voluntarism

TABLE 4. Three Paradigms of Organisational Change

In terms of the "process of change", the contextual change perspective is conceptualised as an interaction of action and context rather than as a rational, evolutionary, discontinuous or dissipative process that ignore the existence of human actors. Thus, contextual change allows us to acknowledge the role of human actors as self-constructing agents that continuously negotiate their own conduct in social interactions.

In terms of the "approach to change", the approach of contextual change is not goal-directed (as a kind of pre-programmed instruction) or goal-seeking (in terms of self-directing agents). Rather, change depends on the way in which human actors can reflect their mental models and thus achieve change in an emergent way.

With the reference to the "time effect" element, the snapshot and life-cycle viewpoint is less useful than the historical perspective in understanding social factors that are affected by historical influences.

In terms of the "causality of change", the mechanistic and organismic system paradigms assume change to be either linear or non-linear (from a natural-scientific viewpoint). In contrast, contextual change suggests a non-linear causality which is characterised by reciprocal causation deriving from "social" interactions. Such a reciprocal causality formulates the concept of underlying logic from which analysts may understand how change unfolds over time in a particular context.

Finally, contextual change offers an alternative viewpoint to the "capability of change". In current thinking, change is mainly determined by leader-driven (managerial voluntarism), technology-led (technological determinism) or environment-imposed (environmental determinism) concepts. The contextual change perspective adds a new dimension: change needs to be resolved by reflecting on human perceptions and how they interact with context.

2.4 SUMMARY

This chapter has investigated the IT productivity paradox issue in relation to two specific dimensions: change alignment and change dynamics. The review of relevant literature suggests two tentative answers of IT productivity paradox may be provided. First, a review of the change alignment literature indicates that change implementation needs to take into account the sequential alignment among different organisational factors. A failure to achieve effective alignment may contribute to the IT productivity paradox. Secondly, a review of the change dynamics literature shows that a valuable social-scientific perspective, contextualism, can be used to understand the IT productivity paradox in terms of human agency and contextual influences. It is clear that the criteria of successful change centre on some questions: Should change be studied in snapshot or longitudinal terms? Is change deterministic or voluntaristic? Moreover, if analysts disagree with the idea that change is linear and goal-directed (planned), what other alternative concepts of change can be provided? Given the issues raised by these questions, the next chapter seeks to provide a research design with specific reference to the understanding of the alignment and dynamics of change.

Chapter 3: Research Methods

This chapter explains the research methods used in this study, and is divided into three parts. The first part discusses some theoretical issues in relation to the nature of qualitative data, processual analysis and the case study method. The aim is to highlight the potential theoretical problems underlying qualitative research. The discussion of these theoretical issues helps to explain the formation of the research design and the approach to theory-building in this thesis. The second part explains the ontological influence of this worldview on the overall research strategy. The third part describes the two-phase design and case selection process. The detailed designs of phases one and two are further explained with reference to case selection, unit of analysis, data collection, data analysis, and validation issues.

3.1 SOME THEORETICAL ISSUES

This section concentrates on four theoretical issues which have been the subject of long-lasting debate in conducting qualitative research. The first issue, "fact or fiction", discusses the general issues relating to qualitative research. In particular, the problem of analysing qualitative data is highlighted. The second issue relates to the case study method. This is not a unitary concept, but contains at least two diverse modes of using case studies in practice. The focus here is on the underlying problem

of conducting case study with regard to the use of "constructs" or "stories" in theory building. The third issue is concerned with the difference between variance theory and process theory, and seeks to identify the theoretical position of this study. The fourth issue highlights the current challenges involved in conducting processual research. The discussion of these four issues reveals the ontological influence of the contextualist perspective in the present study.

3.1.1 FACT OR FICTION?

Qualitative research methods are chosen for many reasons. For example, qualitative data are rich, full and holistic in the sense that they can help researchers to reconstruct real-life experience. They preserve the social actors' interpretation of meaning in the chronological flow with minimal distortion. In principle, qualitative data offer a more precise way to understand organisational affairs than that offered by numerical data building from statistical correlation. Nevertheless, qualitative methods have no precise definition in the field of social science, and there is a wide range of interpretative techniques for describing, coding and translating meanings. In general, such mechanisms enable researchers to bridge the gap between the past and the present, and thus to look into the future. As Van Maanen notes:

> To operate in a qualitative mode is to trade in linguistic symbols and, by so doing, attempt to reduce the distance between indicated and indicator, between theory and data, between context and action. (Van Maanen, 1979)

However, collecting qualitative data cannot easily be equated with qualitative research. There are at least three problems to be considered. First of all, there is a problem concerning how data are collected and analysed. Frequently, qualitative researchers enter a social context with a preconceived conceptual framework to guide their data collection. Such a framework predetermines what data are to be ignored and what data are to be collected. Researchers may inadvertently miss important data that are essential to reflect the required richness of the organisational dynamics and thus reduce the distance between context and action.

The next problem presents a more complex issue for qualitative researchers, that of "inter-subjectivity" (see, for example, Glesne and Peshkin, 1992; Hatch, 1996; Van Mannen, 1996; Miller and Glassner, 1997). This concerns the role of researchers in the interpretation of the social phenomena under investigation. The inter-subjectivity issue arises in two ways. On the one hand, informants incline, intentionally or unintentionally, to recount their stories from their own biased perspectives. Although researchers can resort to different techniques (such as triangulation), it is almost impossible to verify the "opinions" of those informants by traditional scientific methods. On the other hand, researchers tend to interpret their observations according to their own particular subjective understandings. Although these qualitative "facts" are scrupulously collected, they often provide different lessons for

different researchers. The interaction of these two kinds of subjectivity (of informants and researchers) makes it difficult to deal with qualitative data objectively. From the perspective of inter-subjectivity, validity is relative and difficult to attain. For instance, reading *Patterns of Culture* (Benedict, 1934), researchers may be unable to identify clearly how Benedict comes to the conclusion that each culture selects or chooses from an infinite variety of behavioural possibilities that conforms to a configuration. Similarly, reading *The Interpretation of Culture* by Geertz (1973: 5-6), it may be difficult for researchers to trace the stories that lead to an insightful observation which explains cultures through the metaphor of human actors like insects being suspended in webs of significance that they themselves have spun. To put it in a provocative way, both Benedict's and Geertz's interpretations of cultures can be regarded as what Sanday (1979: 533) wittily described as fictions grounded in solid facts.

The example of Benedict's and Geertz's accounts of culture also signals another problem facing qualitative research: what kinds of data are collected and how data are converted into theories. Benedict (1934) seems to focus on collecting data with reference to the "patterns of regularity" from her observations, whereas Geertz (1973) seems to be interested in gathering data relating to the "patterns of meaning" emerging from his own experience. Benedict attempts to generalise theories of

universal laws across these patterns of regularity, whilst Geertz seeks to generalise the dynamics of social behaviour within these patterns of meaning.

The understanding of the above problems does not help to resolve the underlying dilemma of qualitative research. But such an understanding may assist researchers to recognise the nature of qualitative data and the difficulties associated with using such data. One important issue that researchers should consider is whether data should be collected and used for building better constructs or for developing better stories as a basis for rigorous theory building.

3.1.2 A Better Construct or Better Story?

The case study method is often used as a primary means of theory building for qualitative research. The reasons are three-fold: its ability to provide rich details of a particular social phenomenon (Hakim, 1991); its logical and systematic mode of investigation of specific instances (Adelman et al., 1984); and its ability to help form the emergent creation of theory (Hartley, 1994). There are however certain problems arising with the use of the case study method. These relate to the questions of generalisability, representativeness and validity.

In terms of generalisability, in contrast to statistical generalisation, the case study method employs "analytical generalisation", which depends on the inductive

inference derived from cases (Mitchell, 1983: 207). Generalisation of case studies thus lies in the adequate underpinning theory and related knowledge. In principle, a previously developed theory is used as an analytical framework against which the empirical results obtained from case studies can be compared. In terms of representativeness, the case study method involves the selection of cases in order to confirm a theoretical proposition. The sampling technique used is mainly concerned with theoretical sampling rather than statistical sampling (Eisenhardt, 1989). Typical or atypical cases may be chosen purposely because they provide greater explanatory powers (Mitchell, 1983; Platt, 1989). The selection of cases must represent specifically the social entity that embodies the key issues under scrutiny, rather than simply being a sample of the whole population. Finally, in terms of validity, the case study method does not use mathematical validation, as developed in statistical inference. Rather, it achieves validity through the use of multiple data collection methods and triangulation from different informants. A case study is thought to have an acceptable degree of validity if sufficient perspectives are analysed for these to be incorporated in underlying theory.

Generally, there are two major approaches to the case study method. First, the method can be employed in an analytical approach, using specified frameworks to collect evidence systematically, so that theory can be developed (Eisenhardt, 1989;

Yin, 1989, 1993; Miles and Huberman, 1994). In such situations, the collected data are used to build *constructs* in order to support theory building. Secondly, the case study method can be used as the basis for an interpretive approach (Van Maanen et al., 1982; Denzin and Lincoln, 1994; Stake, 1995; Agar, 1996; Silverman, 1997), whose purpose to understand and elicit meaning from *stories* (see, for example, Zuboff, 1988). In the second case, data collection requires the gathering of vivid stories to obtain a rich understanding of the social context.

The problems underlying these two types of case study can be seen in the construct versus story debate (see Eisenhardt, 1989; Dyer and Wilkins, 1991; Eisenhardt, 1991; Cavaye, 1996). From the "construct" side, the case study method provides a set of ready-to-test hypotheses based on rich qualitative descriptions about the case. But because such an approach concentrates essentially on the development and measurability of constructs, researchers often miss the context and the dynamics of each case. The lack of such richness limits the consequent theoretical insights. The weakness of construct-based case study is that researchers are less competent to explain the problem from the "inside" so that the unique experiences of an organisation can be observed (Evered and Louis, 1981; Miller and Glassner, 1997). Furthermore, the developed constructs (such as leadership, change and power) often seem to be abstract and of limited use for practitioners.

In contrast, the story-based approach, as Dyer and Wilkins (1991) maintain, is more capable of providing a rich description of the social context, accounting for the intricacy of historical events, and revealing the "deep structure" of social behaviour (Light, 1979). The interpretative case study method seems to offer deeper social dynamics in theory-building rather than the surface data used by the construct-based approach. Therefore, the primary research issue is to understand and describe the richness of the social drama in order to make the case story intelligible to readers and to generate theory in relation to the context. From this viewpoint, good qualitative research using the case study method depends more on good stories than on testable theories based on refined constructs.

Indeed, in the diversity of social phenomena there are some things that cannot be measured and tested intelligently (such as trust, change, and motivation) but can only be captured in "rich description". However, it is also true that many story-based case studies fail to demonstrate how the richness of insights is translated into theories. Moreover, in reality, few research projects can deliver the promise of describing a rich context and ultimately revealing the deep structure of the relevant social dynamics. Most endeavours become story-telling practices through the use of interview quotations, thereby suggesting ambivalent prescriptions (see such criticisms, for example, in Nisbett and Ross, 1980; Starky, 1987; Van de Ven, 1988).

The issue here is not that of deciding "which is better" (the construct-based or story-based approach) but rather it is more a matter of "which is more appropriate to which kind of inquiry". This requires another level of analysis concerning the difference between variance theory and process theory (see Mohr, 1982; Argyris, 1993: appendix; Van de Ven, 1993; Langley, 1998).

3.1.3 VARIANCE THEORY VERSUS PROCESS THEORY

Variance theory seeks to explain phenomena by using dependent and independent variables with the aim of producing externally valid propositions. For example, the causal schema, $Y= F(X)$, where values of Y are determined by values of X across a wide range of variance, represents the structure of a universal law. However, such generalisation tends to fail in practice because there are always other variables in different contexts. In addition, such a universal law seems to provide trivial truths which are of little value for improving practical wisdom (Schön and Rein, 1994: 204).

On the other hand, process theory seeks to provide generalisation by investigating the sequence of events leading to an outcome (also see Abbott, 1990). The test of validation is based on the causal story that results from the tracing of organisational events over time. Thus, the identification of processual patterns is the key to

developing process theories. However, the problem of construct versus story also arises here. Process theories can be developed by a construct-based, hypothesis-testing approach grounded on comparative logic (Eisenhardt, 1991) or by a story-based, interpretative approach, where insights can be obtained from the rich accounts.

In conducting construct-based process analysis, researchers develop theories through *a priori* process theories and test the propositions using time-series process data (Langley, 1998). The focus is on defining clear constructs and thereby developing mechanisms to verify or falsify a set of propositions. This makes it necessary to record events, describe features and identify patterns from processes by using different methods of processual analysis (for example, the content-context-process model suggested by Pettigrew, 1987) or techniques of process data modelling (such as the seven sense-making strategies for theorising process data proposed by Langley, 1998). Nonetheless, such an approach invariably fails to capture the ongoing dynamics and temporal evolution of organisational change. Therefore, the resulting prescriptions may not sufficiently appreciate the conflicting mental models, reciprocal causalities and pluralistic contexts, thereby generating theories that are scientifically valid but practically less useful (Argyris, 1988; Van de Ven, 1988). But story-based process theory also has its weaknesses. It often turns processual research

into a story-telling practice without contributing to the building of theory. The end product of such an approach can easily become the writing of a novel (Starkey, 1987).

Unfortunately, these problems are not confined to the above two dilemmas. Besides building theories through "better constructs" or "better stories" in processual research, there are other challenges, in particular, for the study of organisational change.

3.1.4 Challenges to Processual Research

These challenges can be viewed from three angles. First, the current works of processual research seem to concentrate on the study of the surface structure of the change process (Huber and Van de Ven, 1995; Dawson, 1997; Ferlie and McNulty, 1997; Hinings, 1997; Ropo et al., 1997). One type of such processual research is concerned with the recipe model of change, which describes change as a linear progression consisting of concrete events. Although other types of processual research observe change from an evolutionary (Miller, 1982) or revolutionary perspective (Gersick, 1991; Romanelli and Tushman, 1994), such views however only describe the contours of the change process through an ecological lens. Both types of processual research, recipe or ecological, seem to neglect the important role

of the complex interactions of *social actors* (Van de Ven, 1988; Pettigrew, 1990).

Van de Ven (1988) explains that the study of change processes seems to pay scant attention to social actors' frames of references and the behaviour of structuration (the interaction of actions and contexts). Similarly, Pettigrew (1990) points out that such neglect may miss the ongoing change of the human knowledge base and the conflicting mental models situated in the social context. From a "second-order error" perspective, Argyris (1988) warns that processual researchers tend to simplify the multiple realities created by social actors, thus failing to detect the "defensive routines" of internal stakeholders. Researchers therefore tend to cover up "the cover-up" (provided by social actors) in their analysis (Argyris, 1988: 345). This undetected error may then become self-sealing, self-reinforcing and self-proliferating. In this way, researchers may generalise change processes and derive universal solutions based on flawed processual data. Therefore, process theories generalised on such a basis inevitably lead to an oversimplification of organisational change, and hence any prescription may be of little use to organisations.

Secondly, Van de Ven (1988) provides another challenge, explaining that current processual methods seem to stress the behaviour (e.g. life-cycle), rate (radical/incremental), path, industrial sector (micro/macro), and continuity (continuous/discontinuous) of the change processes. He maintains that such an

emphasis cannot explain fully the "motor" of change (Van de Ven, 1992; Van de Ven and Poole, 1995) and thus fails to capture the underlying quality of change processes. The concept of motor is also referred to as "underlying logic" (as suggested by Pettigrew, 1990, 1992, 1997), and "deep structure" (Light, 1979). Except for a few efforts in this direction, the search for the motor of change remains dominated by the functionalism (see, for example, Sutton, 1987; Hinings and Greenwood, 1988; Greenwood and Hinings, 1993; Dawson, 1994). Although the functionalism-based studies offer a detailed description of change processes, complement it with statistical justification, they are still unable to explain fully the underlying forces that govern the processual patterns of change.

Thirdly, Starkey (1987) proposes a challenge with reference to the reasoning logic of processual research. He argues that current processual research tends to follow a positivist approach to the theorising of processual patterns. He maintains that the description of "what change processes are" does not sufficiently infer prescription of "how change may be resolved". In principle, a typical processual analysis may be stated in four steps: 1) tabulate raw data over time, 2) identify processual patterns, 3) generalise a theory of change based on these patterns, and 4) generalise prescriptions for future actions. Starkey (1987) points out that the identification of a correlation in processual patterns does not sufficiently justify a view of causation between events.

For example, if an analyst identifies that a firm has implemented three different process reengineering initiatives over time, and each time after the implementation of these reengineering initiatives, the firm achieves a significant performance improvement in sales. This does not necessarily mean that process reengineering leads to better sales performance or that poor performance can be solved by process reengineering in the future. Thus, although researchers can provide a vivid, illuminating story of organisational change, the story does not necessarily generate a normative theory that leads to prescriptions.

These three problems can be seen to result from a fundamental misfit between the research method and the ontological assumptions. The key issue is not that of how researchers deal with process data, but it relates more to how researchers conceptualise organisations, social actors, and change. Unfortunately, except for Pettigrew's continuous efforts to research change processes through an alternative perspective of contextualism (see Pettigrew, 1973, 1985, 1988, 1990, 1992, 1997; Pettigrew and Whipp, 1991; Pettigrew et al., 1992; Zan, Zambon, and Pettigrew, 1993), little attention has been given to these challenges. Most research work seems to accept the face value of this contextualist view by adopting the content-context-process model (see, for example, Walsham, 1993), and ignoring Pettigrew's deeper concerns about human agency and emancipation.

Therefore, what is needed is not the formulation of a better method of analysing process data, but the recognition of a commensurable worldview for guiding processual research. Building on Pettigrew's contextualist perspective, the following discussion seeks to examine the ontological influence of contextualism in the present study.

3.2 THE ONTOLOGICAL INFLUENCE OF CONTEXTUALISM

Any research design is likely to be influenced by a particular worldview which both enables and limits what can be discovered. Hence, one of the key tasks in social inquiry is to be constantly alert to the limitations of the embraced worldview, and to be aware of its potential influence upon the research design. This study is no exception to such an ontological influence. Accordingly, these follows a brief introduction to two major traditions in social science, namely rationalism (relating to construct-based processual research) and idealism (relating to story-based processual research). The purpose of this discussion is to explain the philosophical position of contextualism and thereby to show why such a perspective may offer new insights to the study of organisational change and the application of processual research.

3.2.1 TWO TRADITIONS VERSUS CONTEXTUALISM

There is no single, decisive classification of different worldviews in the social

science discipline (see, for example, Burrell and Morgan, 1979; Sanday, 1979; Morgan and Smircich, 1980; Rosenberg, 1988; Hughes, 1990; Blaikie, 1993; May, 1993; Guba and Linclon, 1994). Nonetheless, there are two major schools of thought, rationalism (or functionalism, positivism) and idealism (or interpretivism, non-positivism), that are particular relevant to the discussion here.

From a rationalist perspective, human activity is understood to be a set of discrete, observable events. What counts as "truth" (in social inquiry) is regarded, in this case, as being external to individuals. Thus, the ultimate concern of knowledge is with universal laws generated by systematic analysis (e.g. through statistical surveys) through the verification and falsification of hypotheses. Universal, scientific laws are products of empirical regularities observed from the social contexts in terms of cause-and-effect relationships. The major criticism of rationalism is its oversimplification of social behaviour by reducing the dynamics of human development into universal laws.

By contrast, idealism emphasises the subjective, human interpretation of meaning. For idealists, the social world is created through the realm of human experience. That experience is characterised as a product of processes in which social actors together negotiate the meaning of actions. Thus, human behaviour depends on how individuals interact with their social context and interpret their situation. Knowledge

is concerned with the understanding of socially constructed meanings and frames of references. The major criticism of idealism concerns the validity of its account of subjective meaning. At one extreme, it can be argued that the whole interpretation of human experience is merely another socially constructed meaning created by the researcher.

The contextualist view discussed here originates from a synthesis of Pepper's (1942) exploration of root metaphor, Giddens' (1984) structuration theory, and Sztompka's (1991, 1993) social becoming theory. For the contextualist view, the philosophical task is to uncover the higher-level structures between action and context, explore the underlying causes of social relations, and understand individuals' conflicting mental models (see Watzlawick et al., 1974). Such a standpoint maintains that social behaviour must be explained essentially with reference to the underlying logic by which social actions are influenced and directed. As summarised in Table 5, contextualism offers a new way of investigating social behaviour by exploring the underlying logic, thus allowing researchers to develop a new kind of insight and knowledge. However, although contextualism gives rise to an alternative method of understanding social behaviour, thus far few efforts have been made to provide a practical way of investigating the concept of underlying logic.

Worldviews	Two Traditions of Social Science		Contextualism
	Rationalism	**Idealism**	
Underlying assumptions	Human activity is a set of concrete and observable events which can be systematically examined	Human experience is socially constructed, which requires an understanding of its subjective interpretation	Human behaviour needs to be understood with reference to the duality of structure and the socially constructed meaning over time.
Ultimate concerns	Universal laws	Socially constructed meaning	*Generic structure of underlying* logic

TABLE 5. Two Traditions of Social Science versus Contextualism

Although contextualism is still subject to rigorous critique, it is the aim of this study to explore how such a concept may be applied in a practical investigation of organisational change, especially, change that is characterised by the interactive influences between actors and context. This does not imply that contextualism is in any way superior to other worldviews. To rephrase Sanday (1979: 537), which worldview one adopts in one's own work is a matter of taste and not of dogma. The use of a worldview depends on one's goals as well as one's preferences.

3.3 RESEARCH DESIGN

3.3.1 THE PROCESS OF CASE SELECTION

Different cases have been used in refining the research design throughout this study. As shown in Table 6, in phase one three cases were used for a pilot study: one was conducted in California (UPS) and two in the UK. The former provided the primary source for the research redesign. At the time of the interview, UPS (United Parcel

Services) was undertaking major transformation projects which involved the reengineering of seven major functions of the company. This case offers a platform to test out the path mapping technique for phase one. Although the mapping of the two cases (Birmingham Midshires and Radcliff House) is incomplete because of problems of data availability, it led to an appreciation of the strengths and weaknesses of the path mapping technique. Phase one ends with the mapping technique applied to five case studies in the 1995-1997 period (see Hsiao and Ormerod, 1998b).

Phase two is concerned with a controversial type of organisational change. The pilot study involved five cases in Taiwan in 1995-96. Chi-Mei is one of the world's top five ABS (a kind of chemical material) manufacturers, and has continuously implemented various initiatives to support its production excellence. The company has been working with Japanese consultants in the area of total process improvement. Nevertheless, this case did not meet the criteria for the theoretical sample (change characterised by human agency and controversy), and thus was not chosen. The second case, 7-Eleven chain stores, provided the material for studying a major revamp of marketing channels. The third and fourth cases (Oracle and SAP) were software firms facing rapid growth and having to respond to ever-demanding customers. The restructuring in both Oracle and SAP offers a test ground for

influence diagram modelling within manageable limits. The next case, China Airlines, involved a financial crisis due to the airline safety problem. Although the company introduced consultants from Germany, Hong Kong and the USA to assist their turnaround, very little improvement was made (Hsiao, 1998). This case offers a chance to use the non-linear modelling technique, and thus to explore the issue of how external contextual factors and hidden agendas can undermine investment in change (due to political and cultural barriers).

Phase	Cases	Change Focus
Phase One Pilot	UPS (USA)	Reengineering in logistic system
	Birmingham Midshires Building Society	Cultural change
	Radcliff House Hospitality (Warwick)	Facility change
Phase One	Aerospace firm (UK)	Company-wide transformation
	Telecom firm (UK)	Large-scale reengineering
	Publish firm (Taiwan)	IT-induced corporate change
	Automobile firm (Taiwan)	Process reengineering
	Semiconductor firm (Taiwan, USA)	IT-induced process change
Phase Two Pilot	Chi-Mei ABS Manufacturing (Taiwan)	Total process improvement
	7-Eleven Stores (Taiwan, US-based)	Strategic change in channel management
	Oracle (Taiwan, US-based)	Restructuring
	SAP (Taiwan, Germany-based)	Market competition
	China Airlines (Taiwan)	Turnaround
Phase Two	President Enterprises	Company-wide transformation
Overall Implications	Cable & Wireless Telecommunications	Organisational development and knowledge management

TABLE 6. Case Studies Used in Different Phases

Finally, President Enterprises (hitherto President), was chosen for formal study. There are two benefits in such an application. First, some of the modelling

experience gained from the studies of 7- Eleven, SAP and Oracle could be transferred to the study of President, because President is the parent company of 7-Eleven and a customer of both SAP and Oracle. Moreover, the President case provides a theoretically useful sample to extend the emergent theory of contextual change (as discussed in Chapter 1). The company has invested millions of dollars in IT-enabled change over a period of more than seven years. In addition, many internationally renowned consulting firms were invited to facilitate the implementation of change. Nevertheless, the IT-enabled change has not been successful. The case provides an excellent setting for analysing the underlying dynamics of contextual change. Furthermore, the "reflective transfer" approach that emerged from phase two was tested in a study of Cable & Wireless Telecommunications (April-September, 1998). The inclusion of this material goes beyond the scope of this study (detailed discussion can be found in Hsiao and Ormerod, 1998a).

3.3.2 PHASE ONE DESIGN. CHANGE ALIGNMENT

The first phase involved a study of five companies in order to understand processual patterns of change alignment that emerge over time. The findings are included in Chapter 4. The focus is on the relation between the transition of change initiatives in

order to explore the alignment patterns. One primary purpose is to decipher the labels attached to various initiatives of change management (such as transformation, reengineering, renewal, restructuring, reconfiguration, etc.). By breaking down changes occurring in the areas of strategy, processes, structure, people, and technology over time, analysts may obtain a better understanding of the sequential patterns of change. However, this approach does not only seek to describe the change process, but is more concerned to show the way in which changes align with each other and to explore the emergent patterns.

Case Selection and the Unit of Analysis

Phase one investigates five cases which were selected because their features cast light on the proactive type of organisational change undertaken within a complete period of time. As displayed in Table 7, these cases are referred to as the Aerospace case, the Telecom case, the Semiconductor case, the Publishing case, and the Automobile case. These five cases are all multinational enterprises: two of them are British and the other three are foreign companies based in Taiwan.

There are three criteria for case selection. First, the case firm must have used IT as a major enabler to implement organisational change. Secondly, the case firm must have sought strategic changes rather than just operational improvements. These changes may be incremental or radical, planned or emergent, but must be over at least a five-

year period. Thirdly, the selection of case firms focuses on proactive change, that is, change undertaken to avoid imminent failure (described by Grinyer et al., 1988 as *sharpbender* change).

Case firm	Aerospace	Telecom	Semiconductor	Publishing	Automobile
Source of change	Pressure from industry	Privatisation and globalisation	International competition	New business opportunity	Domestic competition
Nature of business	Production	Service (telephone)	Production	Service (education)	Service (maintenance)
Use of IT	EPD (database)	ADEPT (database)	SAP (MIS)	Internet	MIS (inventory systems)
Focus of change	Engineering design	Customer service	Order/materials control systems	Marketing channel	Inventory systems

TABLE 7. Summary of the Five Cases in Phase One

The unit of analysis is taken to be "change projects" in each company. These change projects may involve the strategic reorientation of reallocating capital and resources, the human renewal of transforming culture, process reengineering by exploiting IT, or the restructuring of existing organisational architecture. It is noteworthy that although some change initiatives may be named according to the interest of the change agents, the final decision to characterise the change initiative is made at the discretion of the researcher. For example, a change project may be called "reengineering" in one case, but the actual content of the reengineering project may only involve activities of architectural change in the organisational chart. In this case, it is classified as a change in "structure".

Data Collection

Data were collected by semi-structured interviews with top management teams, and from the secondary literature and companies' internal archives. Efforts were made to cover as many key change initiatives as possible in order to understand the alignment behaviour. Using the MIT 1990s framework (Scott-Morton, 1991), the data collection involved five sub-units of analysis in terms of strategy, structure, processes, people and technology. In addition, special attention was paid to the transition of change initiatives in order to identify the relationship between change projects. For instance, an implementation of IS systems may trigger a redesign in processes to accommodate the technological change, or alternatively it may induce a restructuring.

Data Analysis

The data analysis applies the "path mapping" technique (Yetton et al., 1994; Craig and Yetton, 1997) as a way of depicting change processes. The purpose of such path mapping is to examine empirically how change is aligned into processual patterns and what subsequent reactions may be observed from such an alignment (see the discussion of processual pattern-matching method in Pettigrew, 1990, 1997; Langley, 1998). However, this path mapping is used with a minor modification by splitting up the time element into three stages: early, middle and late. The purpose is to map the

sequence of change from a longitudinal standpoint. This processual mapping allows us to avoid aggregate change within a single path. Once these change paths in each stage are mapped, five cases (fifteen paths) are cross-analysed in order to identify generic change patterns. Through pattern matching, this approach also offers a basis for reconstructing the MIT1990s framework in order to achieve a better understanding of change alignment.

Validation Issues

Validation is achieved mainly by checking the content of change projects with informants and examining internal archives. Verification is less concerned with the performance of change, that is, with whether change projects yield successful result; rather, it is concerned more with describing the developmental paths of different change projects, the planned and emergent modes of change, and the relationships between change projects. Although such path mapping provides an effective method of process research, it has given rise to two major difficulties. First, in some cases change projects were implemented almost concurrently. Thus, it was not clear which project should be mapped first. This problem was tentatively resolved by examining the priority of implementing these projects in the company. Secondly, some projects could not easily be broken down into the early, middle and late stages. On such occasions, the division was sought by examining a major strategy shift in the

company, especially when there was a force stemming from the outer context. For example, a deregulation give rise to a direct strategic change in restructuring may move a company from the early stage to the middle stage.

3.3.3 Phase Two Design: Change Dynamics

The focus of the second phase shifts to the study of the underlying logic within a complex change situation (see Chapter 5). Phase two contains three main parts. The first part uses processual analysis at two different levels. At a macro level, the analysis traces the background story of President Enterprise retrospectively from 1967 to 1998, providing a brief overview of the inner and outer contexts. At a micro level, the analysis recounts a rich story explaining the dynamics of the backfire of IT-enabled change in President, with a retrospective account (from 1990 to 1997) based on a one-year period of real-time investigation (one month on site at different times). The second part of the analysis then uses the recurring patterns from the causal story to build constructs and formulate an influence diagram model to represent the underlying logic. This underlying logic seeks to explain the underlying forces that govern the occurrence of events in a situation-specific context. Finally, the third part of the analysis attempts to examine the underlying logic through frame analysis. This seeks to identify the conflicting frames behind the formation of this underlying logic.

The synthesis of the three parts of the analysis helps to build a reflective transfer framework, an alternative mode of analysing change characterised by human agency in a controversial situation.

However, the analysis of "outcome" in this study departs slightly from Pettigrew's (1990) approach. Here, outcome is not seen as a consequence of sequential events; rather the study collects key performance indices (outcome indicators) in order to identify the problem areas: for instance, why does the increase of investment in IT not reduce workload and cost? The purpose of describing content, process and context is to understand what solutions have been applied to problems and what outcomes have been produced over time.

This empirical data help to formulate the analysis in Chapter 5, exploring the underlying causes of IT-enabled change problems. Using influence diagram modelling, the study is able to offer a more sophisticated account of the dynamics of change from a systemic perspective, rather than describing a direct causality between problem and outcome (as, for example, when the failure of IT-enabled change is seen to be due to leadership alone). This feedback loop analysis, provided by influence diagram modelling, offers an effective way of representing the reciprocal relationships of the problem under investigation.

Case Selection and the Unit of Analysis

The case used in phase two is an international consumer product firm – President Enterprises. The selection of this case is based on two rationales. First, President has previously invested millions of dollars working with various international consulting firms on large-scale change projects. However, the top management remains baffled by the paradox of achieving a high sales target and stagnant profits. At the same time, the implementation of IT-enabled change has been unsuccessful in spite of the vast amount of investment on various initiatives. These changes have also resulted in the resignations of many senior staff, and the problems at the operational level seem to be escalating. Divisional managers in general feel that the company's overall capability in dealing with these problems has gradually dwindled. In this case, critical events are used as the unit of analysis.

Data Collection

The data collection traced the strategic implementation systems from the bottom up (from front-line workers to the top management team), and followed the process of the firm's operational activities horizontally (from R&D to customer service). The overall interview strategy is illustrated in Table 8. The analysis traces the change incidence retrospectively, including a real-time intensive field visit (spanning one month from August to September 1997), a follow-up questionnaire, and another site

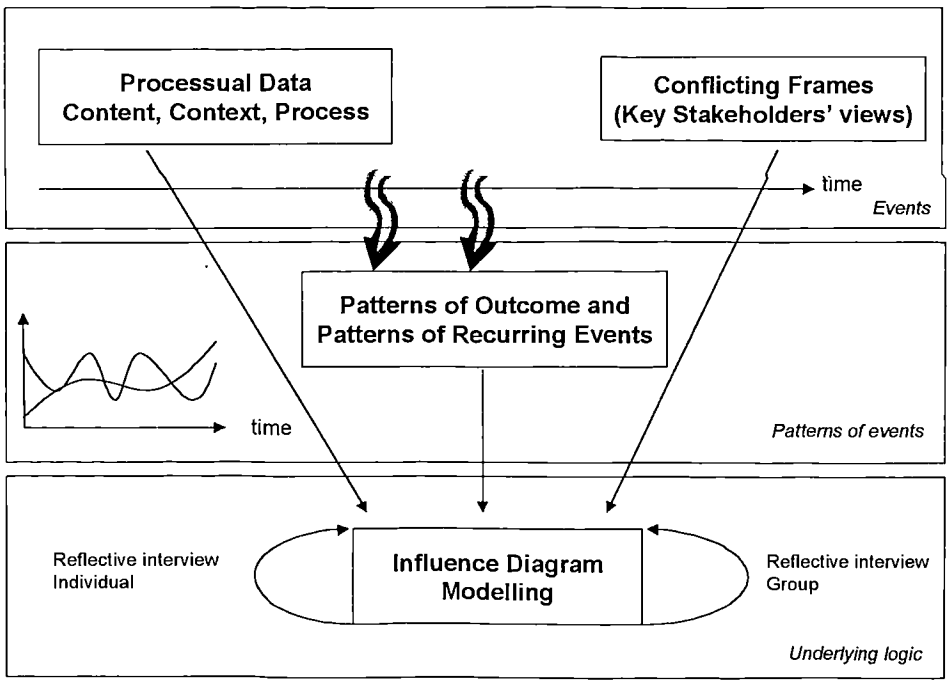
visit (spanning three weeks in April 1998).

	R&D	Production	Sales/Retailers	Headquarters
Management team				8
Divisional Managers	1	2	3	
Middle Managers	1	4	15	
Front-line workers	1	6	28	
Sub-total	3	12	46	8
Total				69 persons

TABLE 8. Interview Strategy in Phase Two

Three main sources of information were collected (each last for one hour on average). First, process data were collected with reference to content and context, according to the different stages of the company's growth. These data were then used to define a system boundary of the context. Secondly, data concerning the subjective interpretations of social actors were collected, including the perceptions of the top management, Strategic Planning Division (SPD), IT department, and divisional managers. These data were used for frame analysis (Schön and Rein, 1994). The third source of data involved the collection of outcome symptoms, including both the quantitative data of system performance (such as profit, revenue, money invested in change, process efficiency, staff turnover, operating cost, rate of goal achievement, and R&D investment revenue) and the qualitative data of intangible factors (such as staff morale and problem accumulation). These patterns of outcome performance were used as reference modes for influence diagram modelling.

The three sources of data were gathered through interviews, participant observation in meetings, internal archives, consultancy reports, and two group meetings. The research framework, which was used to guide the three levels of data collection is shown in Figure 7 (Kim, 1992: 8; Forrester, 1993). The first level is concerned with the process data of change events; the second seeks to explore the patterns of events; whilst the third level attempts to understand the concept of underlying logic that governs the creation of events and patterns.



(Source: adopted from Kim, 1992: 8; Forrester, 1993)

FIGURE 7. The Research Framework for Data Collection

Data Analysis

Data analysis involves the use of influence diagram modelling (Coyle, 1996). Influence diagrams are used as the major technique to represent the concept of

underlying logic, transforming process data and individual interviews into a systemic understanding of multiple causal relationships with reference to the outcome patterns. The analytical process is based on the system dynamics discipline (Forrester, 1961; Randers, 1980; Roberts et al., 1983; Wolstenholm, 1990; Kim, 1992; Morecroft and Sterman, 1994; Vennix, 1996).

However, it should be noted that the modelling process used in this study is different from the current practice, which is based mainly on quantitative modelling (e.g. Sterman, 1989) and qualitative modelling (e.g. Wolstenholm, 1990, 1994). The quantitative modelling approach follows a normative pattern (the positivist perspective), and emphasises the hard facts of a system, ignoring the implication of the soft factors. On the other hand, qualitative modelling stresses the collection of soft data, but still embraces a positivist stance, without considering the influence of contextual factors and social actors conflicting frames. It is more concerned with the collection of qualitative (intangible) data, yet the analysis of these qualitative data is still guided by positivism (as expressed, for example, in the view that if analysts control the "morale factor", the system performance will be improved). The modelling technique used in this study involves two aspects: one with open-ended modelling (suggested by Coyle, 1996) and another with the application of "system archetype" (suggested by Senge, 1990; Senge et al., 1994). However, the

contextualist perspective serves as the guiding principle in data modelling, incorporating logical flows (individual cognition) with data flows (system function).

An intra-case analysis is included to provide a thematic examination of the in-depth case. As a result, four key themes are highlighted, and a set of explanatory propositions is suggested to illuminate the key features of contextual change. The research framework for data analysis is shown in Figure 8.

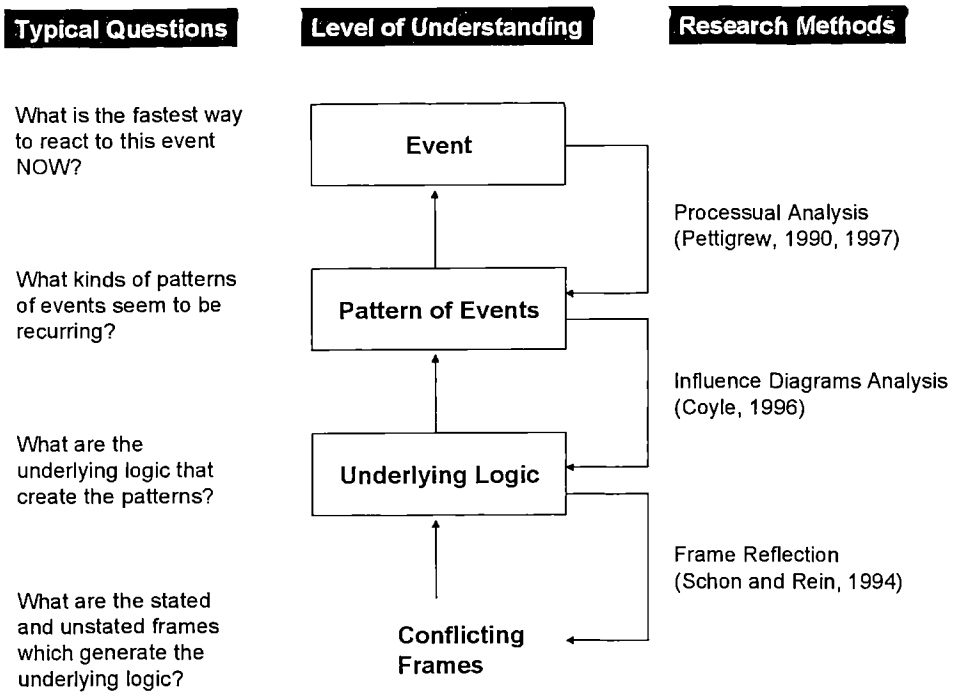


FIGURE 8. The Research Framework for Data Analysis

Validation Issues

The issue of validity raised in phase two is more complex than in phase one. It

involves modelling subjective cognition, which gives rise to the problem of inter-subjectivity. In order to minimise the impact of the researcher's own bias, reflective interviews and group meetings were used to incorporate internal stakeholders' comments. However, the researcher retains the final decision about model building, with reference to the hidden agendas informed by site visits and informal conversation. Finally, five guiding questions are repeatedly raised in different forms in order to achieve data triangulation (Forrester, 1993). These questions are: (1) What was done in various kinds of past crisis (sources of change)? (2) What are the self-interests of individuals? (3) Where are the influential power centres in the organisation? (4) What could be done in various hypothetical situations that have never happened? (5) What is being done to help solve the serious problems facing the company?

3.4 SUMMARY

In summary, the present research constitutes a qualitative inquiry using the case-study method to develop process theories, and is divided into two phases. The focus of phase one is on the understanding of the alignment behaviour of organisational change through five case studies. This involves exploring how change patterns evolve over three time frames (early, middle and late). In particular, emphasis is

placed on the subsequent reaction between changes arising from different organisational factors. Phase two seeks to investigate the underlying dynamics of change, exploring the nature of contextual change. The aim of phase two is to draw out the implications for a frame-reflective approach to change management in contrast to the predominant planned (goal-directed and goal-seeking) change approach. The aim is to provide new insights for understanding the productivity paradox of IT-enabled change. The various techniques used in the two phases are summarised in Table 9.

	Phase 1	Phase 2
Research method	Case-study method using replicate logic	Case study method synthesising the use of stories and constructs
Case selection	5 cases	1 case (in-depth)
Unit of analysis	Change projects	Critical events
Data collection	Semi-structured interviews and secondary information	In-depth unstructured interviews and participant observations
Data analysis	Path mapping (Yetton et al., 1994), temporal bracketing and visual process mapping (Langley, 1998)	Processual analysis (Pettigrew, 1990), influencing diagrams (Coyle, 1996) and frame reflection (Schön and Rein, 1994)

TABLE 9. The Two-Phase Research Design

Chapter 4: Phase One: Change Alignment

This chapter, consisting of three parts, explores the processual patterns of change alignment in five organisational settings over three time frames. The first part outlines the chronology of change processes, tracing the implementation path of change initiatives in each case. The purpose is to explore the transition of and alignment between, different organisational factors. The second part compares the processual patterns and uses them as a basis for cross-case analysis. This results in four distinctive patterns of change alignment, referred to as "relational alignment" in this study. Finally, the theoretical and practical implications of these four patterns are discussed. In particular, the IT productivity paradox is examined from an alignment perspective.

4.1 SINGLE CASE ANALYSIS: PATH MAPPING

The content of each case is presented in terms of five dimensions: strategy, structure, processes, people and technology (using the MIT 1990s framework) in a chronological order. The focus is on how different change initiatives are implemented over time. Applying the path mapping technique (Yetton et al., 1994), each case is mapped out with regard to the pattern of alignment over three key time phases: early, middle and late. The detailed descriptions of the developmental paths

in these five cases (Aerospace, Telecom, Semiconductor, Publishing and Automobile) are discussed in turn.

4.1.1 THE AEROSPACE CASE

The Aerospace case involves an aeroengine company facing ever-increasing competition because of a fundamental change in its supply chains, and later, competitive cost pressure. In general, civil aircraft makers are now capable of producing an aircraft to specification in three years, thus offering a direct challenge to aeroengine manufacturers. Those who can develop an aeroengine within the same time scale as the aircraft makers can obtain significant market opportunities and cost savings.[1] However, the average practice of the industry in producing a civil aeroengine is four to five years. In view of these challenges, the company has considered a series of organisational changes in product and process. Nonetheless, the aeroengine represents mature technology, and the chief opportunity to achieve competitive advantage, thus, lies in redesigning the processes at a lower cost, and with the best specification for the customer.[2]

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[1] Personal interview with the Director of Engineering (6 August 1996). Also see Townsend, Mike. 1995. "Interview: Powerhouse Gets Ready for After Market Crash." Accountancy June: 32-34.
[2] Ruffles, P. C. 1995. Project Derwent: A New Approach to Product Definition and Manufacture. Derbyshire: Rolls Royce Aeroengine Group.

The Early Stage (1990-94): Project Derwent

In the early stage, a process improvement project, Project Derwent, was initiated to undertake the challenge of process efficiency, emphasising effective product design in order to shorten production cycle. Subsequently, the company broadened the scope of Derwent to make it a total business initiative named "integrated product development". The concept of Project Derwent involved three key elements.[3] The first involved scaling-down design and a lowering of risk rather than inventing new technology. The second sought to simplify process design in order to avoid the use of complex computers. The third element sought to avoid any bureaucratic structure that might demoralise personnel. In general, Project Derwent aimed to create a modern engineering environment in which engineers could do things quickly, deliver the product on time, achieve the right quality and significantly reduce costs. This constituted a planned strategy with a focus on the integration of product development.

The idea of a modern electronic engineering environment was proposed as the basis of the technological platform. The company introduced an electronic data environment, EPD (Electronic Product Definition) to support company-wide

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[3] ibid.

changes.[4] This aim was to use information systems to integrate data from the best design practices, design standards and quality standards. In this way, engineers would be able to access all engineering knowledge in a computerised structure. The current use of EPD is embedded in three applications: (1) Compressor Blade Definition, which has shortened the time scale by 12 weeks from the original 22 weeks, covering work items from product definition to engineering modelling to manufacturing definition. (2) Fan Foreign Object Damage and Blade-off Prediction, which is a simulation software predicting bird impact and fan case integrity. (3) Engine External Dressing and Accessories, which uses 3D modelling to assist in the pre-assembly of the turbine engine, replacing the mock-up engine, and thereby saving in cost and time. Engineers sitting in front of the screen can call up the database immediately and know what the criteria are, instead of having to walk through the office, and flip through pages and pages of files. The ideal condition is to operate an entirely paperless environment. Thus, engineers can use EPD to identify the critical paths on the production processes and devise ways of shortening the potential delays. As a result, time scales can be reduced, and costs can be cut.

In order to overcome the inertia stemming from the bureaucratic system, the firm

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[4] Internal project report, 1998.

readjusted its organisation to accommodate the use of EPD. The restructuring involved a redesign to reflect the work breakdown structure of an aeroengine in a manufacturing process. This structure included three teams: The first team was a project organisation arranged by functional areas (such as design, performance, experiment, compressor and etc.). The second was responsible for design and manufacturing processes, involving the coordination of the whole engineering definition with subsystem definition (such as component and material definition). The third was responsible for procurement process. These three teams were established to work with people across departments in order to support the introduction of EPD.

In addition, the company initiated a cultural change in order to support structural changes. This was the most difficult task, as the company had had an engineering-oriented culture for decades. The solution was a redesign in individual job specifications and responsibilities through the use of a new reward system. The aim of the cultural change was to create an environment in which people would be accountable, and in consequence, where their rewards would relate to their achievements. Furthermore, the company introduced a networking scheme which involved mixing the functional expertise of the staff, thus moving away from the traditional hierarchical structure. Such a networking initiative was designed to

achieve synergy between the matrix structure and existing business units, thereby fostering a cultural change especially for the technical and administration staff. In turn, through such an exercise, the networking scheme aimed to trigger a cultural change in the management team's attitude of compliance.

The Middle Stage (1994-96): Electronic Product Definition

In the middle stage, the strategic focus turned to the integration of the supply chain. First, the firm restructured in order to implant a matrix-based system. This enhancement of structural change was designed to facilitate the management of engineering projects by spreading the use of IT and thus supporting the flow of information, both vertically and horizontally. In this sense, the matrix-based system sought to provide a mediated platform through which people could actively participate in the use of technology and interact with staff from different departments. This planned restructuring had both a technical and a psychological purpose. From a technical point of view, the matrix organisation was conceived to support the use of technology (EPD), forcing people to perform tasks in a cross-departmental fashion. From a psychological point of view, this adjustment also sought to impact on the social structure, so that people would recognise a shift in their roles as the new culture replaced the conventional culture.

The psychological change was needed to cope with change in another dimension:

information sharing. The electronic, paperless, environment also requires the voluntary act of making information (engineering data and design) available to others. Information sharing in the firm was particularly concerned with the reconciliation of conflict between internal stakeholders. Thus, management began to acknowledge the important role of front-line engineers. Thus, apart from the new reward system (to provide incentives for a new working mindset), the firm also arranged a series of employee workshops called "One Small Step". This was an organisational development exercise to allow employees to activate their personal goals with those of the company. The spirit of "One Small Step" was to show how a collective effort made up of the small steps of individuals could become a major leap forward in the progress of the company.

Subsequently, the firm began a process integration programme through a reengineering project. The reengineering of the production processes consisted of three major elements: designing, manufacturing and supporting processes. A four-stage framework was used to cover these processes across the company. The first stage, product planning, involved identifying a need for a product, developing a business concept, and evaluating the engine configuration. The second stage focused on the full concept definition, including contract administration, risk evaluation, propulsion system realisation planning, supplier management, and competitor

analysis. An essential part of the first and second stages was capability acquisition, which sought to identify the new technology required to achieve the engine specification and evaluate the resources needed. Stage three, that of propulsion system realisation, delivered a fully defined and approved engine for entry into service. Stage three involved three working phases: (1) the engine-launch phase defined products and identified existing technologies to support this activity. (2) The engine certification phase refined experimental vehicles and incorporated them into a standard test. (3) The engine-in-service phase conducted the flight testing to ensure full compliance with aircraft air-worthiness standards in order to verify engine maturity and demonstrate reliability prior to entry into service. Stage four, in-service monitoring and technical support, was a proactive process which ensured the continuous operational effectiveness of the propulsion system.

The redesign of process involved a concurrent engineering practice to integrate product launch, manufacturing and customer services. The purpose was to achieve improvement in production time, cost and quality. Two measures were used to support the process change: primary and secondary. The primary measures included schedule performance, cost performance and defined specification, whereas secondary measures stressed the performance audit in internal processes. The reengineering project could be seen as an extension of the previous process

improvement. However, at this stage, the firm encountered major difficulties in undertaking the reengineering project. The main sources of problem came from the overstaffed IT department and the inefficient service they delivered to other departments. Considering the allocation of critical resources, the firm decided to delegate the development of EPD to a third party. It was hoped that in this way resources could be concentrated on internal change, and the risk associated with technological development could be minimised. The major technological change at this stage was thus the transfer of the IT department to the third party, EDS (Electronic Data Systems). The firm reached a radical conclusion that the whole IT department had to be sold to EDS. EDS, merged with the IT department, would perform what the firm call "co-sourcing" to provide information management services to the company.[5]

The Late Stage (1996-97): Digital Pre-assembly

By the late stage, the EPD project had gradually been developed into another initiative called PDM (Product Data Management), to be used in the Trent 500 engine. The firm was then able to harness the technology into the area of knowledge

[5] Personal interview with an IS consultant (Winter 1998) and staff in the engineering department (Spring 1996).

management.[6] The aim was to "share information and make it work", thus enabling the management of product information. As noted by its mission statement:

> Information of any sort is useless unless it is available to the right people, at the right time, in the right format. The Product Data Management initiative aims to gather together information from the areas where is has traditionally been stored by those involved in its creation and structure it in such a way as to be more useful to many others. (Fact Sheet of PDM, 1997: 9)

This PDM initiative involved primarily an electronic integration of the product information, for example relating to engines, modules and spares. Such information can be in the form of, for example, CAD (Computer Aided Design) definitions, technical reports, problem reports, blade, and vane aerodynamic data and stress data. The benefits lie in four areas. First, the initiative aimed to trace product changes from problem report to definition and vice-versa. Secondly, it was possible to identify the current status of any change proposal. Thirdly, all the release data relating to the product could be found. Fourthly, the company could be confident that they have the correct version of all data when working on a job. In addition, the PDM project has been implemented to support a major IT-enabled manufacturing initiative called "digital pre-assembly", using virtual reality technology. As the firm faces a "design-to-cost" challenge from the outer environment, it has to monitor the operating cost in

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[6] The prototype of this plan was reported in Mills, R. 1995. "CAD/CAM in Aerospace." Computer Aided Engineering 14(2):52-58. Brown, M. 1994. "Engine Trouble: Rolls Royce's Fitness Drive." Management Today December:51-54.

product development in a real time method. The virtual pre-assembly technology seeks to ensure the quality of engineering design and reduce significantly the cost in the design phase.[7]

The introduction of PDM and digital pre-assembly aimed to improve lead-time in product development in order to enable further innovations in engineering design. These two IT initiatives also brought about further major changes in processes. The first of these was the use of JAD (Joint Application Development).[8] This term describes the development of a system by a team comprising all internal stakeholders. The team sessions made rapid decisions and tried them out immediately on a developing system. The JAD method encouraged workable rather than perfect solutions. This method was an attempt to reduce the cost and time in the starting phase of product design. For the same purpose, the virtual pre-assembly technology enabled the ending phase of product design. Engineers could use this technology to verify the reliability of the product design and identify areas of improvement quickly. The major change was in the design process, where engineers had to share, discuss, and correct engineering design through the mediation of electronic data and

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[7] Personal communication with two managers from competitors (13 May, 1997; 16 June, 1997). Also see Moorman, R. W. 1991. "Choose Your Partner! Engine Manufacturers Learn to Dance Together in Order to Tap into 80-100 Seat Regional Jet Market." Air Transport World May: 91-105.

[8] Wood, J. and D. Silver. 1989. Joint Application Design: How to Design Quality Systems in 40% Less Time. New York: John Wiley & Sons.

representation.

The major investment in people was through training and education. The use of both new technologies, PDM and digital pre-assembly, required the employees' full participation. Courses were developed to help users cope with the new methods of working in an electronic environment. Furthermore, engineers at this stage had to cope with new technology, new culture, and increasing orders at the same time.

Finally, the firm rearranged its global organisational structure into SBUs (Strategic Business Units) to facilitate knowledge sharing. The aim of this restructuring was to introduce best practices (PDM in particular) among SBUs in order to assist innovation activities. Additionally, the restructuring also sought to deliver a globalisation message to employees that highlighted a shift in their responsibilities as global knowledge workers.

The path of change is mapped out and shown in Figure 9. In summary, the Aerospace case demonstrates three modes of change alignment. First, in the early stage, the strategic move of a process improvement project introduced a planned process change, driving a subsequent change in technology (the electronic environment), restructuring (by function), and people (change the engineer-oriented culture).

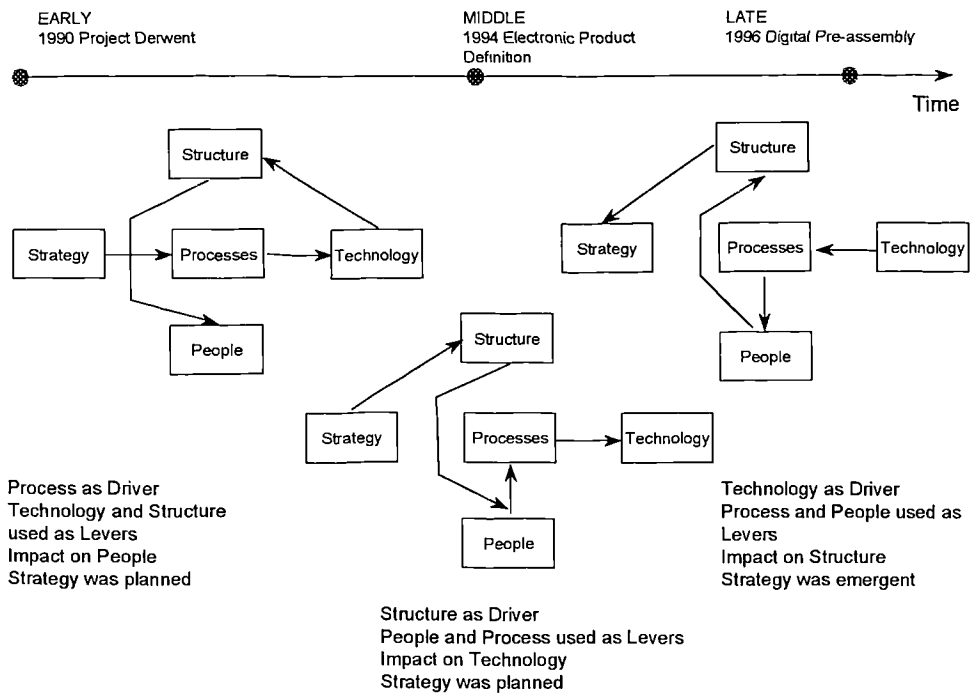

FIGURE 9. Change Path Mapping in the Aerospace Case

Secondly, in the middle stage, the strategic aim was to streamline efficiency in the supply chain. The firm, as a result of cultural change in the previous stage, initiated a planned restructuring (matrix-based organisation), driving a series of changes in people (information sharing culture), processes (reengineering in the product development process) and technology (reinforcing EPD). Thirdly, in the late stage, as a consequence of experimenting with EPD, the firm became more confident in extending the technological initiative to PDM and digital pre-assembly, thus driving changes in processes (JAD and manufacturing), people (education and training) and structure (rearranging into SBUs). Gradually, these changes enabled an emergent

global initiative in knowledge management.

4.1.2 THE TELECOM CASE

The Telecom case has had to face several sources of pressure: privatisation, competition in the European market, and global expansion. In the domestic market in the UK, the company was losing 16,000 lines every month to other telephone operators such as AT&T and Cable & Wireless.[9] For the telecommunications market, rapid launch procedures are becoming a vital commercial determinant of competitive success. The key challenge is to confront the growing competition and generate overall revenue.

The Early Stage (1984-87): Total Quality Management

Strategic change in the Telecom case resulted from the privatisation legislation of the Conservative government in 1984. As a result, a strategic joint venture was launched that merged Cellnet (radiotelephone) with Securicor. Further, in 1988 the company aligned with NYNEXX, a New York based telecommunications company. These joint ventures pressured the firm to transform the bureaucratic culture and prevailing attitudes of compliance in the company. The firm recognised that process

[9] Personal interviews with staff in the strategic planning department, explaining a recent marketing survey report (26 June 1996).

improvement had greater advantage than product innovation. Thus, streamlining was encouraged, and this initiated a reorganisation of the firm's hierarchy into a process-oriented organisation.

A management initiative, TQM (Total Quality Management), was introduced to regain customers' confidence. The firm restructured its business units according to various business activities. Subsequently, the firm introduced a set of quality control skills to its employees as a mechanism for changing their old working habits. The focus on the people aspect was primarily concerned with cultural change through a series of education and training initiatives. The change in structure and people then enabled the firm to undertake the introduction of the ISO 9000 programme as a means of reforming their internal operations. A task force called the Process Management Unit was set up to review the functional decomposition of the company. They identified five major work processes: managing the business, managing people and work, serving the customer, running the network, and supporting the business.[10] All processes were then placed in a reference model that took two forms: (1) current processes and (2) future processes. At this stage, standalone information systems were mainly used to support the quality management system devised by the TQM

[10] Personal interviews with staff in the change team (28 June 1996).

initiative.

The Middle Stage (1988-93): Project Sovereign

In the middle stage, the key strategic concern was to align with the market leaders in order to enter the global telecommunications market.[11] In 1991 the firm won licenses from the German government to offer satellite services, adding to its existing satellite operations in France and the Netherlands. In 1993 the company announced a multimillion-pound, five-year contract to provide a communication network to improve Europe's air traffic management. In the same year, it paid $4.3 billion to take a 20% stake in MCI Communications Corp and set up joint ventures with Banco Santander SA of Spain to sell a range of voice and data services. In order to support these global expansions, the firm gradually initiated another series of changes to further trim its unwieldy organisation. These initiatives were included in a process management initiative in 1984 (follow the TQM in the early stage) and a programme called "Project Sovereign" launched in April 1990.[12]

The first impact was on the people and structure dimension. The firm had to make 205,000 employees voluntarily redundant in order to remain competitive. [13] A joint

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[11] Brown, Malcolm. 1997. "Dial C for Change." Management Today July: 65-71.
[12] A personal interview to a change manager (26 June 1996).
[13] Barrett, M. and E. Heery. 1995. ""It's Good to Talk"? The Reform of Joint Consultation in British Telecom." Industrial Relations Journal 26(1):57-64.

consultation redundancy scheme called Release '92 was launched to meet the job cuts target. The terms of the scheme were linked to age of employees, length of service, and membership of the Superannuation Scheme. For the remaining employees, Project Sovereign specified a requirement for greater flexibility, quality and commitment. In addition, the number of management layers was reduced from twelve to six in order to improve communications, quicken response time and reduce costs. Such a change was accompanied by an attempt to establish a more managerial ethos within the organisation. A series of management development programmes was introduced to strengthen managers' responsibilities, innovation, and their communication with other employees.

The pre-Sovereign organisation, based on geography and products, was replaced in 1991 by a new structure consisting of three main customer-facing divisions: Business Communications, Personal Communications and Special Business.[14] These were to operate as distinct profit centres, responsible for revenue, costs and assets under their own control. Such a restructuring sought to ensure that the firm could provide a single interface for all its customers in order to facilitate consistency of product and services. In 1993 another initiative, "Breakout", was inaugurated, and this led to yet

[14] Personal interview with a change agent. (26 June 1996)

another reorganisation in response to the large-scale downsizing programme. In accordance with the restructuring, a process improvement technology OPA was introduced.

OPA (On-line Process Analysis) is a software system which enables data to be extracted as a job progresses along a process.[15] OPA collects critical measure points and displays the information graphically to the process designers and line managers if problems occur. Similar problems can then be collated and presented for discussion, leading to a modification of the process. Once the new processes begin to consolidate, the task level procedures will be captured in the company's national documentation. This documentation records details of the redesigned processes, which can later be replicated throughout the whole company. The purpose of this process improvement programme is to update old processes (in particular, processes relating to customer services), and define best practices for a wider dissemination.[16]

The Late Stage (1995-97): the Strategic Business Process Project

In the late stage, the firm felt more confident about undertaking a company-wide transformation in order to support the global expansion process.[17] In 1996 various

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[15] " Internal Report: Process Reengineering: Measure and Analysis in BT" (1995: 3-4).
[16] ibid.
[17] The Economist. 1998. "Phone Tie-Ups: Telecommunications Industry Mergers and Joint Ventures." The Economist 1 August: 17-19.

change initiatives were integrated into the Strategic Business Process Project, emphasising the redesign of processes.

The firm first introduced activity-based management, a method of tracking the costs of each single activity, thus supporting the redesign of customer service.[18] The process change emphasised three areas: business, support and components. The *business processes* linked directly to the customer's request for action: for example, to install or repair a telephone line. The *support processes* focused on service delivery. The firm further marked out the common parts of business and support processes. These were seen as *component processes* that facilitate common tasks. Several techniques were used to facilitate the process change. SLAs (Service Level Agreements) were used to monitor the overall performance target, including interdepartmental agreements that record the quality of service required across the interface. A second technique used was benchmarking, which involves maintaining an up-to-date knowledge of other competitors' practices and borrows fresh thinking from other similar industries. A third technique used ABM (Activity-Based Management) to evaluate the costs and benefits of a change project. ABM is a form of process modelling for linking the processes with their designated financial

[18] Internal report, "Process Measures: Producing Activity Costs", pp. 5

systems.[19]

These process changes were supported by a pioneering technological initiative: the Project ADEPT (Advanced Decision Environment for Process Task), a database system which integrates the various technological systems in the organisation.[20] This project collaborated with government, industry and universities in an attempt to provide a concurrent engineering capability to integrate information systems on a common platform. The development of Project ADEPT focused on three areas: information infrastructure, information management and information presentation. The technology includes information fusion, computerised negotiating agents, open-distributed processing, heterogeneous information sources, and shared information models. A main concern of Project ADEPT was system platform integration, that is, the integration of data from different databases on various technology platforms (PC, IBM mainframe and UNIX) in order to make an informed decision. The project was designed to achieve integration between computers and service agents. It offered quick access, in specific places and in specific times, to the resources and skills that are needed for customer services.

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[19] In a personal communication, one senior executive explained that this ABM initiative began as a budget control mechanism to support process changes (12 July 1996).

[20] Fineman, Laurie. 1995. "Process Reengineering: Measure and Analysis in BT." London: British Telecommunications Internal Report. pp. 4

For example, while a customer is holding on the line, a sales person can trigger a request through the ADEPT computer agent, linking with other agents throughout the country. The sales person has access to all the necessary databases, such as those for the availability of transmission plant, suitable equipment at the telephone exchanges, people available to do the job, and the schedule at which the work can be booked and carried out. The computer agent will make sure that all the relevant information is collated concurrently, evaluated and acted upon. As a result, ADEPT enables responses from the customer to be achieved within seconds, thus making it possible to take orders confidently and provide service at the agreed time at a competitive price.

The firm recognised the complexity of transferring these change initiatives to its many divisions. It therefore established a task-oriented department, the Process Control and Management (PCM) unit, to facilitate the implementation of change.[21] The idea was to accumulate the experience of change in the organisation. Based on balanced scoreboard criteria in terms of financial measures, organisational development, staff competence and process efficiency, PCM could select change proposals from various departments, and then devise strategies for implementing

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[21] Internal Report, "Process Control and Measurement: A Guide to PCM's Way of Working" (30 October, 1995)

them. PCM could decide on the appropriate degree of involvement and set up a task force team to facilitate the implementation. Once a particular proposal was selected, a virtual team would be established to develop the required competencies for the completion of a change project. In this way, the institutionalised agent (PCM) would play the role of imparting relevant knowledge of change to the whole organisation, thus building a mechanism for continuous innovation (in 1996).

In order to support change, a Learning Laboratory concept was set up to help staff codify, create and share knowledge within the organisation.[22] The Learning Laboratory approach was introduced to facilitate organisational change in process redesign, systems development and continuous innovation. This concept involved a group of activities to help people create knowledge, share understanding, and continuously improve themselves and the company. Teams were selected from people working and managing current processes. These people understood the process problems but often had difficulties in breaking the mould. Learning laboratories were established in which these people were brought together to directly design the new processes in a series of short workshops. Details from the workshops were captured on a database, analysed by OPA (as explained in the middle stage),

[22] See Beard, David. 1993. "Learning to Change Organisations." Personnel Management 25(1): 32-35.

and sent back to the multidisciplinary team for assessing the time and cost of the emerging processes.

Moreover, the concept of the Learning Laboratory was also intended to support customer service. For example, the repair time for product circuits had a new target of five hours. If the company could not meet the target, a national project would be established and a national team would be formed, including systems, change management and other staff across different fields of expertise, to tackle the specific problem.[23] The basic aim of the Learning Laboratory was to acquire a learning ability at three levels (individual, team and organisation) in order to strengthen managerial effectiveness in confronting complex problems. At an individual level, the company invited participants to attend a development centre to review their performance and abilities, and apply learning concepts to their work. At a team level, team learning was introduced to facilitate process reengineering, enabling new processes to be developed and captured rapidly in documentation. The third (organisation) level involved a cultural change for the whole organisation. The company used a planning model known as the Shepherd Wheel, a balanced performance measurement scheme,

[23] Personal interview with a divisional manager and a change agent. (26 June 1996) Also see Kennedy, S. 1997. "Future Talk: The Learning Lab Concept." Computer Weekly 4 December: 42-44.

to facilitate the development of a results-oriented culture.[24] The wheel model was based on six criteria: profit-financial viability, quality of product and service, customer satisfaction, productivity, staff commitment, and the effect of change. Managers' key responsibility was to achieve the best balance among these criteria.

In summary, the Telecom case illustrates three patterns of change alignment (as shown in Figure 10). In the early stage, the external pressure (deregulation) introduced a planned restructuring (from functional structure to business activity-based structure), driving a subsequent change in people (cultural change via education and training), process (through the ISO 9000 initiative), and technology (standalone information systems). In the middle stage, the firm faced the pressure to expand globally under uncertain environmental situations. It then adopted an emergent approach to change, driving a series of changes in people (downsizing and joint consultation), restructuring (from geography-based to customer service-based), technology (on-line Process Analysis software), and process (best practice imitation). In the late stage, as the firm had consolidated different change initiatives, it introduced another planned process change (activity-based management) aimed at cost reduction. This change subsequently drove alternations in technology (ADEPT

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[24] Davey, J. and D. Shepherd. 1992. "BT's Wheel of Fortune." Personnel Management 24(1): 40-43.

database systems), structure (an institutionalised change agent: the Process Control and Management unit), and people (the Learning Laboratory).

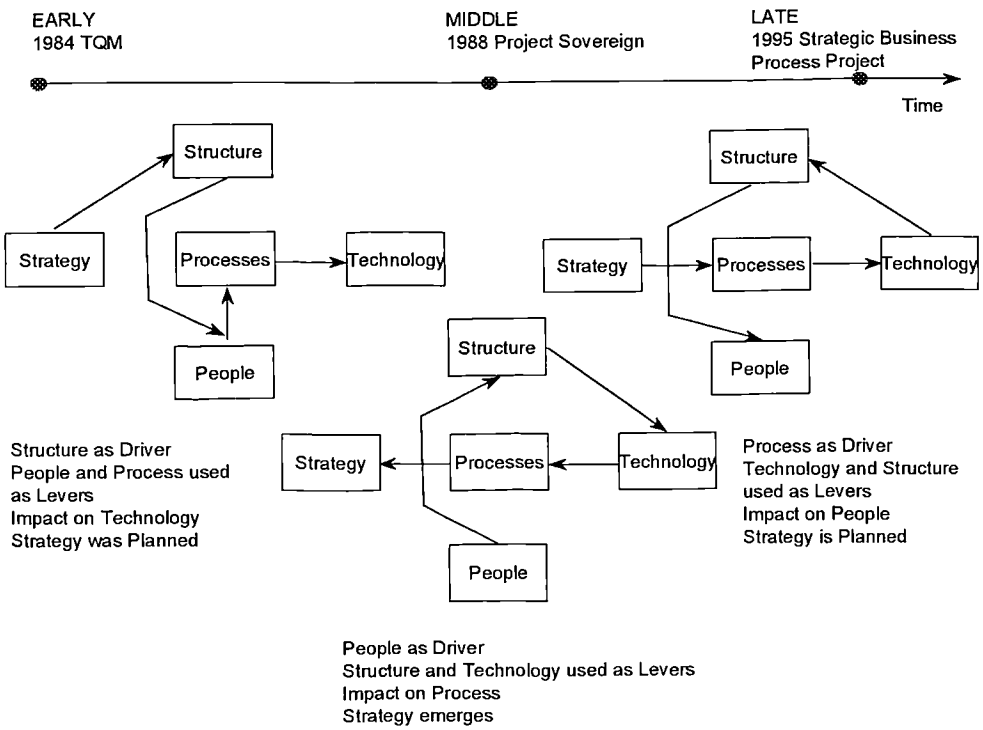

FIGURE 10. Change Path Mapping in the Telecom Case

4.1.3 THE SEMICONDUCTOR CASE

Unlike other manufacturers who focused mainly on standard products such as SRAM (Static Random Access Memory) and DRAM (Dynamic Random Access Memory), the Semiconductor company concentrated on Mask RAM, EP ROM, and Flash. These products relied on technological competence rather than production and

marketing.[25] In 1996 the semiconductor industry faced its most ferocious challenge, with recession affecting every aspect of manufacturing. This resulted in a sharp fall in prices, and most semiconductor manufacturers had to cope with severe competition. In spite of these challenges, the case study firm still managed to maintain its position in the top-four list (1996).

The Early Stage (1988-92): A Production-based Strategy

In the early stage, the firm was a new start-up high-tech company specialising in tailor-designed ICs (Integrated Circuits), focusing on production and marketing.[26] Experiencing the problems of the semiconductor industry, the CEO set out a strategy stressing the need to achieve technological competence and which required a significant amount of resources and capital to be invested for this purpose.

The firm had to invest in IT-based production facilities in order to set up manufacturing operations. In order to achieve its long-term strategy of building technological competence in manufacturing EP ROM and Flash, the firm established production lines tailored to the computer, consumer electronics and communications markets. Thus, at this stage the main priority was to install production technology

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[25] Browning, L. D., J. M. Beyer, and J. C. Shetler. 1995. "Building Cooperation in a Competitive Industry: SEMATECH and the Semiconductor Industry." Academy of Management Journal 38(1): 113-52.

[26] Editorial 1995. "Semiconductor Industry Analysis: Special Report." Common Wealth Magazine October: 88-108.

and set up processes for manufacturing dominant products (RAM), with a specific strategic intent to expand production to future products (EP ROM and Flash).[27]

As most of the chief engineers came from various US-based semiconductors firms, the management paid special attention to building an entrepreneurial culture. The emphasis was on assimilating the diverse backgrounds of these engineers. In order to reflect such an entrepreneurial spirit, the firm was restructured from a function-based hierarchy to a matrix organisation in accordance with this a cultural shift.

The Middle Stage (1992-94): A Market-based Strategy

In the middle stage, the emphasis shifted from a production-based to a marketing-based strategy, aiming to align with key customers to provide them with tailor-made semiconductor chips.[28] The firm began to realise its competence-oriented strategy, which focused on the 3C industries (Computers, Communications, and Consumer Electronics) and was concerned with building a closer relationship with customers in terms of chip design and research development.

The implementation of strategy first required a process change to integrate the operation between product design and production. This involved two major

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[27] Personal interview with Chief Financial Officer and other staff (10 July, 1996).
[28] Hobday, M. 1989. "Corporate Strategies in the International Semiconductor Industry." Research Policy 18:225-38.

reengineering activities. The first was concerned with the redesign of the product. The firm introduced new semiconductor design technology and updated the obsolete processes accordingly. The second reengineering activity included two areas of improvement in the administration processes: simplifying and automating existing operations. The company recorded process performance from ordering to delivering on an hourly basis, and sought to simplify the operational process whenever possible. For example, the company found that if they delivered products one hour earlier in the morning (from 10:00am to 9:00am), because of air transportation scheduling the products would arrive one day earlier.[29] By constantly reviewing the existing processes, the company achieved a cost advantage of 20% to 30% ahead of its competitors.[30] At this stage, the company developed information-processing system to support such process improvement. The implementation of information systems was based on departmental requests and local exploitation. Few systems were integrated for cross-departmental collaboration. In 1993, to complement the competence-oriented strategy, the company also invested resources in building customer bonds. An institutionalised exchange of research staff was established to support this aim. For example, senior management teams were sent to customers to

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[29] Personal interview with a group of senior managers (12 July, 1996).
[30] Editorial 1996. "MXIC Semiconductors Challenges Recession." Common Wealth Magazine 1 October: 126-31.

solve strategic problems and explore new business opportunities. Moreover, technical staff members were also encouraged to participate in their customers' R&D activities, by sharing ideas and information. However, at the middle stage an economic recession brought about a restructuring to cope with a significant increase in staff turnover. This was partly caused by the dissatisfaction of employees (in particular, of senior staff), and many of whom felt that the management team did not appreciate their valuable expertise. The loss of many senior staff caused a substantial decline in the firm's technological competence.

The Late Stage (1995-96): A Niche Market Strategy

In the late stage, the firm had to cope with three sources of pressure. The first came from the economic recession as a result of the industry's life-cycle (semiconductor industry follows a heuristic rule of "3-2" life cycle, meaning every three years of profitability follows a two-year recession).[31] The second source was the increasing competition which came from the USA.[32] The third source of pressure was the problem of staff turnover. Strategically, the firm dealt with competition by focusing on the niche market of special IC (Integrated Circuit) production. The aim was to

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[31] See Editorial 1996. "Semiconductors Trend Analysis." Common Wealth Magazine October: 124-25.
[32] For a detailed explanation of the political threat, see hUallachain, B. 1997. "Restructuring the American Semiconductor Industry: Vertical Integration of Design Houses and Wafer Fabricators." Annals of Association of American Geographers 87(2): 217-37.

align itself with major system integrators (such as SEGA, NEC and HP). Under this strategic intent, it initiated a company-wide change programme: Vision 2000.

The major challenge was to retain staff and revive morale. Therefore, the Vision 2000 programme was proposed to alleviate the challenge by moving towards undertake cultural transformation. This programme ran through a series of staff development workshops in order to establish a shared corporate vision. Furthermore, the firm redesigned the employee career system and reward schemes in order to reflect seniority of expertise.

Subsequently, in 1996 the firm restructured in response to its niche market strategy. This restructuring involved the building of relationships with the firm's key accounts, aiming to promote the exchange of technological know-how with client firms. Basically, the redesign of organisational structure was intended to support inter-firm knowledge-sharing with an emphasis on R&D activities. Moreover, prior to the implementation of an integrated information system, the firm was advised to restructure its departments into a process-oriented structure in order to exploit the IT capability. This re-organisation was needed to meet the requirements of the information system, SAP. SAP is a management information system that applies a common database platform to integrate the physical and information flows according to a firm's operational processes. Such an integration aims to bring together various

functions of manufacturing processes, including sales offices, factories, warehouses, accounting departments, and headquarters. The SAP system was introduced to integrate the firm's administrative activities into a process-based structure, focusing on ordering and materials control systems. At this stage, the manufacturing processes achieved steady production, and thus the introduction of SAP was more concerned with the managerial processes. The aim of the management team was to employ radical process reengineering in order to transform the departmentalised operations and enhance collaboration.

The change path is shown in Figure 11. The organisational change in the Semiconductor started with an emergent strategy of differentiation, focusing on technological competence-building (EPROM). By setting up IT-based production facilities, the firm concentrated on designing the manufacturing processes. At the early stage, special efforts were put into the building of an entrepreneurial culture, which then led to a restructuring to support technology-based production. At the middle stage, the firm, faced with global competition, had to employ a market-based strategy. The firm was relatively confident of its ability to initiate a planned change in processes, leading to a series of changes in technology (information systems for local exploitation); restructuring (for inter-departmental collaboration) and people (cope with staff turnover). At the late stage, due to the uncertainty caused by the high

level of staff turnover, the firm introduced the Vision 2000 programme (involving a change in people) in order to retain senior staff and restore technological competence. In consequence, the management restructured the firm into a customer-based organisation, facilitating knowledge-sharing with client firms and at the same time restoring the motivation of its technical staff (change in structure). This restructuring also paved the way for a further introduction of SAP information systems (change in technology) in order to force a reengineering in the administrative processes. These adaptations shifted the firm's market-based strategy to a niche-market strategy that sought to form strategic alliances with system integrators.

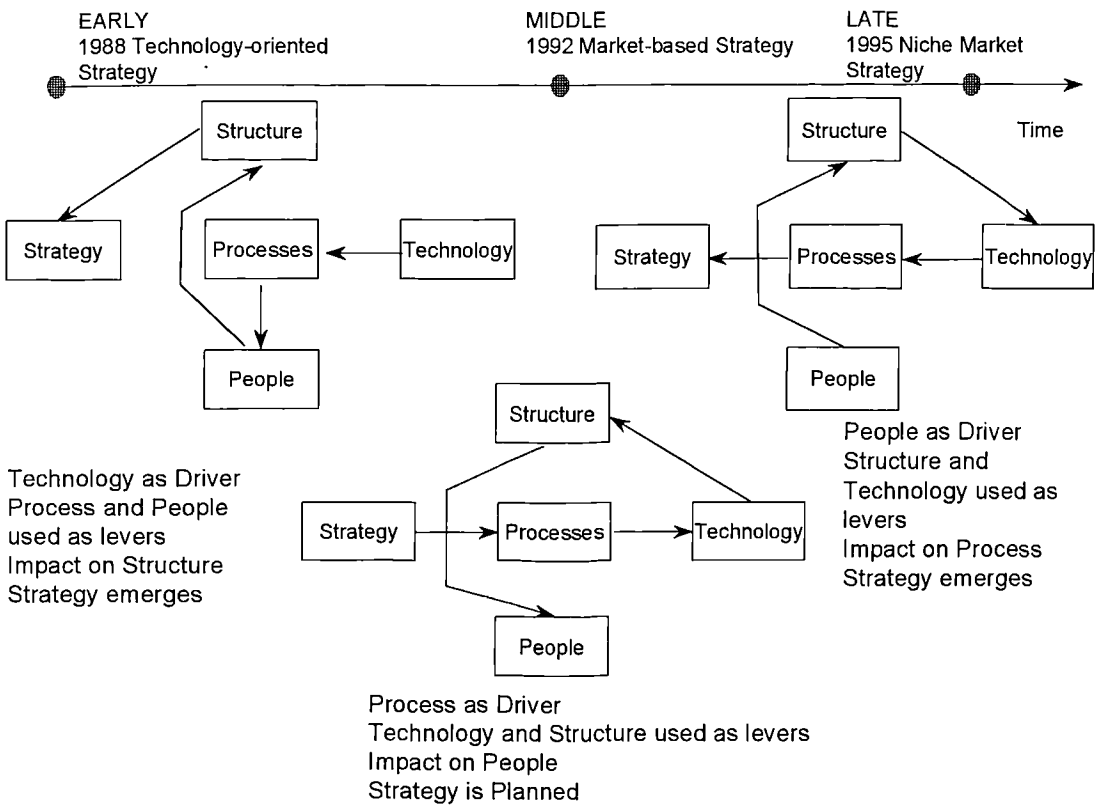

FIGURE 11. Change Path Mapping in the Semiconductor Case

4.1.4 THE PUBLISHING CASE

The Publishing firm is specialised in language publications and English teaching. The company has maintained a close relationship with major international publishing companies and language education institutes such as BBC (British Broadcasting Corporation) English, Prentice Hall Regents, Oxford University Press, Longman, Children's Television Workshop, Walt Disney, Addison-Wesley, Dorling Kindersley, and San Diego University in California. Experience in publication has now prompted the company to enter the field of electronic publishing. To achieve the company's global strategy, branches have been set up in London, New York, Jersey City, Cyprus, Hong Kong and Bangkok. Such a rapid expansion has inevitably led to problems in the company's operations. The employee turnover rate is high, and competition from the domestic market is intensifying.

The Early Stage (1990-92): IT for Automation

The early strategy in the Publishing case focused on internal consolidation in order to respond to domestic competition. The firm stressed two areas of internal consolidation: cost reduction and sales forces restructuring. Starting as a medium-sized company in 1986, the firm was unable at first to keep abreast with up-to-date operations. The administrative processes were suffering from the convoluted procedures. In addition, the sales department had no clear internal marketing policy

and product integration. There was no coordination mechanism to facilitate the sales operations, so that the firm often received customer complaints stemming from poor collaboration between the sales department and internal administration (such as the finance department). Even worse, different sales units often repeated the same mistakes (such as a wrong marketing strategy), and sales persons needed to spend a significant amount of time in finding out the internal administrative procedures. As a result, the firm could not accumulate its knowledge of the market; nor could it allocate sufficient time for product marketing. Based on the previous experience of working with personal computers, the management team decided to modernise the internal operation in order to achieve more efficient productivity.[33]

The firm first introduced standalone personal computers to facilitate accounting and finance automation. An off-the-shelf software package was purchased in order to automate internal administrative processes. The main financial resources were directed towards setting up an IT unit in order to work with the software vendor. The company decided to replace the obsolete administrative operations immediately, and the computerisation was thus implemented across the company. The selected processes for automation focused on the accounting and sales departments. Process

[33] Board meeting memo (21 December, 1990).

redesign was guided by the standardised information system.[34]

There was little resistance from the employees. In fact, most employees welcomed such a change. At the time, the old processes frustrated employees, and morale was gradually declining. The management employed a relatively top-down, authoritarian leadership style. Thus, most employees were used to receiving and implementing instructions. The change in the people aspect at the early stage was mainly concerned with education and training with particular reference to the application of the packaged software.[35] In 1992, after the firm had assimilated the software system, the sales department was restructured on the basis of different product lines. This enabled centralised control of the sales department, which sought to offer customers better services and quicker responses.

The Middle Stage (1993-1995): A Service-oriented Organisation

In the middle stage, the firm had to confront more difficult competition from many foreign companies in the Taiwanese market. Although the product line had been rearranged, the complexity of products did not allow the firm to compete effectively. Moreover, the products offered by other competitors were increasingly bundled with

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[34] Personal interview with the Vice President of the sales department and the President (19 October, 1995).

[35] "Report of IT Implementation Project Report", Ladder International (1990). Personal interview with the Director of the Media Education Department (23 October, 1995).

various types of services. For example, the English Studio, a Seattle-based competitor, provided magazine and radio English-teaching services alongside the purchase of its products. Regular music rallies were organised for customers to add value to the products.

Recognising this new form of competition, the company's response to the challenge was to develop a full product line. The focus involved a service-oriented product integration: the company devised a range of language education services, including educational consultancy, language training, and publishing. The firm's first task was to restructure its sales department, which had previously sold mainly imported products with prestigious brand names, while the headquarters merely served as an administrative centre. There was thus an historical burden on the sales department which demoralise the staff. This resulted in customers frequently complaining, and the reimbursement rate was high. In 1993, the company dismissed the whole sales force in one region, releasing about 100 people and closing the office. A similar restructuring (downsizing) also took place in other branches.[36] The company's aim was to replace the sales force (organised according to product category) by a team of educational consultants (organised by niche markets). This restructuring aimed to

[36] Observation in a regional meeting with senior executives (19 July, 1995).

enable sales people to focus on product integration for customers. The new responsibility of these educational consultants was to familiarise themselves with a range of products in order to provide solutions for the customers in the child, youth, adult and professional markets.

Subsequently, a cultural change accompanied structural change. The firm had to revise its reward system and at the same time smooth the internal conflicts between regional managers. It recognised the need to change its authoritarian culture into a self-directing one. The first action was to transform the sales force into multitalented educational consultants specialising in language learning. The new job required the consultants to learn about the whole range of products and services, from language learning materials to CD-ROM multimedia, English club membership, publications, and new language technology advancement.

In 1994, marketing and accounting processes were redesigned to support the above changes. The adjustment in structure and people led to a remodelling of the processes for better coordination between the sales department and headquarters. The primary concern was to rebuild the marketing operation in order to reduce the complexity of various product lines and respond to the service-oriented marketing strategy. In June 1995, the IT unit was expanded into a full-fledged IT department. The stand-alone personal computers were replaced by an integrated management information system

to support the management processes.

The Late Stage (1996-97): Re-channel by Internet

In the late stage, the firm's global expansion strategy shifted attention from product integration to market entry into China. This focus brought the full product line to the Chinese market as a starting-point for global expansion. For example, the company began by marketing Family Album USA, a video series for English learning. The series were on 35 provincial and regional television stations and 20 radio stations in China. The company also moved into the child and youth education market. In Beijing and Shanghai the firm offered English teaching programmes to more than 50 kindergartens, and achieved a record number of 5,000 students. Moreover, the firm set up an "English Club for Children" which had nearly 700 active members and a child's English choir (in 1996). In order to achieve such an expansion strategy, the firm initiated process reengineering. The central concern was to reduce the distance between customers and the sales department. This aim led to a redefinition of the firm's business scope by building a virtual marketing channel in order to reach a wider customer base. The firm's process reengineering involved shortening the supply chain through Internet technology. The aim was to avoid enormous overheads and maintain revenue growth. A world wide website (Internet-based) was established to provide a total English learning solution, aiming to integrate language teaching in

terms of listening, speaking, reading and writing.[37] The company could thus reach customers directly through the website, and customers could participate actively in the English learning process. This also redirected the market segment away from high school students to knowledgeable computer users such as university students and white-collar workers. Customers could access the English website, participate in interactive multimedia tutorials, write e-mails to pen pals from different countries, and place orders on-line. From a global perspective, the firm also attempted to integrate its international resources from Thailand, Hong Kong, Singapore, Malaysia, the UK and the USA through this process reengineering.[38]

The firm then introduced an Internet-based *English Language Teaching (ELT)* initiative, called LadderNet, to provide distance learning to incorporate a wide range of products. LadderNet included three elements: a *learning zone, service zone and* activity zone. The learning zone offered multimedia on-line courses in listening, reading, writing and speaking; an on-line magazine that provided up-to-date leaning news; and a TOEFL (Test of English as Foreign Language) clinic that helped learners to cope with the English examination. The service zone provided a hot-line that answered learners' enquiries; an "English CQC" which was designed to improve

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[37] See http://www.ladder.com.tw and http://www.opentaiwan.com

[38] Personal interview with the President (26 November, 1996).

learners' writing skills; and an English proficiency certification through which learners could assess their progress at their own pace. The activity zone was a virtual discussion area where learners could meet friends, exchange and discuss ideas and obtain seminar information.

The introduction of this process reengineering led to a major reconfiguration of product lines and collaboration between the sales department and headquarters. In this new design, sales persons acted as consultants to help learners navigate their study in "cyberspace".[39] To support the process reengineering initiative, the firm implemented a major technological infrastructure (computer network) to link up their global resources. In the beginning, the company installed seven nodes around the world: Beijing, Bangkok, Taipei, Jersey City, New York, Cyprus and London. This investment sought to ensure that there were no information bottlenecks in the use of LadderNet. Customers could access the website without waiting hours for transmission. The website was also connected to the major ISPs (Internet Service Providers) such as Hinet, Seednet, American Online, Prodigy CompuServe, Microsoft and Netscape, in order to maximize their publicity.

In late 1996, the firm further downsized its domestic branches while expanding

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[39] "LadderNet Project Report", May 1992. Also see senior management meeting memo (17 January, 1996).

factories, R&D, and marketing research centres globally. To achieve global expansion, it undertook a major restructuring which shifted its factories from Taipei to Hong Kong, established an R&D centre in Beijing and a marketing research department in New York, and maintained its headquarters in Taipei. The purpose of this restructuring was to leverage the firm's global resources. Furthermore, in accordance with Internet-based ELT initiatives, the sales department restructured into a group of self-directing teams organised according to geographical area rather than product lines. In this way, education consultants could advise customers a full range of services and products.

Thus, the main emphasis was on enhancing consultant-based teams developed in the previous stage. The first action was to reorganise the sales force into multitalented educational consultants specialising in language learning. In the past, sales people were assumed to be merely responsible for selling the products. The new roles and responsibilities required the consultants to learn about the whole range of products, including language learning materials, CD-ROM multimedia for "Edutainment" (education plus entertainment), English club membership, publications, and new language technology advancement (such as artificial intelligent translator). They also had to familiarise themselves with the different market segments: children, youth, adults and professionals. In addition, these consultants had to acquire skills in writing

a proposal for suggesting the establishment of a learning environment for educational institutions. Moreover, the firm established a task force as a change agent for coordinating changes in the Internet, the training of educational consultants, and product redefinition.

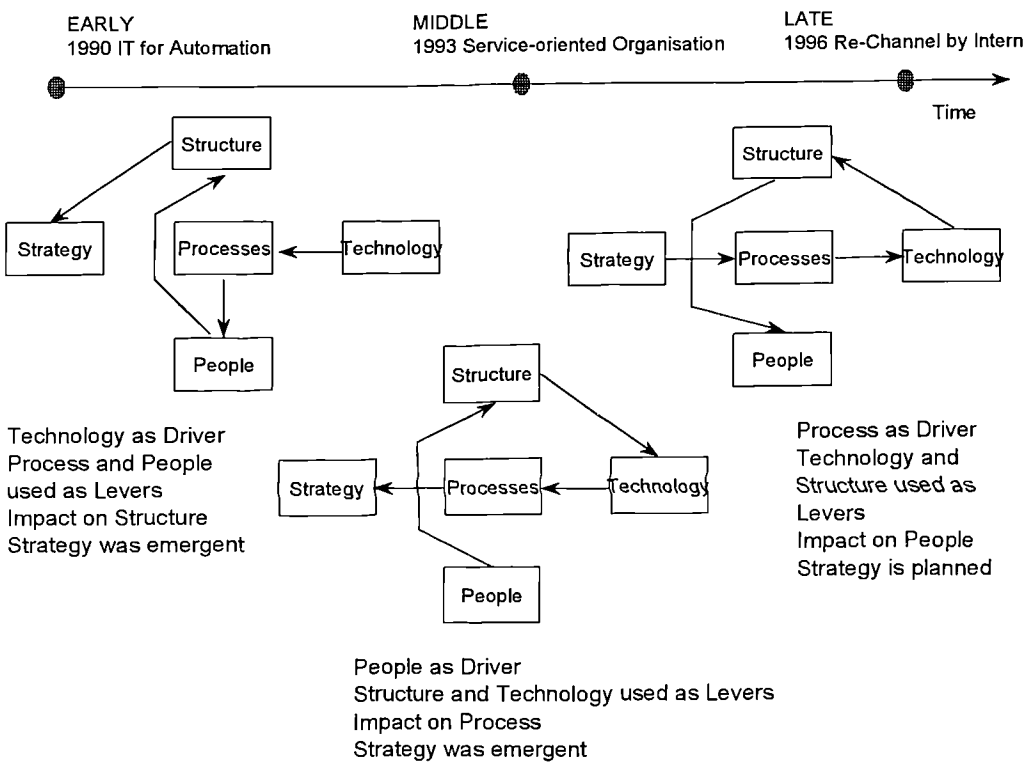

FIGURE 12. Change Path Mapping in the Publishing Case.

The change path is mapped in Figure 12, showing that change started with an emergent strategy to introduce computers to achieve internal consolidation in the early stage. PC-based systems and packaged software were used to replace existing processes (technology and process). The focus of this initiative led to a change in the people aspect through education and training (people). A restructuring followed in

order to reconfigure the firm from a hierarchical organisation into a business activity-based organisation (structure). In the middle stage, a service-oriented strategy brought about a planned restructuring in the sales department (structure). The restructuring triggered a series of conflicts between regional managers, and the firm had to mediate negotiations between regional managers in order to achieve a successful transition (people). Once the conflicts had been alleviated, the firm introduced further process reengineering in accounting and marketing, aiming to integrate products and services in order to cope with market competition (processes). The packaged software had to be replaced by integrated systems to facilitate the process reengineering. In the late stage, the firm aimed to integrate global resources and expand into China. A planned change revolved around Internet-based English Language Teaching. This called for a process redesign which sought to transform the physical marketing channel into a virtual marketing channel in order to reduce cost and enhance services. A global technological infrastructure was installed to sustain the software development of Internet-based ELT (technology). Subsequently, a major restructuring was introduced to integrate global resources and to reconfigure the sales department into consultant-based teams (structure). A significant amount of resources was invested in these education consultants to support the concept of virtual marketing (people).

4.1.5 THE AUTOMOBILE CASE

The Automobile case is concerned with a sole agent of a luxury brand car, Mercedes Benz of Germany. The firm has to manage the national dealerships, and its regional factories run daily operations from sales and maintenance to customer service. The prestigious brand name has helped the company achieve an enviable record of growth. The case reports the alignment of various change initiatives in three stages: establishment, cost reduction and turnaround.

The Early Stage (1990-92): Establishment

In the early stage, the Automobile firm's major strategic concern was an emergent strategy of integrating various managerial functions. In particular, the management team dedicated most of their effort to dealership management. The firm initiated two major changes: reintegration of dealership and retention of technicians.[40]

The dealership integration dealt with an evaluation of regional dealers according to their performance. A series of dealer training programmes was introduced as a result of this evaluation. These programmes aimed to enhance the coherence between dealers and the parent company. The second initiative involved the retention of technicians. As it required specialised knowledge in luxury car maintenance (Benz

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[40] Personal interview with a strategic manager in the headquarters (23 July, 1996).

car requires specific skills to handle some of the complex aspects of engine maintenance), the firm had difficulties in retaining these experts, who were in high demand in the luxury automobile industry job market. The management thus introduced different reward and incentive systems in order to retain the expert technicians.[41] In addition to these benefits packages, the firm also tried to reallocate the workload of the technicians. This led to a shift from a hierarchy-based to a service-based organisation. This reconfiguration also reflected the commitment made by the management to provide timely service to dealers.

Starting from an experiment by a number of staff, the firm gradually came to appreciate the use of information systems in administration.[42] In particular, the firm had long-standing problems with the ordering systems installed by the German parent company. General-purpose computer systems were used to support transaction processing. These systems were designed and coded internally to cope with the ordering processes. However, as the system from the German side was not compatible with this design, the firm had to use both systems separately. Manual transactions were introduced to bridge the interface between these two systems. Incrementally, the firm devised a transitional process that linked up the internally

[41] "Annual Report of Strategic Department" (1991), pp 12.
[42] Ibid, pp 1.

designed system with the German ordering systems.

The Middle Stage (1993-95): Cost Reduction

In the middle stage, the strategic focus shifted to cost reduction. The firm rearranged its maintenance operation into two teams: reception and technical service. The aim was to resolve two internal problems: efficiency and conflicts.[43] The first problem was concerned with streamlining the existing productivity by separating the responsibility between customer service and maintenance. The second involved smoothing the conflicts within the service operation. The technicians had difficulties in dealing with customers and sorting out the billing processes. The reorganisation helped technicians to concentrate on the core process (repair and maintenance) while the reception engineers could deal with the administration. As a result, the firm achieved immediate savings in labour costs and customer queuing time.

But, the restructuring led to a fight for control over resources, which became an arena for a political struggle between headquarters staff, the maintenance team and the reception engineers. The conflict centred on the salary structure and career systems. In order to resolve these conflicts, several human renewal initiatives were proposed to improve the morale of dissatisfied employees. These initiatives included

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[43] Personal interview with the head of strategic planning units (24 July, 1996)

revised welfare systems, career regeneration schemes, and an evaluation of remuneration systems.

Until the conflict had settled, additional effort was put into sorting out shop-floor chaos such as missing maintenance orders or facility dysfunction.[44] The management finally committed themselves to a series of process improvement programmes, most of which were concerned with building communication processes between employees at the shop-floor level. Basic quality techniques (such as the fishbone chart) were introduced to employees to facilitate the process improvement. Finally, the management decided to implement information systems to support the process improvement, stressing the automation of administration between shop-floor and reception.

The Late Stage (1996-97): Turnaround

In the late stage, the firm faced severe competition within the domestic market and quota pressure from its German partners. In direct competition with Nissan, Toyota and BMW, the sales revenue declined drastically. The management acknowledged the need to call for a turnaround strategy.[45] The firm's main strategic concern involved a planned process reengineering for better customer services. There were

[44] Personal interview with a reception engineer who used to work in the shop-floor (24 July, 1996).
[45] Participant meeting with the strategic planning unit (25 July, 1996).

two sources of the problem: The first resulted from the inconsistent dealership policy, which caused internal competition and conflicts, thus giving rise to service quality decreases and damage to the company's reputation. The second source of the problem was concerned with the company's bureaucratic system and the resulting demoralisation, which meant that the factory manager again had to spend an enormous amount of time in resolving the conflicts between reception engineers and technicians.

A reengineering project was introduced to replace obsolete facilities, speed up maintenance operations, and link the overall operation.[46] Furthermore, the process change sought to break the bottleneck of the service maintenance process in the factory. There was a lack of control of inventory, and the ordering system did not work according to expectations, causing delay and waste. In the old practice, the average time for materials ordering through the German headquarters was seven weeks, not including other extraneous delays such as shortage of stock. The shop-floor technicians thus tended to over-order materials. As a result, the inventory included not only the over-ordered stock but also the lost stock. The problem arose from the old proprietary information system which handled material-ordering

[46] This reengineering concept was presented and discussed in a meeting held by the strategic department with members from the Association of Reengineering (19 July, 1996).

processing. The inventory staff could not monitor the stock through the materials ordering system. Until the arrival of the materials, the inventory staff, without any confirmation from the materials system, put components in the places where they knew they should be located. Thus, the materials could only be found by those who had handled the stock.

The process reengineering involved change in five areas.[47] (1) Part of the maintenance service was provided at the customers' sites. An ad hoc team consisting of a sales person and a technician will be scheduled to visit customers, providing standard maintenance service or minor repairs. (2) Service was built into the processes. The receptionist would take the opportunity to introduce a new car model or conduct a customer satisfaction survey while customers were waiting in the guest room. (3) The maintenance processes were divided into two tracks: speed track and normal track. This was to resolve the bottleneck in the shop floor. The speed track sought to handle quick-and-dirty tasks such as replacing lubricants. The normal track sought to handle other malfunctions which take more than one day to repair. (4) The performance time record for individual performance would be abandoned and be replaced by team measurement of productivity performance. (5) The order

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[47] "Reengineering Report", Engineering Department, 1997

preparation, materials recording, and order invoicing would be located in the back office.

One of the greatest difficulties was the challenge to integrate two incompatible technological platforms: component ordering and the inventory system.[48] This change involved a technological migration between the German ordering system and the internally developed system. The firm implemented a joint management information system, including a customer database, order and billing processing, invoicing, materials ordering, inventory control, shop floor job dispatch, performance and reward system, and maintenance processes. The major aim of the new systems was to support a team-based working environment.

The subsequent change involved restructuring the firm into team-based work groups. The restructuring focused on the factory, which aimed to replace a function-based organisation by a multitalented team-based system. This design sought to resolve the conflicts between reception engineers and shop-floor technicians. The reception engineers required professional knowledge concerning diagnosis, service operation, computer application, and intra-personal skills. They had to work closely with the shop-floor teams. In turn, the shop-floor team members had to perform the

[48] Personal interview with an IT manager (20 July, 1996).

maintenance with respect to painting, engine repairing, sheeting, electricity, and exception-task-handling. These maintenance teams included the multitalented reception engineers and technicians. New training programmes, a career path and a reward system were thus introduced.[49] This renewal scheme had two emphases. The first was on hardware and involved renovating the factory shop-floor and redecorating the reception areas. The company also installed new information systems that linked order-processing to material requirements. The second emphasis was on software, and this involved establishing a technical institute exclusively serving employees and dealers. The institute provided training with regard to car maintenance technology, new maintenance tools, information systems, customer service, and team-working. The renewal scheme sought to stabilise the employee turnover rate and brought in new skills to facilitate the multitalented teams.

As shown in Figure 13, the Automobile case started with an emergent strategy to resolve internal crises (strategy). The early focus was on the integration of dealers and the retention of technicians, leading to a service-based restructuring (structure). The firm was aware of the need to design a separate information system in order to complement the ordering system provided by the German partner (technology). This

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[49] Personal interview with the head of the strategy planning unit (24 July, 1996).

system also led to a process change in the order handling system, and helped the firm to improve the inventory operation (processes).

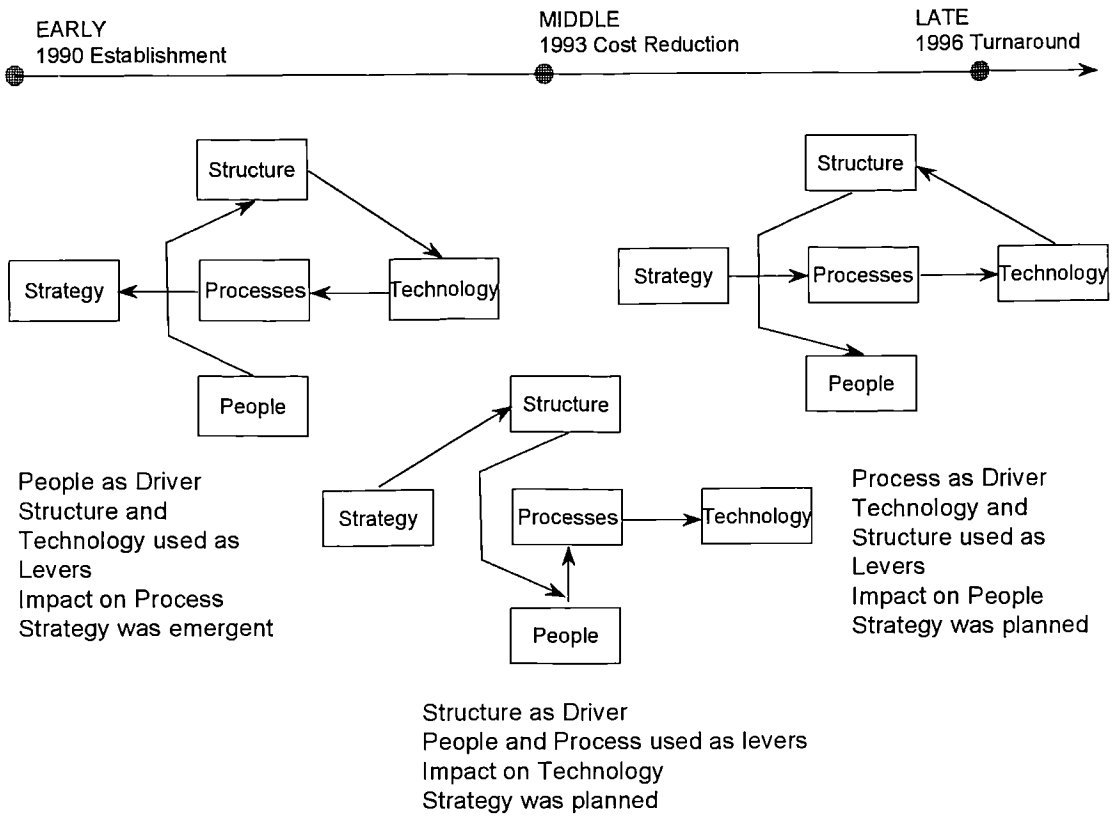

FIGURE 13. Change Path Mapping in the Automobile Case

In the middle stage, the competition called for a cost reduction strategy by streamlining the core processes in reception and maintenance (strategy and processes). Various incentive systems were introduced to smooth the conflicts and boost the morale of employees (people) before taking on the process improvement at the shop-floor level. Other information systems were implemented for automating the administrative tasks (technology).

In the late stage, the firm had to confront heated competition as a result of an open

market policy in the macro economic context. The firm was faced with a turnaround situation, and a reengineering project was introduced to eliminate dilapidated operations (processes). Subsequently, efforts were made to integrate the two information systems: a German-based ordering system and an internal designed inventory system, in order to facilitate process reengineering (technology). The reengineering project and the updated information system enabled a team-based working environment to support the introduction of a cultural transformation (structure). Finally, the firm determined to redesign new incentive systems, enhance human resource supports, and reconstruct a corporate identity (people).

4.2 CROSS-CASE ANALYSIS: PATTERNS OF ALIGNMENT

4.2.1 CROSS-PATTERN MATCHING

The cross-case analysis focuses on the patterns of organisational change in these five cases. Initially each change path was plotted on the MIT 1990s framework (see the previous five single case analyses), resulting in a multiplicity of patterns (as shown in Figures 9-13). In order to examine the patterns across a case over time, the change patterns are transformed topologically onto a new framework. This is an approach which repositions these factors (i.e. strategy, structure, processes, people and technology) and their connections so as to provide visualisation and simplification.

The result of the new framework is much greater clarity (as shown in Figure 15).

An important breakthrough was achieved when the role of strategy in the change process was appreciated: it was either planned or emergent throughout each change process. In mapping the path of these five cases, the observation shows that "strategy" plays a coordinating role that consistently integrates the other four factors within each stage with either a planned or an emergent mode of change. When the transformed patterns are displayed together in Figure 14, across cases over time (the three time phases), there are four distinctive patterns. The subsequent sections explain the four generic patterns, explore the modified MIT framework, and relate the alignment patterns to practical applications.

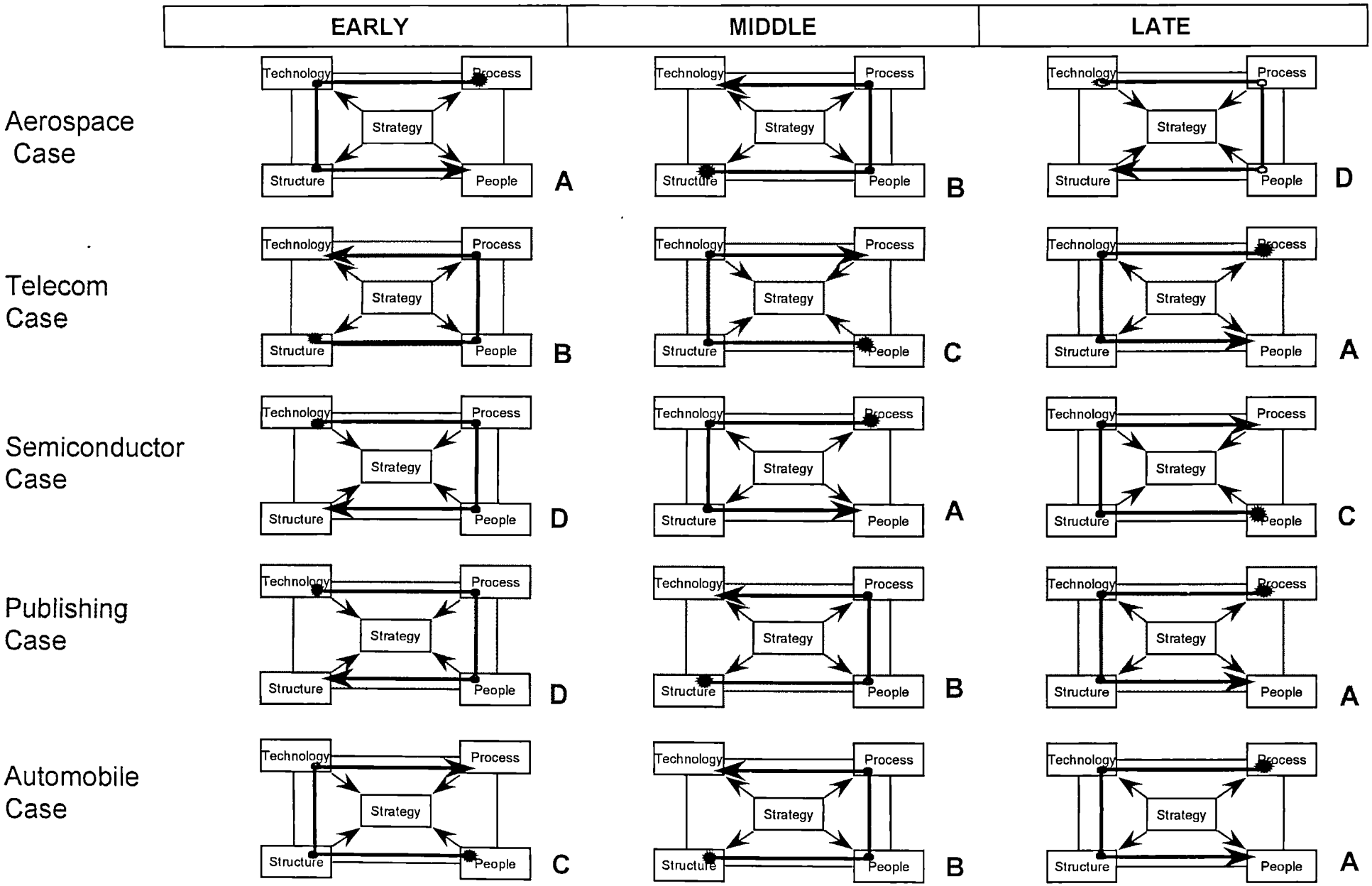

FIGURE 14. Cross-Case Analysis of Five Cases

(similar patterns are grouped and labelled A, B, C, and D)

4.2.2 FOUR GENERIC PATTERNS OF CHANGE ALIGNMENT

As shown in Figure 15, four generic patterns can be identified from the cross-case analysis. These are the result of change alignment arising from the five cases, and they may be identified as follows: process reengineering (pattern A), structural reconfiguration (pattern B), human renewal (pattern C) and IT transformation (pattern D), each indicating a specific path of change driven by different factors (see Figure 14). These four patterns of change may be explained as follows.

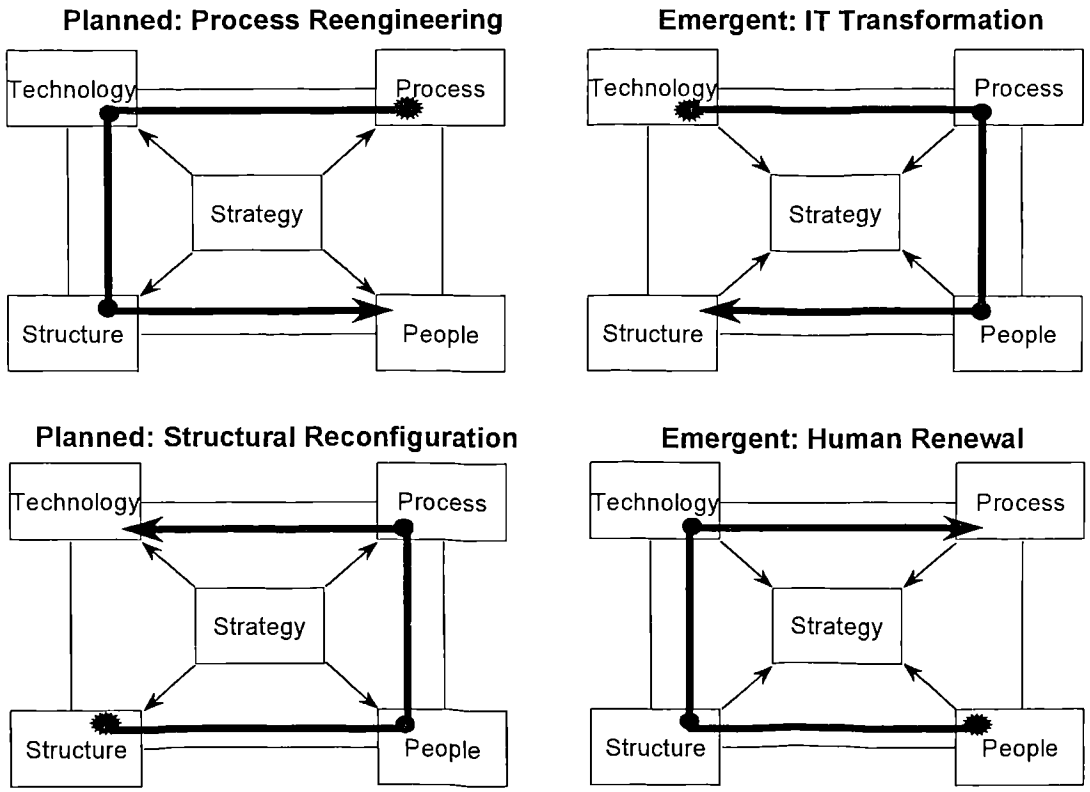

FIGURE 15. Four Generic Patterns of Change Alignment

Alignment Pattern 1: Process Reengineering

This refers to both process improvement and process innovation and is often leveraged through the use of information technology. For change undertaken in this way, the change path tends to negotiate through technology and structure, ends with a cultural change initiative, and impacts on human actors. This type of change has a specific plan at the outset and follows a planned strategy method (i.e. set vision, formulate goals, implement actions, and evaluate results).

For example, the early stage of the Aerospace case shows that the management team identified a need to revamp the old product development process in order to maintain competitiveness (external pressure to shorten production schedule). A planned approach process reengineering was used, because it was convenient for the firm to follow a former initiative, Project Derwent, in order to attract the attention of engineers. Once this initiative was in place, engineers found they needed an electronic environment to facilitate their manual engineering tasks, and thus standalone information systems were introduced. The firm soon recognised that it required a structural adjustment to enable an effective collaboration between engineers. However, to achieve such collaboration, it was necessary to transform the old engineer-oriented culture.

The Telecom case also demonstrates the same pattern. In the late stage of this case,

the firm consolidated most internal operations. In order to support a global expansion strategy, the firm introduced planned process reengineering and activity-based management in the hope of achieving further cost reduction in the customer service operation. To support this complex measurement of cost-based on activity, the firm introduced an integrated database system (ADEPT) for coordinating the tasks between different departments, as well as recording the activity costs in each process. As these initiatives were incorporated into the overall corporate performance, the firm introduced an institutionalised change agent (PCM – Process Control and Management Unit). The major task of PCM was to facilitate a tailor-made implementation of activity-based management in various departments. Finally, the Learning Laboratory was introduced to help build the staff's competence in improving processes. In this case, the same pattern may be observed: a planned strategy guiding the introduction of various change initiatives, following a path of processes, technology, structure and people.

Moreover, the same pattern in the Semiconductor case may also be identified. In the middle stage, the firm also faced global competition, which forced it to adopt a market-based strategy. At this period, the firm was confident enough to undertake a planned process reengineering by examining parsimoniously every single working procedure in order to reduce cost and avoid unnecessary jobs. It subsequently

introduced primitive computer systems for local application. As this local exploitation required interdepartmental collaboration, the firm had to restructure its organisation to achieve better coordination. However, the firm was too focused on the technical implementation and ignored the employees' dissatisfaction. Although these systems were successfully put in place, the firm had to cope with a high level of staff turnover.

The Publishing case shows a more radical approach to the process-driven alignment pattern. In the late stage, the firm sought to integrate resources among different regions. It proposed a revolutionary concept – to transform its service from traditional marketing (selling language materials) into Internet-based English Language Teaching. A large-scale redesign of the marketing channel was undertaken in order to switch to the virtual marketing concept (change of marketing processes). The process redesign thus called for an introduction of Internet-based technological infrastructure and software development. Further, a structural change was adopted to transform sales departments into consultant-based teams. The restructuring was supported by a human renewal scheme to turn sales persons into education consultants, enabling staff to develop new roles and responsibilities for virtual marketing.

The Automobile case illustrates yet another pattern of process reengineering in the

light of turnaround strategy (the late stage). A reengineering project was introduced to eliminate decaying processes. The firm realised that it would be an inadequate reengineering initiative if its two proprietary information systems were not integrated. Both the reengineering and the system integration were intended to build a team-based working environment, within which a cultural transformation could be achieved. The firm also redesigned new incentive systems to support the transformation.

Cases	Change Path			
Aerospace	Strategy: shorten production schedule			
Early stage	1. Improve the process of product development	2. Introduce electronic environment	3. Adopt a functional structure	4. Transform engineer-oriented culture
Telecom	Strategy: consolidation of internal operations			
Late stage	1. Introduce activity-based management for process measurement	2. Develop a shared database system (ADEPT)	3. Institutionalise a change agent (PCM)	4. Introduce Learning Laboratory
Semiconductor	Strategy: market-based strategy			
middle stage	1. Improve process between product design and production	2. Introduce IS for local applications	3. Adjust structure to enhance inter-departmental coordination	4. Cope with staff turnover
Publishing	Strategy: global resource integration			
Late stage	1. Transfer to virtual marketing process via Internet-based ELT	2. Develop software and establish technical infrastructure	3. Restructure sales department into consultant-based teams	4. Introduce education and training for these consultants
Automobile	Strategy: turnaround strategy for confronting heightened competition			
Late stage	1. Eliminate dilapidated processes	2. Integrate two proprietary information systems	3. Establish a team-based working environment	4. Revise incentive systems to facilitate new responsibilities

TABLE 10. The Alignment Pattern of Process Reengineering

Table 10 summarises these process-driven alignment patterns. It is not surprising that the pattern of process reengineering appears to be the most frequent pattern observed

in all these five cases. This may be partly because of the process fashion (Hammer and Champy, 1993); partly it may be due to the fact that in the need for cost reduction and better productivity, firms often resort to improvement in process-related activities. In these fifteen patterns, there is no emergent mode of process reengineering. A plausible answer may be that firms often start with process reengineering when they have an immediate need to reduce cost or improve productivity, and are relatively familiar with the problem situation.

Alignment Pattern 2: Structural Reconfiguration

This pattern also involves a planned strategy, starting with a restructuring initiative, modifying the organisational architecture in order to react to change, and trying to involve employees in the change activity. As a result of these collective efforts, firms identify important areas for redesigning management processes, and follow a use of technology in order to make the process change effective. This type of change also tends to be deliberately planned when it commences. This pattern has been observed in the Aerospace, Telecom, Publishing and Automobile cases. The pattern of their alignment is reported as follows.

In the middle stage, the strategy of the Aerospace case was to improve efficiency in the supply chain. In the light of the earlier cultural change, the firm initiated a planned restructuring, turning its original organisation into a matrix-based

arrangement. In order to enable the matrix structure, the firm advocated an information-sharing culture to employees. Such a cultural change was followed by a reengineering project to improve the process of product development, which in turn permitted the building of a shared database system for a paperless office environment through the use of EPD (Electronic Product Definition) technology.

Similarly, the Telecom case illustrates the same patterns of change alignment. At an early stage, the deregulation pressure stemming from the external context introduced a planned restructuring by transforming a functional structure into a business activity-based structure. This led to a subsequent change in culture, placing emphasis on education and training. Employees were required to equip themselves with skills in order to achieve a process improvement scheme through the ISO 9000. Standalone information systems were introduced to support quality circles.

In contrast to the two stories above, which portray an incremental structural reconfiguration, the pattern in the Publishing case shows a more revolutionary approach. In the middle stage, the firm continued a planned restructuring from the previous stage. However, this time, the firm aimed to transform the whole company under a service-oriented strategy in order to cope with market competition. Unexpectedly, this restructuring caused conflicts between internal stakeholders, and as a result, employees' morale dropped sharply. The firm had to concentrate on

resolving the internal conflicts before revamping the old administrative processes. This process redesign also led to a need to renew the firm's packaged software into an integrated system.

In the middle stage of the Automobile case, guided by a cost reduction strategy, the firm adopted a core-activity-based structure in order to resolve the problem of the overlap of responsibilities between the administrative and maintenance teams. These changes led to a redesign of incentive systems to smooth down escalating conflicts. Once these conflicts settled, the firm was able to introduce process improvement in the shop floor. Finally, information systems were installed to automate processes.

Table 11 shows these four structure-driven patterns. Like the pattern of process reengineering, the pattern of structural reconfiguration also follows a planned approach. A plausible explanation for this may be that firms are more familiar with tangible changes. Modifications in processes and structure are more tangible than, for example, alterations in information and culture. In general, both planned approaches (process and structure-driven) can maintain control relatively well as different stages of change unfold.

Cases	Change Path			
Aerospace	Strategy: supply chain efficiency			
Middle stage	1. Adopt a matrix-based structure	2. Instill information-sharing culture	3. Introduce process re_ngineering in product development	4. Develop a shared database system (EPD)
Telecom	Strategy: response to deregulation			
Early stage	1. Adopt a business activity-based structure	2. Focus on education and training	3. Implement ISO 9000	4. Introduce standalone IS
Publishing	Strategy: service-oriented organisation			
Middle stage	1. Adopt a customer-focus structure	2. Revitalise employees' morale and resolve conflicts	3. Revamp administrative process	4. Upgrade packaged software to integrated systems
Automobile	Strategy: cost reduction			
Middle stage	1. Adopt a core-activity-based structure	2. Redefine task responsibilities, and resolve conflicts between teams	3. Introduce process improvement at shop floor level.	4. Use IS to automate administration processes

TABLE 11. The Alignment Pattern of Structural Reconfiguration

Alignment Pattern 3: Human Renewal

This alignment pattern refers to cultural change at the beginning of the change process, which leads to restructuring in order to enhance the quality of interdepartmental coordination. While responding to the problem situation, firms then gradually recognise the need to implement technology in order to achieve improvements in processes. This pattern of alignment follows an emergent mode of change, which can be identified in the Telecom, Semiconductor and Automobile cases.

In the middle stage of the Telecom case, the firm faced external pressure to enter the global telecommunications market. It began by initiating a large-scale downsizing

project accompanied by a joint consultation with employees to minimise conflicts. A restructuring followed, which turned a geography-based structure into a customer-based structure. This new arrangement enabled the firm to exploit the "On-line Process Analysis" (OPA) software for improving processes. The improved processes were subsequently used by other departments, and this became a regular exercise for disseminating best practices. Generally, guided by an overall strategy, this case illustrates an emergent approach to change.

In similar vein, the Semiconductor case (in the late stage) adopted an emergent niche market strategy. Due to the vicissitudes of the staff turnover in the previous stage, the firm introduced a Vision 2000 programme, which aimed to maintain senior staff so as to restore technological competence. After this programme, the management acknowledged the need to restructure the firm into a customer-bonded organisation, enabling knowledge-sharing with client firms and at the same time restoring the motivation of its engineers. This restructuring also led the management to introduce SAP information systems for better collaboration between departments. The systems subsequently forced the firm to adopt a fundamental change in the administrative processes in order to achieve technological coherence. Again, this case also portrays an emergent mode of change through the initial introduction of a human renewal programme.

The Automobile case also demonstrates an emergent mode of change, although it appears in a more chaotic way. In the early stage, the firm aimed to resolve internal crises by integrating existing operations. The focus was on the integration of dealership contracts and the retention of technical staff. The firm found that it had to adopt a new, service-based organisational structure in order to reallocate power and smooth conflicts. During the restructuring, the firm identified a need to develop a separate information system in order to resolve the convoluted administrative problem caused by the ordering system provided by the German partner. This system subsequently led to a process change in the order-handling system and helped the firm to improve its inventory operation.

Cases	Change Path			
Telecom	Strategy: entering global market			
Middle stage	1. Introduce redundancy schemes	2. Adopt customer-based structure	3. Develop OPA software	4. Disseminate processes of best practice
Semiconductor	Strategy: occupying a niche market			
Late stage	1. Introduce Vision 2000 programme to retain senior staff	2. Adopt customer-bonded structure	3. Introduce SAP information systems	4. Change processes in order to fit SAP
Automobile	Strategy: entrenchment			
Early stage	1. Retain technical staff and rearrange dealerships	2. Adopt service-based structure	3. Develop a separate information system	4. Redesign order handling processes

TABLE 12. The Alignment Pattern of Human Renewal

As shown in Table 12, these three patterns explain an emergent mode of change. The alignment of change occurs through experiment, improvisation and adaptation. This

echoes the behaviour suggested by Orlikowski and Hofman (1997), where change occurs through periods of crisis and firms have to take opportunities to make appropriate changes. In such situations, firms are inclined to adopt a low-profile approach to initiate changes.

Alignment Pattern 4: IT Transformation

In this type of alignment, firms often begin by experimenting with information technology in management processes. Subsequently, they recognise that such change needs to incorporate a change in the people dimension if it is to be effective. As a result, the change in people impacts on organisational structure. Like the previous alignment pattern, this one also shows an emergent mode of change alignment. In the cross-case analysis, there are three identifiable patterns (in the Aerospace, Semiconductor and Publishing cases) which demonstrate such an alignment.

In the late stage of the Aerospace case, the firm extended the application of EPD (Electronic Product Definition) to the use of PDM (Product Data Management) and digital pre-assembly. This technical change drove a reengineering of product development processes. A new process technique, JAD (Joint Application Development), was adopted to reflect the technological advantage. In order to leverage the complex mix of IT and JAD technique, the management invested a significant amount of resources into education and training. Subsequently, the firm

restructured the organisation based on strategic business units (SBUs).

The Semiconductor case (in the early stage) illustr ıtes a relatively commonplacc story. The firm started with a strategy of differentiation, focusing on technological competence-building with regard to the EPROM product. By setting up IT-based production facilities, the firm concentrated on designing manufacturing processes. The start-up management team placed emphasis on the building of an entrepreneurial culture, because the process improvement required demanding working hours. This initiative then led to a restructuring so as to support technology-based production. As the case indicates, this emergent approach of alignment followed the preferences of the management team.

The Publishing case, in the early stage, emphasised a strategy of internal consolidation. The firm started with a computerised system to link up processes. PC-based systems and packaged software were deployed to renew existing processes. This IT-enabled change led to an introduction of education and training, preparing employees for operating the new system. The process change provided employees with new job descriptions, and thus a business-activity-based restructuring was introduced. In this case, the emergent mode of change was determined by the resources available.

As shown in Table 13, the IT-driven pattern also demonstrates an emergent mode of

alignment. Like the people-triggered alignment pattern, emergent changes are adopted because management face uncertainties. Firms thus accept an exploratory approach to take on one change, and subsequently discover that they may have to engage on yet another change.

Cases	Change Path			
Aerospace	Strategy: innovation management			
Late stage	1. Extend EPD to PDM	2. Introduce JAD process technique	3. Invest in education and training	4. Adopt a SBU-based structure
Semiconductor	Strategy: differentiation			
Early stage	1. Introduce IT-based production facilities	2. Focus on manufacturing process improvement	3. Instill entrepreneurial culture	4. Adopt a production-based structure
Publishing	Strategy: internal consolidation			
Early stage	1. Introduce IT for automation	2. Alter processes to adopt packaged software	3. Invest in education and training	4. Adopt a business activity-based structure

TABLE 13. The Alignment Pattern of IT Transformation

Reflections on the Generic Patterns

The above findings suggest that a more specific mode (planned or emergent) of change may evolve as a consequence of corresponding changes in the firm's context triggered by the previous change action. In both the planned and emergent modes, strategy serves as a coordinating force to push, or to be pulled by, the other organisational factors. For the planned mode of change, changes seem to be driven by processes or structure. One reason for this may be the tangible nature of these two organisational factors. On the other hand, with the emergent mode of change,

changes seem to be navigated through an evolving strategy and aligned with other organisational factors within the process of implementation. A key feature of this emergent mode of change alignment is the role which uncertainty plays in the strategy-formation process. In patterns 3 and 4, although firms seem to initiate a planned strategy, due to the uncertainty they actually have to muddle through crises while improvising as opportunities arise. In this way, firms gradually formulate subsequent changes. Table 14 summarises the four generic patterns in terms of the initial strategic focus and role of IT.

Patterns	Modes of Change	Initial Strategic Focus	Role of IT
Process Reengineering	Planned	Improving process efficiency	Renovating existing processes
Structural Reconfiguration	Planned	Streamlining oversized organisations	Supporting organisational interdependence
Human Renewal	Emergent	Instilling new organisational culture	Redefining roles and responsibilities
IT Transformation	Emergent	Introducing IT to enhance organisational effectiveness	The use of IT is assimilated through a learning process

TABLE 14. Four Generic Patterns of Change Alignment

Furthermore, by mapping the path of change longitudinally, the pattern of relational alignment can be observed, illustrating a series of impacts from the previous initiatives. This shows a type of "chain-reaction" behaviour in each pattern, either planned or emergent. In other words, when change is attempted, it will inevitably impinge on other factors following a certain logical sequence. This relational alignment perspective may help us to understand why single change initiatives are

unlikely to produce successful results. The key lesson here is that change will proceed through a series of initiatives one after another, regardless of which type of change a firm may begin with.

4.2.3 The Behaviour of Change Alignment

Key Components of Alignment

The alignment patterns can be examined further through a conceptual framework (Figure 16) which, as a result of topological transformation, conceives of three major components that form a sequential path: driver, lever and impact. Each path is conceptualised by a "driver" (for example, technology), and change is followed by leveraging through two "levers" (for example, process and people follow the introduction of technology). Finally, a subsequent change ends with an "impact" on certain factors (in this case, structure).

These findings indicate that firms, due to their particular contexts, often initiate change through a "driver". For instance, in the Telecom case (early stage), a response to deregulation (strategy) guided a planned change in downsizing before it moved forward to further consolidation through changing the people aspect. In this case, "structure" was the driver. Moreover, as the change proceeded, it required the firm to adjust other factors (i.e. the two levers – people and processes), and subsequently

there was an impact on "technology". The completion of this change path assisted the firm to achieve specific advantages in the early stage.

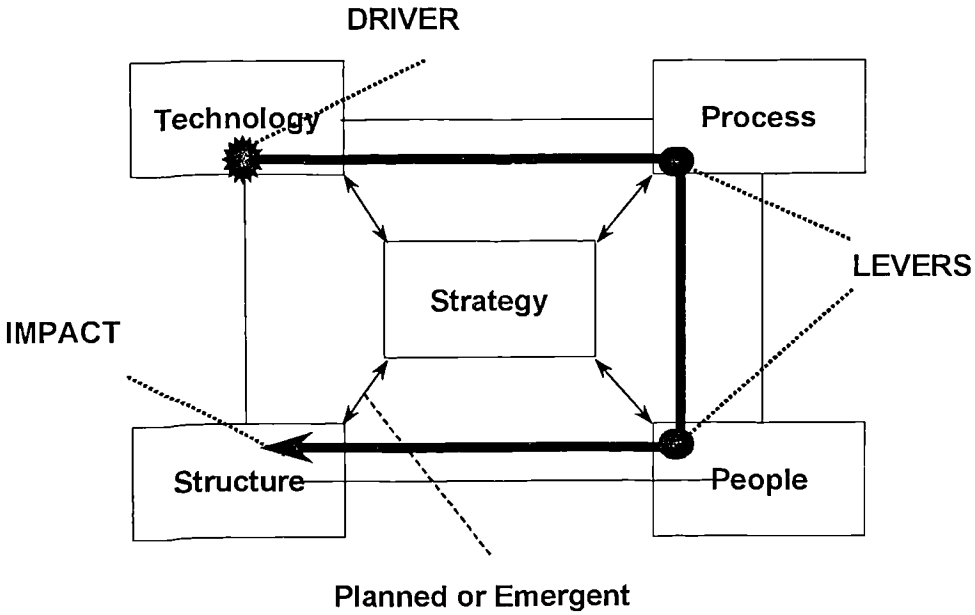

FIGURE 16. Key Components of Change Alignment

There are in fact two modes of change (planned and emergent) intertwined in the process of change. A firm may begin with a strategy to introduce a planned change, leading to a series of relational alignments. But, as situations alter, it may adopt an emergent mode of change while muddling through another sequence of changes. This concept is shown in Figure 16, with the strategy factor placed at the centre of the framework, depicting its relation to other factors as either planned or emergent.

Analysing IT-enabled Change from the Relational Alignment Viewpoint

Such a conception of change alignment may provide a useful lens through which to examine change processes from a longitudinal perspective. At first sight, the frameworks of relational alignment seem to indicate a different assumption from those in the work of Yetton et al. (1994). However, if the case provided by Yetton et al. (1994) is split up, it may reveal the same types of pattern proposed by the present research. Yetton and his associates explain a case in which IT-enabled change follows the introduction of technology, affects the people aspect, causes restructuring, and leads to process redesign. In proposing this change path, the authors incorporate primary business processes into the category of people (i.e. individuals and roles). As they comment:

> Over time, management and control processes were also adjusted to integrate the work processes...all staff members had to use the system and give up their old drawing... As the number of computers grew, the firm installed a local area network and a file server to facilitate communication and file transfer. Material specifications and costing programmes, as well as project management and accounting and electronic mail were also added. (Yetton et al., 1994: 63)

This echoes the behaviour of alignment pattern 4, IT Transformation, where strategy emerges via the introduction of IT, leading to changes in processes, people and structure. Although the authors do not explain subsequent changes in terms of structure and people, they do indicate that the redesign of processes consequently led

to the introduction of IT under an emergent mode of change. These four types of relational framework seem to provide a set of more integrative models for analysing change alignment. A further example may illustrate the application of the change patterns suggested in the present study. In a case study of Ford Motor, Benjamin and Levison note:

> The driving change was a new business process: paying on receipt of merchandise rather than on invoice. To restore equilibrium, this work process change had to be supported by new technology and organizational and cultural change. The necessary technology included a unified database to record receipt of merchandise against orders and to issue checks when the merchandise had been received. The culture had to be changed to value work for the common good rather than the independence of the different plants. People had to learn to accept the computer's output as sufficient to authorize payment rather than many signatures from multiple organizations. Any layoffs had to be managed in such a way that implementation was not undermined. (Benjamin and Levison, 1993: 24-25)

This description exemplifies the pattern of process reengineering (process-technology-structure-people). The benefit of such an analysis is to see the relationship in the change initiatives between different organisational factors. To extend the application of relational alignment patterns, another example, the Vista School, may be taken:

> Flattening the organizational hierarchy is another driver of change. In that case, business processes and technology must be adapted to match organisational changes. (Benjamin and Levison, 1993: 23)

In this example, the change alignment seems to fit the pattern of structural

reconfiguration (structure-people-process-technology), although the people factor is implicitly included in "organisational change" by the authors. This corresponds to the finding that although change occurs in one specific dimension (for instance, structure in the Vista School case), it may invariably impact on other organisational factors in a particular path. Change may begin in one specific dimension (e.g. restructuring) and produce subsequent effects in other dimensions. Therefore, organisational change should not necessarily be viewed simply as restructuring, process reengineering, cultural change, or IT introduction alone, rather it may be seen as structure-, process-, culture-, IT-driven change that entails subsequent changes in the other organisational factors.

It should be noted that the three examples used here do not justify a normative use of the four alignment patterns. Rather, these relational alignment frameworks are intended to offer an alternative analytical tool for understanding how different initiatives may trigger a particular path of change. In particular, when using these frameworks, it is necessary to consider two issues. First, they are context-specific. Each company will exhibit particular patterns of change alignment according to its specific environmental circumstances. Secondly, there are two possible modes of undertaking change (planned and emergent), depending upon the situation faced by the company (for example, stable or uncertain problem conditions). It is possible to

control and predict a planned mode of change by starting a process-driven or structure-driven alignment. But exploration and improvisation may be required to deal with an emergent mode of change driven by initiatives in the dimension of people or technology. The key implication of these four generic patterns is the importance of appreciating the relational effect of IT-enabled change: understanding how one change initiative may result in a subsequent one. In a sense, each path records the sequence of organisational change, in which firms explore their next possible position in relation to the previous change.

Although the findings are encouraging, they are exploratory rather than conclusive. The use of these alignment patterns should not imply that these paths have no implementation problems, nor that they are necessarily the best paths to choose. These patterns of alignment are, nevertheless, a set of heuristic experiences (or, as one may say, "hindsight") observed in a wide variety of circumstances. Furthermore, this must herald the warning that the patterns of these relational alignments are not universal. By taking more case studies, analysts may find other patterns of change alignment underlying different paths (for example, a structural reconfiguration pattern which may follow a path of structure-process-technology-people) or different modes (for example, an IT transformation pattern that follows planned mode rather than emergent mode of change). The aim of the present study is to highlight

alignment behaviour as a subject which has not received much attention in current thinking. This study identifies an important dimension of change alignment, demonstrating an alternative conceptual framework that is relational, contingent and integrative. Analysts should not narrowly focus on these four patterns of change alignment; instead, they need to take into account other possible ways of achieving alignment. With this gentle reminder, a more integrative method of devising the change agenda can be explored.

4.3 DISCUSSION

This analysis of alignment behaviour employs the MIT 1990s framework to map the process of change (following the method of Yetton et al., 1994). The result suggests a revision of the framework in order to enhance its explanatory capability. The mapping avoids depicting the "strategy" as a guiding force, because the empirical evidence indicates that strategy operates as a coordinating mechanism through two modes of change alignment: planned and emergent.

Although the sequence of arrows in each path of change is linear, this is mainly to show how an organisation within a particular time span collectively undertakes change from a strategic perspective. Moreover, these five cases do not exhibit an implementation of more than three change initiatives at the same time. One plausible

explanation of such an observation is that it may be due to the high risk involved in undertaking too many changes at once. A sequential approach of introducing change may minimise risk and turbulence in the organisation. Further, such a longitudinal study can avoid aggregating change into one change path, thereby allowing researchers to understand the transition of the different change paths.

4.3.1 Relational Change Alignment: A New Proposition

The study of phase one suggests an alternative way of understanding the behaviour of change alignment. This is named "relational alignment", and consists of three main implications. Firstly, organisational change is not a snapshot activity driven only by strategy or technology; it is driven by various factors (processes, people, technology or structure) centred on "strategy".

Secondly, four generic strategies of change alignment can be suggested by this study: process reengineering, structural reconfiguration, IT transformation, and human renewal. These four strategies can be used in a contingent manner according to the contexts. However, they should be used as reference modes for change implementation rather than as a prescriptive framework. The key lesson is that firms should not rely only on single change initiatives, but need to take into account the sequential effect and alignment of change implementation.

Thirdly, the role of strategy is influenced by two modes of change: planned and emergent. These two modes of change are created by the way in which firms undertake change initiatives through intended control or improvised implementation. The planned mode of change enables the firm to establish an explicit strategy to guide change actions. The completion of the change path is pushed by strategy. On the other hand, due to the uncertain situation, firms may not be able to articulate a clear strategy to respond to contextual challenges. They thus have to initiate some change action, muddle through the situation, and gradually formulate a strategy. As a result, a clear change approach emerges. In this case, strategy is pulled by the completion of the change path. The empirical evidence of this study indicates that the patterns of process reengineering and structural reconfiguration tend to produce planned change, whereas the patterns of IT transformation and human renewal tend to create emergent change.

Most importantly, it is possible to reflect on the existing conceptualisation of change alignment and suggest a set of new propositions. The underlying propositions of the five schools of thought can be analysed in terms of change drivers, the centre of change, the role of IT, and change approaches (see Table 15).

In terms of change drivers, the three rational schools (including the technological imperative, strategic rationalism and strategic alignment) focus on either strategy or

technology. The emphasis is more on a designed system in which strategy or technology can best be utilised. On the other hand, the dynamic learning school is more concerned with the people factor. In this view, technology and strategy will be effectively employed if people can assimilate them through progressive learning (Yetton et al., 1994). Thus, learning, rather than the technical design of strategy or technology, becomes the major mechanism for effecting IT-enabled change. In contrast, the relation alignment approach proposes a different emphasis, where change has no dominant factors. There are different "triggers", either processes, structure, technology or people. These triggers drive a particular type of change alignment (i.e. one of the four generic patterns), which subsequently initiates a series of changes in organisations.

Technological Imperative	Strategic Rationalism	Strategic Alignment	Dynamic Learning	Relational Alignment
		Driver		
Technology	Strategy	Strategy or technology	People (through the emergent use of IT)	Processes/Structure/ Technology/People act as triggers
		Contred on		
Processes	Structure	Fitness of strategy and technology	Learning (people)	Strategy
		Role of IT		
IT imposes change	IT supports strategy	IT enables strategy building	IT is used through assimilation of learning	IT is one of the triggers of change
		Approaches		
Planned	Planned	Contingent planned (strategy-driven and IT-led)	Emergent	Planned: PR/SR Emergent: ITT/HR

TABLE 15. Underpinning Propositions of Change Alignment in Different Schools

In terms of the centre of change, the technological imperative approach places a greater emphasis on linking "processes" as the centre of IT-driven change, whilst the strategic rationalism approach stresses the use of "structure" to lay the ground for IT-enabled change. From a synthetic angle, the strategic alignment school considers a coherent fitness between strategy and technology, enabling four alternative methods of IT-enabled change (see the detailed discussion in chapter 2.2.3). The dynamic learning school rejects the above three types of rational alignment for achieving change; rather it proposes that learning should be the centre for assimilating strategy and technology. In contrast with conventional wisdom, this study suggests that change alignment can be conceptualised as a series of relational impacts, whereas strategy plays a coordinating role (planned or emergent) in bringing together these impacts.

In terms of the role of IT, the existing four schools of thought (the technological imperative, strategic rationalism, strategic alignment, and dynamic learning) treat IT as a distinctive part to effect change. The role of IT, in the view of the technological imperative school, is to impose change, thereupon forcing other organisational factors to "fit in" to the specification provided by IT. For the strategic rationalism school, the role of IT is to support a formulated strategy through which firms may gain a distinctive advantage through the exploitation of IT. For the strategic

alignment school, the role of IT is used within the four alignment frameworks, assisting a set of contingent strategies for IT-enabled change. In contrast, the present study gives IT a less important role in the alignment. IT is seen as one of the triggers in a sequence of relational effects.

In terms of the change approaches, the study suggests a synthesis of the dominant planned and emergent modes of change. The technological imperative and the strategic rationalism schools advocate a solely planned approach for IT-enabled change. Although the strategic alignment school attempts to offer four contingent modes of change based on strategy-driven and IT-led approach, it still fails to explicate fully the role of "emergent change" played in an implementation process. On the other hand, the dynamic learning school emphasises the emergent approach without observing the opportunity for planned change. Building on previous knowledge, this study suggests four generic patterns of IT-enabled change. For change triggered by processes or structure, strategy seems to coordinate actively the process of change; whereas when IT- or people-related initiatives are used at the initial stage of change, strategy appears to be improvised in an emergent process of adaptation.

The four generic patterns of alignment emphasise the chain reaction of change rather than individual change activities. Effective change depends on the alignment of the

change path in which technology, people, management processes and structure are sequentially coordinated. Individual success or failure of change during the implementation process is less important than developing a change agenda (i.e. an appropriate change path) which appreciates where the change comes from and where it may lead to. Therefore, in this view, the conceptualisation of relational alignment can be seen as the balanced management of a sequential change path of organisational factors.

4.3.2 Change Agenda-building: Practical Implications

Although this new proposition opens up a fresh dimension in the understanding of change alignment, there is a danger in seeking to apply these four generic patterns in a prescriptive way. It has to be appreciated that there may be other patterns of change, and, moreover, different change paths may occur in the process of change. The key implication is to recognise the consequences of the chain reaction involved in the change path.

It is not the purpose of these alignment patterns simply to suggest using the planned change mode for the process reengineering or structural reconfiguration patterns, or the emergent mode of change for the human renewal and IT transformation patterns. Rather, the aim is to promote an awareness of the flexible use of the planned and

emergent modes of change in the process of implementation. The practical implication is to use these patterns as reference modes to facilitate the alignment of different change initiatives.

There are three guiding principles that can be extracted from this research. First, *direct the chain reaction into a complete change path in relation to different stages of change*. Firms need to recognise the behaviour of the driver, the levers and the impact in the implementation. Although changes in structure, processes, people and technology may occur concurrently, firms can employ the relational alignment concept to guide the coordination of these various change activities. It is important to develop a sense that makes managers aware of the subsequent impact of an individual change on other factors.

Secondly, *formulate the change agenda through the use of a planned or emergent mode of alignment*. If firms employ a planned mode of change, they are more capable of bringing together the four organisational factors (technology, structure, people and processes) under the guidance of a designed strategy. As such, firms may adopt a planned approach to introduce a structural reconfiguration or process reengineering. Alternatively, if firms undertake specific change action under uncertainty, they may want to develop an emergent mode of change, that is, to navigate change in the course of implementation with an evolving strategy. In

particular, they may need to employ a low-profile approach for the implementation to avoid conflicts and allow change to be assimilated over time. In both cases, firms need to regard change as an integrative implementation.

Thirdly, *use the four alignment patterns as reference modes for building a change agenda*. Firms can use these four reference modes to diagnose their current change situations. Once firms identify the change path in which they are currently involved and the previous change path they have gone through, they are in a better position to devise subsequent strategy for integrating the current changes. Additionally, they can move forward to another new set of change initiatives. These change patterns help to conceptualise the transition of various change paths within firms.

In short, the relational alignment model suggests an effective remedy for the IT productivity paradox. The practical application of the relational alignment model may be illustrated by the example of the Aerospace firm.[50] The Director of the Aerospace firm, through a study of the earlier steps in the alignment process using the relational model (the late stage highlights an IT Transformation pattern), concluded that the motivation of people was out of line with the new working arrangements. The overemphasis on technological implementation seemed to have

[50] A research meeting with Professor Richard Ormerod, Professor John McGee and the Director of Engineering in the Aeroengine firm at the Warwick Business School (26 January, 1998).

generated resistance from engineers. Taking into account the political climate at the top management level, the Director decided to adopt a low-profile in undertaking change. He thus employed a Human Renewal pattern for the purpose of change agenda-building. Recognising the emergent nature of implementation, he began with a people-related initiative which sought to communicate the corporate goal to individual engineers. The follow-up actions included a restructuring of self-directing teams and re-introduction of technology (a data architecture management project) in order to achieve a renovation of development processes. In this way, change was navigated through an emergent, low-profile approach, *but followed* a sequential path of alignment.

Another relevant case is the virtual teamworking initiative in British Petroleum (BP). This company offers an excellent background to test the four generic patterns of change alignment for two reasons. First, BP was an active sponsor of the early MIT 1990s research, and is thus familiar with the concept of change alignment. Second, BP's recent IT-enabled change (Davenport, 1997; Prokesch, 1997) provided a successful model of IT-enabled change. The four generic patterns were presented to the CIO (Chief Information Officer), John Cross, as a device to reflect on their various initiatives with regard to virtual teamworking. An encouraging result was obtained as the CIO attempted to apply these four generic patterns in evaluating the

change alignment in BP. As the CIO recalls:

> The change alignment in BP was multidimensional...what we have done is to implement information technology for virtual teamworking, including yellow pages, Internet technology, and satellite systems. These technologies later enabled us to roll out a process reengineering for our field communications. We then invited a group of behavioural scientists to coach the users before restructuring the coordination mechanism between departments. (Personal interview with John Cross, BP, 13 February, 1998)

This responds to the pattern of IT transformation. This is another example which supports the usefulness of the relational alignment concept.

4.3.3 Rediscovering the IT Productivity Paradox

The result of phase one provides a tentative answer to the IT productivity paradox. It adds an alternative view to the current understanding: IT-enabled change needs to consider the relational alignment of change implementation. From a micro-organisational perspective, the paradox of IT productivity results from seeking to understand change alignment on the basis of a single experience (Baskerville and Smithson, 1995). Through a longitudinal analysis of change paths, the lesson can be drawn that the effective transfer of IT-related initiatives cannot be based solely on any one organisational factor, and cannot rely entirely on any universal framework (especially the planned mode). Rather, it is necessary to take into account the context in order to decide the mode of change (planned or emergent).

Furthermore, it can easily be seen why the previous models of change alignment result in the IT productivity paradox. The three schools (the technological imperative, strategic rationalism and strategic alignment) overemphasise the planned mode of strategy-driven and technology-led change, whereas the dynamic learning school addresses only the emergent mode of change based on the people dimension. The present study suggests that it is necessary to integrate the two types of thinking, employing both planned and emergent modes of change according to the different situations. In addition, change alignment requires us to avoid stressing individually either strategy or technology or people. An integrative perspective is useful when firms need to navigate change alignment through a sequential path of implementation. In practical terms, the study suggests that the four generic patterns may be used as reference modes for planning IT-enabled change. This relational alignment perspective may help practitioners to reduce the risks of undertaking too little effort (for example, only implementing process reengineering) or initiating too many changes at one time. Furthermore, this perspective can enhance the previous thinking with regard to the technological imperative (where IT is used to impose desired change), strategic rationalism (where IT is used to support a strategic position), strategic alignment (where IT and strategy are aligned to achieve organisational coherence), and dynamic learning (where IT is assimilated through an emergent

process of learning).

4.4 SUMMARY

Phase one contributes a relational alignment perspective to the present understanding of change alignment. The findings indicate that change must not be confined to a planned, strategy-driven approach or an emergent learning approach. Rather, change alignment needs to be examined from a relational viewpoint through four generic patterns. As the context alters, new change initiatives will evolve through either the planned or emergent mode of change, and will be driven by a sequence of change initiatives. The study of phase one suggests that firms may use the four patterns of alignment as reference modes for achieving effective IT-enabled change and responding to the IT productivity paradox. However, these alignment patterns still cannot explain the interaction of action and context; nor can they analyse the problem underlying the organisational dynamics. Such an inquiry is continued in phase two.

Chapter 5: Phase Two: Change Dynamics

Phase two continues the inquiry into the IT productivity paradox by investigating a controversial change in a global firm – President Enterprises. This chapter is divided into four parts. The first part describes the evolution of problems and seeks to explain the major controversies of President, while the second part consists of an analytical description of the IT solution backfire in the case study. The second part adopts three methodological approaches to explore the processes of organisational change. The purpose is not just to outline the path of change processes, but also to study in particular the underlying logic which governs the formation of the change process. The first method involves the use of processual analysis in identifying major events and providing a detailed description of the evolution and accumulation of problems relating to the IT solution backfire. In addition, these problems are taken further by the application of coded themes to provide a rich description with reference to the content, process and context shifting over time (Van de Ven, 1989; Pettigrew, 1990, 1992, 1997). The second method involves using influencing diagrams to analyse the recurring processual patterns in order to provide a systemic understanding of these problems, taking into account the reciprocal interaction of action and context. An influence diagram model is built to represent the underlying logic, with the aim of

identifying the observed processual patterns. The third method involves a frame analysis intended to reflect on the conflicting frames that induce barriers to change.

The third part of this chapter is concerned with an intra-analysis of the case study described in the second part, and offers an analysis at a higher-level of abstraction by reflecting on four key themes: underlying logic, reciprocal causality, time effect, and frame awareness. As a result, each theme is elaborated by relating it to the case study in order to develop explanatory hypotheses, thus adding to the understanding of the contextualist view of change. The fourth and final part sums up three the key lessons derived from phase two in relation to an enhanced explanation of contextual change, a "reflective transfer" framework to change management, and a response to the IT productivity paradox.

5.1 INTRODUCTION

The first section reports the case history, which is divided into two stages: early and late. It traces the process of change and the emergence of problems stemming from the contexts (internal and external). This analysis aims to understand the transition of problems in an historical context, including the derived problems of previous solutions. Tracing the evolution of problems allows us to highlight the dilemmas embedded in IT-enabled change. The essence of such an analysis is to illustrate the

evolving patterns of problems underlying the policy controversy in order to understand why social actors see only events and are forced to react to problems.

5.1.1 CASE OVERVIEW

The case is based on the study of an international consumer products company – President Enterprises (hereafter President). The globalisation challenge has brought about a series of strategic changes in President, one of the world's leading players in the consumer products industry. Since its establishment in 1967, the company has grown into a multinational organisation which employs 6,200 people (for the core business only), owns 52 factories around the world (including 21 overseas factories), and has strategic alliances with over 70 internationally known firms (up to 1997). Its business scope ranges from animal foods (e.g. stock-feed), consumer foods (such as plain flour, meat, frozen foods, and beverages), chain stores, distribution, construction, electronics, semiconductors, and financial services to leisure enterprises. President's remarkable achievement and its unremitting effort in social responsibility also make it one of the best performance enterprises in Asia.

The company's aim was to integrate its core competencies to achieve successful globalisation. The management team acknowledged the importance of IT-enabled change to support future business growth. With the assistance of various consulting

firms (such as McKinsey, Cooper & Lybrand, Hay, and Oracle), President invested in a series of change initiatives during the period 1989-1998. However, these initiatives were not beneficial; rather, they seemed to create more trouble throughout the organisation.

Stage	Early		Late	
	Entrepreneurial	Rapid Growth	Conglomeration	Global Expansion
Time	1967-1973	1974-1982	1983-1989	1990-1997
New Businesses	3	6	14	11
Strategy	Product Expansion	Market Leadership	Vertical Integration	Diversification and Global Expansion
Orientation	Production	Sales	Marketing	Social impact
Major new products and services	Plain flour, stock-feed, instant noodles, oil	Dairy, beverages, soybean sauce, bread, sesame oil, butter, canned food	Frozen meat, instant food chain, stock trading, mass communication, health foods, mass supermarkets, supermarkets, convenience chain store	Retail pharmaceutical chain store, construction, medical instruments, mineral water, insurance, options, leisure services, baseball game, beverages

TABLE 16. President's Four Stages of Growth (Company Annual Report, 1997)

Furthermore, conflicts between divisions seemed to escalate, and the management team started losing faith in further investment. The dilemma was that if the firm stopped investing in IT-enabled change, its competitiveness would soon erode. But if the firm continued to invest in such change, more chaos would overwhelm current operations. Moreover, these initiatives seemed to make problems better in the short term, but worse in the long term. Table 16 shows four periods of focus (entrepreneurial, rapid growth, conglomeration and global expansion) within two

stages (early and late).

5.1.2 The Evolution of IT-enabled Change in President

Problems in the early stage were centred on the issue of mass production. The external context in the domestic country (Taiwan) was relatively stable, in both the social and political environments. The booming economy therefore created a growing demand throughout the domestic market. Furthermore, there were few competitors in the food industry. To grasp such an opportunity, President has developed from a traditional textile conglomerate. The start-up management team consisted mostly of teachers recruited from senior high schools. The early CEO believed that this would help him to foster a coherent culture and strong leadership for future development.

The Early Stage: Production-based Growth

In order to cope with the growing demand in the domestic market in the early stage, President had to concentrate on mass production. The key concern was to deliver products that could achieve economies of scale. Product variety and marketing promotion seemed to be less important issues. Thus, the firm's major activity emphasised the recruitment of staff exhibiting hard-working personalities, the establishment of a stable distribution channel, and the maintenance of a steady

production output. The leadership was based on a centralised model adopting a Japanese style management system (including seniority-based promotion, authority-based leadership, and life-long employment). Most technological advances in production were transferred from Japan. Accordingly, various changes were introduced to enhance the production-based strategy.

In the entrepreneurial period (1967-73), President's strategy emphasised the reduction of costs through factory expansion in Taiwan and Thailand. The first restructuring stressed a group of production-oriented business units, with the aim of integrating the functions of production and sales. Under this reorganisation, a change in manufacturing processes was introduced through the implementation of Japanese production methods. As for the administrative processes, the early installation of Mitac's QI computer systems aimed to automate accounting and personnel processing. To absorb the production output, President established various channels based on traditional retail outlets (small and medium size local stores). The key activity of the sales department was to negotiate storage space and maintain good relationships with these storeowners. A strong top-down leadership imparted a culture emphasising "hard-work and honesty". The establishment of a welfare system

also provided an environment of job security. [51]

In the second period, rapid growth (1974-82), strategy was centred on establishing market leadership. The strategic aim was to leverage the mass production with effective channels. To achieve this, efforts were made to introduce the 7-Eleven channel from the South Ice Company (USA). The introduction of 7-Eleven convenient vendor stores (CVS) sought to complement the traditional retail outlets, and to pave the way for major channel expansion. The firm then found it necessary to offer autonomy to business units. Thus, it introduced another restructuring scheme, emphasising a shift to profit centres. The production-based strategy was successful and provided a platform for President's rapid growth during this period. In order to stabilise the quality of production, the firm initiated a process improvement project, seeking to transfer the techniques of TQC (Total Quality Control) into the factories.[52] Furthermore, the old information systems were replaced by the Wang VS-80 system. The firm instituted an IT department to carry out most system analysis and software programming. The hardware and software quickly spread to different business units. The hard-work culture was reinforced in this period by top-down leadership. Virtuous employees were supposed to follow instructions without questioning the

[51] Personal Interview with the Vice President (23 September, 1997; 12 April, 1998).
[52] Personal interview with a divisional manager (27 August, 1997).

authority. This leadership style was especially effective in managing the troop of production-line workers. With such a culture and job security, President became one of the most envied employers. Moreover, employees were proud of President's reputation in various public service programmes for local communities.

The Japanese management model was effective at an early stage. As expected, the firm grew rapidly due to the successful leverage between production and channels. President was mainly concerned with domestic demand. However, the concomitant of this success was a series of historical burdens. An initial problem was that of the "hard-work" culture. The increasing workload seemed to incur health problems and family conflicts among a small number of senior managers. The bureaucratic climate seemed to foster organisational rigidity in departmental coordination and in employees' response to problems. A second difficulty was that of renewing information systems. The upgrade of information systems did not achieve the desired results; instead, the software based on WANG systems seemed to suffer from technological incompatibility. Although the in-house developed software was successfully implemented into most business units, the application seemed to create ensuing conflicts between the IT department and business divisional managers. The IT department therefore had to redesign most software in order to meet individual needs. The hardware incompatibility and software setback urged a demand to

migrate the information system to a new platform.[53]

A third problem centred on channel efficiency. The introduction of 7-Eleven, an ideal type of modernised channel, encouraged the firm to rethink its channel strategy. One reason is that the traditional retailing stores were difficult to monitor and control in terms of product distribution. The firm had to invest more resources in managing these traditional stores. Additionally, the maintenance of the stores seemed to rely on personal relationships with storeowners. The management believed this relationship could become a hindrance for President's further channel expansions. At times, the management also found corruption within such channel systems. The firm felt an immediate need to resolve this issue.

A fourth problem resided in old production equipment. The firm recognised the need to extend the improvement of administrative processes and link these with production activities. Old information systems covered only the inventory control and other administrative processes. Most administrative tasks were still built on inefficient processes. For example, a large volume of order processing had to rely on a single fax machine to coordinate suppliers and buyers. The future expansion would have to take into account the integration of manufacturing, administration (order and

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[53] Personal interview with a divisional manager (14 April, 1998).

inventory in particular) and distribution processes.

The Late Stage: Global Expansion

The context in the late stage underwent dramatic shifts. In the external context, one important force of change occurred in the social structure of the domestic country itself.[54] With growing economic prosperity and higher personal incomes, the traditional large Taiwanese family was replaced by a smaller core family unit. Accordingly, consumer preference shifted from quantity to quality. A growing proportion of young consumers cared more about product quality in terms of image, convenience and packaging. All these factors had an impact on President's product development, marketing strategy and distribution channel arrangements. Additionally, technological change in biological science in Japan, the USA and Europe, and new product developments in health foods inevitably increased the complexity of product innovation and market segmentation.

One immediate impact was on product and manufacturing strategy. President had to change its strategy from mass production to mass customization. This required a fundamental change in continuous product innovation, creative marketing and manufacturing processes. At the same time, the firm faced a challenge to turn most

[54] Internal Consultancy Report (September 1997). Taiwanese Food Industry Survey (1996).

of its production lines from mass production into batch production. President had to transform the old product development team who had been used to simple, unitary design. In addition, the firm had to readjust its channel structure to incorporate modernised convenience stores. The difficulties lay not only in this transition, but also in managing the mix of these channels, for both the traditional and modernised stores.

In addition, there were difficulties in the competition between channels. There were an increasing number of small competitors with more flexible product portfolios and occupying several niche markets. Channel owners and manufacturers formed various alliances to secure their position in the market. In response, President needed to emphasise the deployment of multiple-layer retailing channels and complex distribution methods in order to remain competitive. This distribution revolution required more sophisticated systems to manage retailing in terms of physical and information flow. As a result of this competition, the product life-cycle in the food industry became shorter. Increasingly, firms in the food industry had to compete in terms of production innovation. In comparison to these competitors, President's product range and scope seemed unwieldy and complicated, making the management of product lines more difficult.

A further impact came from a significant number of global competitors (such as

Nestle) seeking to enter the China market. They chose the Taiwanese market as the testing ground for further expansion to the Mainland Chinese market. These global competitors escalated the tension of competition in areas of product innovation, marketing, distribution channels, and production. Increasingly, President had to compete through cost reduction, flexible production, and stronger R&D; moreover, the firm had to consider an aggressive expansion to the Mainland Chinese market.

In the internal context, there were three major events. The first was the rise of the SPD (Strategic Planning Division) in the strategic development of President. The firm realised the importance of strategic thinking and implementation for future development, and recognised that the Information Division alone seemed insufficient to relate IT strategy to corporate strategy. The firm thus instituted the SPD to assist the alignment of IT and business strategy. The second event concerned the change of leadership. The founder decided that a new CEO was needed to lead the future global expansion. In 1989, the top management team was restructured and the new CEO demanded an immediate cultural change to promote proactive, innovative attitudes. This change also brought in a reshuffle of the power structure, with divisional managers being given more autonomy and resources to run their business, thus building a flatter, more responsive organisation.

The key issues for the late stage involved the problems accumulated from the early

stage and the emerging contextual challenges. The firm's main response to these strategic issues centred on four areas.[55] The first was the problem of reducing increasing operating costs. The focus of cost reduction involved distribution, manufacturing and product development (R&D) costs. A second difficulty in the late stage was the stagnant profit growth. The top management team reached a consensus that global expansion was necessary if the firm wanted to maintain its future competitiveness. The Mainland Chinese market naturally assumed a high priority on the globalisation agenda. A third problem was concerned with product development. The firm realised the need to speed up the development cycle by offering innovative product designs. However, although the firm developed more product lines than the industry average (30-40 products per season), the product "hit-rate" seemed to be relatively low. The new CEO perceived this problem as a need to "foster a collaborative, proactive, and innovative culture in order to achieve organisational interdependency".[56] He believed that the transformation of the traditional hard-work culture would play an important role in developing inter-departmental operations and innovative products. Finally, the SPD initiated a company-wide project called "supply chain management", which sought to upgrade information systems, revamp

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[55] Personal interview with Vice President, divisional managers (Dairy Division), and the head of the Strategic Planning Division (22 September, 1997).
[56] The senior management meeting speech (13 September, 1997).

distribution and manufacturing processes, and align IT with business strategy.[57] The essence of this project lay in a central concern of supply chain management: using advanced information systems to link up processes between R&D, production, distribution, administration, and customer services.

The implemented strategic change needs to be set against the background of the two periods: conglomeration and globalisation. In the period of conglomeration (1983-89), the strategic concern was to ensure vertical integration. President expanded its channels through the opening of more CVS (Convenience Vendor Stores) chains, such as President Bread 3Q shops, in order to complement its 7-Eleven chain stores. A third channel was also added by establishing vendor machine chains throughout Taiwan, and a fourth channel was created through a joint venture with the Welcome and Carrefour supermarkets. The underlying idea was to establish the firm's own modernised channel. The firm hoped to set up a series of channels integrating traditional retailers and franchised CVS. This expansion was based on the firm's belief that multiple types of channel would leverage production capacity. In setting up these channels, the firm could benefit from both mass production and mass customisation strategy.

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[57] "Effective Customer Response Report", Information Division, 1996/97.

A key concern of this stage was to introduce a new POS (Point of Sale) information system into various chain stores. This aimed to assist the real-time management of stock, ordering and inventory processes for the modernised channels. At the same time, the firm wanted to establish another information system to monitor the administration of channel distribution. Thus, a MIS system was developed in collaboration with an external research institute to improve the efficiency of the distribution process. Later, this investment had to be called off, because of the high expense involved and constant schedule delays. This experience made the firm believed that in-house development or buying packaged IS solutions should be more cost effective.

For factory automation, machines were brought in to improve food quality and reduce cost. A company-wide quality circle (CWQC) programme was introduced to support technology transfer from Japan, integrating product quality across diverse functional units. A QWL (Quality of Work Life) programme was also devised to accompany the factory-wide total improvement programme.

Additionally, President established various welfare and reward systems, and introduced various corporate citizenship programmes. The latter included worldwide schemes such as "saving the young from prostitution", "rediscovering love: preventing youth violence", "hunger strike 30: aid for famine in Africa, Asia and

Latin America", "saving the innocent AIDS babies", "promotion of green awareness", "anti-drug abuse", and many other ecological revival programmes. The management believed that employees would be motivated by the growing reputation of the company, and the result of this would be high productivity to support the firm's rapid growth. However, most front-line employees and some senior managers seemed to considering these programmes to be no more than ineffective promotional campaigns. Furthermore, President diversified into electronics (via EE TECK, USA) and the semiconductors industry (via joint ventures with MTI USA and TAG Swiss), effectively becoming a conglomerate. There was thus another restructuring of business units in order to respond to the vast expansion.

In the global expansion period (1990-1997), the firm's strategic focus shifted to a global restructuring and the initiative of supply chain management.[58] The firm continued their strategic alliances through another series of joint ventures, including an acquisition of a world-top biscuit firm in the USA, the opening of another 19 factories in China, joint ventures with Japanese banks, diversification into the telecommunication sector, and collaboration with Walt Disney (USA). To enhance its distribution channels, President expanded the 7-Elven chain to 1,500 stores across

[58] Personal interview with staff in factory, the Diary Division and headquarters (23 September, 1997).

Taiwan. It also introduced the COSMED pharmaceutical retailing stores and Starbucks café chain stores (a joint venture with an American firm). President thus sought to consolidate its experience in setting up these channels for an eventual transfer to the Mainland Chinese market.

At the same time, a CIS (Corporate Identity System) was introduced to promote a new culture, with a stress on innovation (smart-work) rather than hard-work. Organisational development activities, including systems thinking, SOI (Seasonal Operation Interview) and LDG (Leaderless Group Discussion), were used to promote organisational learning. Finally, President moved from corporate citizenship to social responsibility programmes with a particular concern for green issues, healthy living styles and community care these were be built into various activities such as advertising, product design and the production process.

The old salary and career planning system seemed to be outdated when set against the new restructuring. Consequently, a redesigned system was installed to ensure the appropriate deployment of President's large human resources pool. The resulted in a human renewal programme assisted by Hay, a consulting firm specialising in human resource management. The project sought to redesign a more flexible career system to accommodate the future personnel expansion. However, this renewal project failed because the resultant design was perceived as an even more rigid and bureaucratic

career structure. Hay's reply was that the design was fully dependent on customers' demands and should thus be considered successful. Divisional mangers disagreed with this view, maintaining that the implemented HR (Human Resource) systems were a failure and could not possibly resolve the problem of the new restructuring. Divisional managers came to feel that the redesigned system would actually downgrade employees' future careers. In consequence, the SPD took the blame for the project's failure.

In 1996, the firm undertook a further restructuring which aimed to introduce a new management model in response to the need for a global perspective and local autonomy. As the new CEO noted:

> This new reorganisation aims to increase... autonomy and professionalism in individual divisions, allowing them to better serve local and central needs. (Annual Report, CEO Forwards, 1997)

The idea was to regroup the major business units to improve global communication (as shown in Figure 17). For example, the Foodstuff Group included traditional businesses such as livestock, flour, edible oil, and animal feed, which was located in Indonesia, Beijing, Shenyang and six other major cities in China. The Second Food Division was regrouped for the same purpose, but its focus was on beverage and vending machines. The Third Food Group encompassed major business lines such as Soy Sauce Condiment, Health Foods, Baking, Chain Stores, Frozen Foods, Dairy and

Meat Divisions.

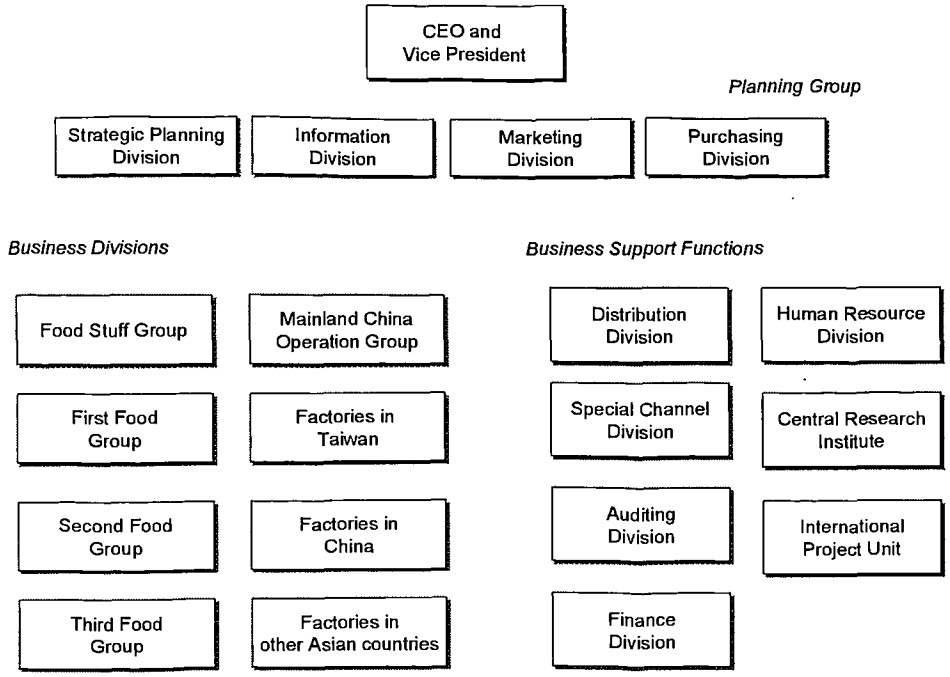

FIGURE 17. President's Restructuring in 1996[59]

It should be noted that the restructuring of the four groups was intended to shift power to the smaller divisions. The emphasis was now on two types of manager: the divisional managers (in the Foodstuff and Third Groups) and geographical managers (in the First and Second Groups). Moreover, one special group, the Mainland China Operation Group, was set up to coordinate the major activities in the Chinese market. Through these global measures, President sought to undertake a network-based restructuring, aiming to delegate power to local offices and at the same time

[59] Company Annual Report, 1996/97

maximising centralised resource control. The new CEO's ambition was to build a network organisation in which President, according to the company's new vision, could function like a symphony orchestra.

The restructuring also expanded the Distribution Division into four major functions: storage/shipment, business operations, low temperature product distribution, and normal temperature product distribution. The R&D department was renamed the Central Research Institute, with responsibilities for company-wide new technology transfer and product innovation. President decided to increase the investment in product innovation, allocating over 4% of their total revenue to R&D.

Another important shift was the establishment of Planning Group, including the Strategic Planning Division, Marketing Division, and Purchasing Division. The marketing promotion and material purchasing were still centrally controlled. The IT department expanded into the Information Division. This restructuring sought to prepare for the supply chain management project. The Strategic Planning Division was responsible for this change initiative, coordinating consulting firms and various divisions, whereas the Information Division prepared for the technological migration of the data architecture and database.

At a divisional level, further restructuring of senior staff also took place. The firm introduced a "product manager system" with the aim of transforming traditional sales

managers into product managers, thus facilitating horizontal product development. Following these new roles and responsibilities, the function of sales managers was abandoned. Product managers had to gather customers' responses (from retailers and chain stores) and collaborate with the Central Research Institute to develop customer-oriented products. Because the marketing and promotion functions were centralised in the Planning Group, product managers had to coordinate the launch of a new product with the marketing campaign (e.g. TV commercials) and with distribution and display in each channel. The positive side of this was that most junior sales persons were highly motivated, having been given greater responsibility. However, the negative side was that most senior staff, previously managing directors in regional offices, felt demoted in their less responsible positions (but with additional workloads).

Subsequently, the firm initiated two major process changes. The first was to continue TQC and to pursue the certification of ISO 9002 and ISO 14000 (for environmental protection) at factory level. A second initiative was to introduce major process reengineering in the supply chain management, which necessitated the introduction of information systems (a choice between Oracle Application™ and SAP™) in order

to achieve effective supply chain management.[60] This project was proposed by the SPD, with the aim of resolving problems relating to the overlapping of processes, the delay of information flow, inconsistency of data architecture, the lack of system integration (because of different technological platforms in the firm), long lead time, a poor inventory system, and the repeated investment in IT. The suggested solutions included establishing a cross-divisional team to manage reengineering, inviting external consultants to assist in change management, and introducing IT-based supply chain integration. This latter concept involved introducing an information system capable of handling data flow across suppliers, manufacturers, wholesales/retailers, and consumers.

However, once this supply chain project was conceived, several sources of conflict emerged. The divisional managers seemed to be hesitant about the introduction of yet another information system. The worry lay in the broad scope of the proposed reengineering, which, it was feared, would cause an interruption to routine work. In particular, divisional managers were concerned about the possible incompatibility of foreign software (in the English version). They were dubious as to whether the SAP or Oracle could actually deliver the promise of supply chain integration. On the other

[60] "Evaluation of Information Policy Report: Reengineering in President Enterprises", April 1997, pp 1-2

hand, the Information Division was more concerned with technological migration. The unsuccessful migration in the previous stage had incurred a bad reputation for the IT manager. Thus, from the IT manager's perspective, it was crucial for him to restore his reputation. To this end, he was more interested in whether the database could be effectively transferred to a common platform, and less concerned about strategic alignment with the supply chain.[61]

In 1996, the firm called for another project in process reengineering. McKinsey, a consulting firm specialising in strategic planning, began with a reengineering project working with the Dairy Division. The aim was to improve productivity within various channels. However, the redesigned distribution channel structure seemed to complicate the operation and cause inefficiency. For example, business divisions had to share distribution channels. Each distribution channel was assigned a channel manager, who was responsible for allocating products to different channels in accordance with the market demand and competition. The problem arose when too many products were poured into one particular channel. On such occasions, channel managers had to decide which product should be allocated to which channel. There were two evaluative criteria: the profitability of each product and the demand from

[61] Personal interview with the IT manager, one SPD planning manager (14 September, 1997), one divisional manager (22 September, 1997), and a site visit in Dairy Division (27 September, 1997).

each retailer. Therefore, if a product had very low profit margin, channel managers could ignore it (for example, one from the Dairy Division) and favour another (for example, one from the Beverage Division). Moreover, according to customers' demands, channel managers could choose "hot" products in preference to less known products to be distributed to various channels. They could even introduce competitors' products in order to satisfy the needs of retailers and chain-store owners. The mission of McKinsey consultants was to help resolve the sophisticated relationship and processes between divisions, channels and chain stores. However, this initial reengineering project seemed to fail abysmally. As one divisional manager commented:

> These consultants were totally ignorant of our processes and the complicated relationship between divisions. They tried to impose their ideal type of supply chain processes into ours. We just cannot change everything and replace processes all at once. It is the relationship and conflict that need to be reengineered. (Personal interview with divisional manager, April 1997)

A more sympathetic view offered by the SPD was that these consultants were not well acquainted with the firm's domestic operation since they brought with them a global perspective of supply chain management. As a result, the reengineering project was called off. Again, the SPD took the blame for the project's failure.

The SPD itself attributed the two failures to a lack of coherent corporate vision. In

September 1996, the SPD introduced another consulting firm, Cooper & Lybrand, to assist the formulation of corporate vision. The strategic exercise covered interviews with senior managers (in different divisions), suppliers and competitors. The top management team was summoned to formulate a coherent corporate vision to guide the future strategic development and create "a business for people's lives". As the new vision stated:

> President has always orchestrated the culinary symphonies everyone loves; our success has been based on the philosophy of caring and concern for the modern family. (Corporate Vision, "Corporate Strategic Planning Report", 1996)

However, this time-consuming exercise did not allow any consensus to be reached among divisional managers. Rather, it incurred conflicts between them and the SPD staff. Divisional managers treated this strategic exercise as a means for the SPD to acquire more resources from them. General mistrust was directed towards the SPD and the new CEO. In consequence, the attention seemed to be centred on the political struggle rather than building a consensual strategic vision. One senior manager even mocked such a vision as being "an innocuous novel without any practical knowledge on food business".[62] A few months later, an informal survey conducted in one division indicated that none of the employees ever know about such events. Most

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[62] Personal interview with senior managers in three major business divisions (2 October 1997).

employees interpreted the vision as just another promotion of the corporate image. Again, the blame seemed to be placed on the incompetence of the SPD.

In early 1997, the SPD urged the top management team to implement IT-based supply chain integration. This time, other consulting firms such as KPMG, Price Waterhouse, SAP, and Oracle were included in the planning processes. The aim was to use reengineering to support a customer-driven, seamless supply chain strategy.[63] The objectives included workflow improvement, decision making support, redundant investment reduction, and order cycle-time improvement. The redesigned processes were intended to cover four areas: sales and distribution, purchasing, manufacturing, and finance support functions. Despite numerous meetings, the decision was inconclusive until the Information Division suggested a convincing recommendation, namely that the firm had to maintain a coherent system platform in order to transfer data from the old systems to the new ones. Because the previous changes were based on Oracle database tools, it would be cost effective to continue the investment building application on Oracle software. Therefore, the Oracle Application™ systems became the chosen software platform of supply chain management for President in the late stage. However, it was not only the divisional managers who lacked

[63] "Process and Systems Reengineering Study Report, Strategic Planning Division", August 1997.

confidence. Oracle's senior executives also expressed their concern about the IT-enabled change. One of them stated:

> For an IT-enabled change to be successful, it requires both sides to take part in the change management. We [Oracle] may provide the technical specification of the supply chain system, but we will never be able to resolve the fundamental issues underlying their [President] organisational problems. (Personal Interview with CEO, Great China Area, Autumn 1997)

The head of the SPD was later replaced and a new task force was created for implementing IT-based supply chain management. The old problem concerned the interplay of the top management, the SPD staff, the IT manager and divisional managers. The IT manager believed that the implementation of IT would automatically bring about the desired change, this facilitating to appreciate the importance of other influences such as cultural inertia and staff motivation. The communication gap was perceived by divisional managers as being due partly to the IT strategy-formation process, where planning was headed by the SPD and the Information Division. Nevertheless, the top management believed that the new head of SPD, having experience in sales and marketing, would have sufficient knowledge to resolve this problem.

In conclusion, some major problems evolved from the early stage, including the incompatibility of old information systems, the rigidity incurred by a hard-work culture, and convoluted processes of mixed distribution channels. As these historical

burdens emerged in the late stage, they were reinforced by another set of problems revolving around global restructuring, processes reengineering and supply-chain integration. Unexpectedly, some of these latter solutions seemed to create more problems. For example, the introduction of IT-enabled change caused more administrative problems in current operations, and later also incurred database migration problems. The introduction of the human renewal programme led to increased staff turnover and demoralised employees. The investment in product innovation generated a low product hit-rate, and many divisions reported the frequent premature death of products. The vision-building programme seemed to promote internal contention rather than consensus. The effort to achieve supply chain integration seemed to escalate conflicts between the SPD and business divisions.

5.1.3 Problem Symptoms

There are three key performance indices which may provide a basis for understanding the major symptoms of problems in President. These provide reference points for the analysis of the outcome of change dynamics. The first is concerned with the *investment in change programmes*. The top management were puzzled by the enormous investment in IT and consultancy, which seemed to have little positive impact on the firm's performance. The cost of various investments in

change programmes seemed to increase rapidly. In the light of the conflicts among the SPD, the Information Division and various divisional managers, the top management seemed to lose confidence in implementing more changes. As the investment in IT-enabled change increased, the problems within administrative processes and the resistance of employees escalated.

A second index is that of the *turnover of senior staff.* Frequently, both senior product managers and channel managers were recruited by competitors. As the number of resignations increased, divisions faced major sales difficulties and suffered from low morale. This in turn tended to cause further resignations. Divisional managers were very worried about such a vicious circle.

A third index relates to a more intangible measure of conflict and morale. The conflict between SPD and divisional managers seemed to escalate because the two parties disagreed about the allocation of resources. As a result, divisional managers tended to resist changes introduced by the SPD. However, as the strategic resources were still mainly controlled by the SPD, more and more divisional managers were seeking to implement changes by themselves, thereby neglecting those organised by the SPD. This situation was reported as an inappropriate design of reengineering planning.

This section has provided an outline of the case background and main chronological

events, thus paving the way for the next section, in which the key themes relating to IT solution backfire are elaborated. In this way, the dynamics of the change process are explained and the conflicting frames are examined.

5.2 CASE STUDY: IT SOLUTIONS BACKFIRE

The processual account of this case study focuses on the evolution of problems relating to IT-enabled change and offers an explanation of how recent problems were formed (1997). The tracing also explores how change initiatives designed to solve these current problems became problems in themselves, thus adding to unresolved difficulties. As a result, problems became even more difficult to remedy and thus presented themselves as historical burdens. In this way, the case story seeks to provide a rich account of the evolution of problems, looking inside the organisational dynamics and identifying the recurring patterns of events. These patterns are then used as a basis to develop constructs for building a context-specific underlying logic.

5.2.1 PROCESSUAL ANALYSIS

There has always been a sense of crisis in President with regard to IT-enabled change. For President, the vision of IT-enabled change lay in the "advanced IT infrastructure

to sustain the future business growth".[64] However, although President invested heavily in four major IT developments (the early information system for distribution management, the WANG-based system for company-wide computerisation, the IT infrastructure upgrading, and the supply chain management), the benefits were less obvious. In appearance, President was committed to continuous investment by collaborating with the best IT consulting firms, instituting a Strategic Planning Division to act as a change agent, providing advanced IT-based applications, and offering unremitting top management support. These were all conventional notions to ensure the implementation of IT-enabled change. But the result was rather puzzling in that no one could comprehend why such a "best practice model" of IT-enabled change still remained in a controversial stalemate situation.

The symptoms were in fact even more worrying. The technical difficulties of the IT systems seemed to rise steadily. The unsuccessful investment in IT-enabled change led to a loss of top management support. Frequently, there were signs of a significant rise in the workload of senior staff, the level of inter-departmental conflicts, and operating costs. The management team believed that immediate remedies must be sought to resolve operational bottleneck, and thus promote productivity. Nevertheless,

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[64] Personal interview with the Vice President (12 April, 1998).

these symptoms indicated not only problems but also associated dilemmas.

It is true that a sustainable IT infrastructure is needed to support continuous growth and global expansion, and that any delay in IT-enabled change may incur an unrecoverable decline of competitiveness. But in President's case the increasing investment in IT seemed to offer little improvement in operational bottlenecks, merely causing more and more problems in routine jobs. The case study concentrates on the investigation relating to IT-enabled change and reflects on the major dilemmas.

The Plight of Operational Bottlenecks

The early history of IT-enabled change in President began with a joint project with a renowned Japanese consulting firm undergoing a major improvement in the distribution processes. As a result, 14 modernised channels were established, each equipped with a POS (Point of Sales) system.[65] Although traditional retailing stores were still averse to the idea of computerisation, the management team began to comprehend that IT-based automation was inevitable.

From 1983, the SPD (Strategic Planning Division) took over the masterminding of computerisation and helped to outsource the project to a quasi-government research

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[65] Internal Evaluation Report, President Enterprise (Summer, 1992).

institute. The idea was to provide a customised software design in order to automate the administrative processes of distribution. Unfortunately, this IS project took two years, and was finally abandoned because of poor software design and insufficient support from the business divisions. For the SPD, an important lesson to be learnt from this project was that the quality of outsourced software development might be inferior to that of software developed internally.[66] Following the failure of this project, the problem of operational bottlenecks, accompanied by sluggish productivity and rising operating costs, began to preoccupy the top management's attention. They therefore urged the SPD to take action on further IT-enabled change. This time, the SPD was relatively confident about their ability to initiate the project internally by working with the IT department.

The Age of the "Smart" Machine

The in-house design was an exciting project for the IT department, providing it with the chance to prove its worth through its technological expertise. Several actions were taken. The IT department decided to use the WANG system to provide the technical platform, and to use the COBOL language as the software development tool. In 1990, the scope of this project was extended to cover more functional areas

[66] Personal interview with a SPD senior executive (8 September, 1997).

such as finance/accounting, R&D management, marketing, and production.[67]

Later, in 1992, the IT department was also expanded into the Information Division. This meant that it could play a more important role and shared equal responsibility (and power) with the SPD.

The SPD was more concerned with the justification of the project's strategic value. In terms of IS (Information Systems) development, the SPD managers seemed to share two implicit assumptions.[68] First, once the information system was in place and discretionary resources were made available, operational bottlenecks would be resolved. Secondly, product managers in business divisions would be able to assist the development of software without being distracted from their current tasks. Even if their routine performance suffered from the interruption of the IS project, this would only be a temporary difficulty. On the other hand, the Information Division also shared the assumption that the information system would work well within the parameters of a coherent IT infrastructure. Thus, it was necessary for hardware and software to be compatible in order to maintain the optimal performance of the system.

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[67] Information System Development Specification, 1994.

[68] Personal interview with two managers in the SPD and one senior programmer in the Information Division (16 April, 1997).

A change in leadership in 1989 brought President into a new age of IT application. The management recognised that the old "hard-work" culture was not necessarily helpful in preparing President for the next decade. A new CEO was established whose mission was to oversee President's cultural transformation. His ambition was to maintain the company's hard-work culture and at the same time develop a blended culture of innovation. As he noted:

> We need to keep the traditional spirit of hard-work in jobs, honesty and integrity. But to face the future challenge, we need not only to work hard to maintain our productivity, but we also have to develop a sense of innovation, a culture that can help us to transcend from working hard to "working smart". (Special Annual Report, Collections of the CEO's Speeches in 1990, 1997)

The mission of transforming into a "smart-work" culture became the heart of the core design of the next IS development, although the SPD had no concrete idea of how a culture consisting of both hard-work and smart-work could be realised. In general, the key planners believed that the company-wide use of computer systems would bring about a smart-work culture, and in some way this would also introduce administrative innovation within the firm. At this point, the Information Division also enthusiastically agreed that the intelligent machine (i.e. an advanced IT system) would foster the habit of smart working. Subsequent IS projects thus concentrated on expanding the local exploitation of computer systems and developing software for functional applications. Key tasks, such as, the analysis of user requirements,

business processes, information flow and electronic interface programming, required the majority of resources from Information Division.

In tandem with the smart working policy, the SPD also introduced a Lotus Notes groupware system which was installed for internal communication. Although this system demonstrated to the new CEO certain intelligent ways of smart working (e.g. sending email, internal bulletins, and Internet applications), it was used only in limited ways for communication among a few SPD staff. This was not a good way to inspire business divisions with a vision of how a "smart-work" culture can be achieved by the use of IT applications. As one senior product manager explained:

> The concept of the smart machine does not seem to happen to my division. Apart from the routine workload, we have to deal with the constant interruption of user requirement interviews...How in heaven's name do I know what information flow, business processes or ER diagrams are. My concern is simple: to find out how many products I sold last week, to place orders with production in time, to inform distribution for logistical arrangements, and to avoid writing tedious reports by hand. However, it seems to me that I have to deal with the constant breakdown of information systems which I do not know how to use in the first place. (Personal interview, 21 September 1997)

In consequence, the use of groupware did little to inspire divisional applications. At worst it seemed to provoke the hostility of business divisions. Divisional managers indignantly complained about the allocation of IT resources. As most divisions were still using fax machines to process orders, they did not understand why applications

such as groupware could not be put into use at a divisional level. This problem did not attract the Information Division's attention, as they were tied up in fixing the problems generated by new software and occasional hardware breakdowns, as well as being under the pressure to develop several software applications at the same time. As complaints mounted, the Information Division turned its attention to users' demand to link up the existing database (for order processing purpose). The link with the POS system could quickly provide up-to-date marketing information to business divisions (such as the Dairy, Meat, Vendor, and Beverage divisions). The Information Division believed that this would gain the sympathy of business divisions and minimise their resistance to the development of new information systems. Such an ambition inevitably resulted in extra workloads for the IT staff.

In order to sustain a coherent system, the Information Division installed WANG and COBOL-based software applications in all divisions. At the same time, the use of DOS-based applications was shunned. The Information Division's aim was to maintain consistency in system application so that business divisions could concentrate on employing a developed system. However, at a divisional level, as most staff needed to complete numerous forms for order-processing or internal administrative tasks, divisions secretly installed personal computers with standalone software to handle the routine word processing. Increasingly, as the insatiability of

information systems discouraged employees, more and more staff turned to the use of more convenient packaged software to automate their administrative tasks.

Cultural Stickiness

The introduction of information systems did not in practice lead to a flourishing of the innovative (smart-work) culture; instead, the old hard-work culture seemed to persist. The life-long employment policy gave staff job security, but at the same time, led to complacency. Most senior front-line workers were still used to waiting for instructions if any improvement programme was to proceed. In practice, for most senior administrative managers, any individual innovation was a sign of disobedience to their authority. As one (administrative) divisional manager noted: "Why do we need to change our success formula? The old way of working has been so successful for the past thirty years".[69] This negative view of the hard-work culture could be observed in the regular cross-departmental meetings between sales, production and distribution:

> The meeting often involves 22 persons in the name of consensus building. To most employees, such a meeting is seen to be a vital mechanism for interdepartmental collaboration... While the chair, the divisional manager, was checking the follow-up list with one particular problem with one department at a time, the other staff were sitting idly scribbling on their proposal or making occasional phone calls outside the room. Sometimes the

[69] Personal interview with a senior manager in the auditing department and three staff at the company headquarters (16 September, 1997).

> chair's attention could be fixed on one difficult issue for a long time. At other times, staff began to chat about private matters. When the situation was getting chaotic, the chair would irritatingly remind each department representative of the importance of listening to what other department's problems were. Such a meeting often had to last five to six hours every week for interdepartmental coordination. Other similar meetings were held in each department for intradepartmental collaboration. Employees expressed their frustration in attending such meetings, but would feel they were not working hard enough if they were absent. (Field notes, participant observation in a divisional meeting, 20 September 1997)

This sense of powerlessness apparent in the above quotation was widespread among employees, especially in the production and sales divisions. The hard-work culture also affected operational bottlenecks in the business divisions. For example, one of the most critical tasks in the business divisions was the processing of orders. Sales persons and product managers had to deal with daily incoming orders from suppliers and retailers, as well as manual order forms. However, in certain divisions, this task was handled by one single fax machine. Employees had to join a long queue in order to receive or send an order. As a result, many staff had to stay overtime just to process their orders. In the busiest moth, the increasing workload often upset staff and led to absenteeism.

Skepticism mounted about the idea of "smart work through the intelligent machine". At first, senior product managers were involved in the design of business processes, spending a substantial amount of time on activities relating to user requirements and systems analysis. Because most users (product managers) had little knowledge of IT,

they simply provided the relevant documentation forms required by current administrative procedures. Some product managers intuitively felt that this might result in building new information systems out of old working processes. However, as the workload built up, they started to ignore the IS-related activities and turn to their most critical task – dealing with product failures, which were known as "premature product death" in President. Senior managers were assigned to investigate the cause, and consequently junior staff had to deal with the system analysis tasks required by the Information Division. These junior employees were often embarrassed because of their inability to describe the process specification to the system analysts.

Starting in 1991, another crisis, namely the lost of senior staff, swept through the firm. In part this was due to the market demand for such experts; but it was also due to the unbearable workload and family pressure, resulting in senior product managers leaving President and joining competitors. This situation also added to the increasing conflicts between business divisions and the SPD. In addition, senior managers were frustrated at the rising internal corruption stemming from the stagnant culture.[70] More and more employees were indignant about the situation, and the name "Dilbert" (a

[70] This widely known Dilbert syndrome was confirmed by interviews with four senior staff (15 April 1998), two sales managers (17 September, 1997), and one divisional managers (1 October, 1997).

cynical cartoon character representing a stupid white-collar worker) was attributed informally to those senior staff who were thought to be corrupt. Some employees even made fun of such a situation:

> If you stay long enough, you would be entitled to become a "Dilbert" and be promoted to a senior manager position which accommodates the most incompetent people. (Personal interview, Spring 1996)

The seniority system in President used to be respected, but now it seemed to be the subject of criticisms and jokes. This provided very little incentive for senior staff to remain in the company.

The Beauty and Danger of System Coherency

In the period 1993-95, the Information Division was engaged in yet another technological initiative. It believed that rising technical problems could be attributed to an outmoded IT infrastructure. Thus, old problems could best be resolved by revamping the old system architecture. This time the key target was to reduce system instability by enhancing system coherency. This initiative involved the upgrading of software by replacing COBOL language with RDBM (Relational Database Management).[71] The purpose was to achieve flexible software maintenance whilst also improving programming efficiency. The RDBM system, an Oracle (tool)

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[71] Personal interview with the head of the Information Division (27 September, 1997).

product, was used to replace most of the existing database. The data migration work was extremely challenging, involving the transfer of the format of data structure to the new information system and the design of new software applications based on RDBM language. Programmers had to redesign software according to the RDBM principle, which meant another round of user requirement analysis.

The renewal of software led to another system coherency problem. The WANG computer was a proprietary system that was not compatible with the programming language (RDBM). Thus, the Information Division had to begin a second stage of hardware renewal by replacing the WANG system (and many terminals) with an IBM AS400 system (a minicomputer model). To the Information Division, this technological change was a successful coup which demonstrated their ability to undergo sophisticated engineering work and to regain the confidence of the business divisions. Nonetheless, the same confidence did not seem to be shared by many product managers.

The combination of RDBM (software) and IBM AS400 (hardware) led to two separate problems. First, for users at the divisional level, the advancement of IBM AS400 and RDBM did not offer the benefits of system coherence. It was the personal computer- (PC-) based Windows system and the many user-friendly applications (such as Word, Powerpoint and Excel) that attracted those users. The previous

nightmare of computer difficulties made users reluctant to get involved again in the software development process. Besides, product managers would risk their careers if they did not achieve the stipulated sales quotas. In consequence, the use of personal computers steadily replaced the use of minicomputer terminals before the Information Division began its renewal of the IT infrastructure. Divisional managers were happy about such local computerisation, since it provided a clear boost to productivity. However, this did not seem to assist the vision of system coherency preferred by the Information Division.

Secondly, some other divisions had to extend the administrative application to functional operations. In particular, order processing was one of the first priority items. Some divisional managers decided to bypass the Information Division, contracting software programmers to develop PC-based applications. Such applications were intended simply to handle routine information processing tasks, for example keeping inventory data and printing product sales records. Because of the technical difficulties encountered, namely data migration, software evaluation and installation of hardware, the Information Division seemed to be unaware of this quiet technological revolution in the business divisions.

The Power Dynamics of Champions and Challengers

As a way of dealing with product failure, the SPD initiated a series of training

programmes for product manages in order to facilitate the collaboration between sales, marketing and product development. The purpose was to enhance the quality of inter-departmental collaboration so that product managers could effectively integrate activity between production and retailers. However, this effort did not seem to be appreciated by product managers, who were more concerned with the problem of underlying policy than with the enhancement of routine work. For product managers, training projects, like IT-related initiatives, were symptomatic solutions which just added to their workload. Consequently, senior product managers decided to send more junior staff to deal with the Information Division's analysis of user requirements.[72] This had one serious effect that was anxiously discussed among product managers:

> [Our] problems are actually hidden and embedded in the outdated processes. We need a fundamental redesign not just in the processes of the supply chain, but also the outdated retailing policies. IT has nothing to do with this problem in our context. They [the Information Division and the SPD] want to believe it is an IT problem, because they can benefit from the introduction of such projects. They can have training, overseas travel, and can enjoy their conference trips. If the project succeeds, it's their accomplishment, if not, it's the consultants' problem. What really worries the business divisions are that once these process problems were designed into IT, it will be more difficult to see them. In such a case, the spread of the IT system means an epidemic of these problems. (A group meeting with four product managers, 14 September, 1997)

[72] Personal interview with a channel manager (19 September, 1997), three senior manager (16 September, 1997) and two sales in distribution divisions (17 September, 1997).

Naturally, product managers resisted the further implementation of IT-enabled change. As the internal problems (cost overrun, profit decrease, staff turnover, and product failures) continued to escalate, most business divisions treated IT-related activities as marginal issues. The task of user requirement acquisition became the responsibility of junior staff. The primary aim was not to provide valid suggestions, but to "get system analysts off product managers' backs".

Other problems also festered and bubbled to the surface. More divisions were dissatisfied with the increasing technical difficulties of such unstable information systems, and decided to bypass the Information Division's new IT infrastructure proposal, and proceeded to develop their own information systems based on somewhat different technical platforms. For example, one special channel division employed a private programmer to develop its own applications in inventory management. This resulted in two types of systems for some business divisions: one system for demonstration to headquarters inspectors and another for the division's daily practice.[73]

Basically, divisional managers did not fully agree with the policy of "imposing IT on the problem", and maintained that their bottlenecks were due to three primary

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[73] Personal interview with a senior executive in special channel division (9 September, 1997).

causes.[74] First, it was the result of outdated processes. For example, product managers still had to use fax machines to process orders from suppliers and retailers, whereas most competitors had already employed the technology of electronic data interchange to expedite transactions. Even worse, in one division, one fax machine might have to be shared by 12-13 product managers. In such circumstances, even if divisions could successfully implement an information system, and even if the system design was less bug-ridden, the system could only improve the efficiency and not the effectiveness of the outmoded ordering processing. Secondly, process problems were a result of outdated policies. For instance, a new retailer policy might be needed to readjust the proportion of modernised channels to traditional channels, and a new distribution policy might be needed to respond to poor public transportation infrastructure in Taiwan. Thirdly, another cause of operational bottlenecks was the old hard-work culture. For example, most divisions still had to spend 3-4 hours each day in ineffective meetings. They felt that they were not working hard if they did not attend these meetings and if the meetings were not long.[75]

For the Information Division, it was depressing to learn that business divisions could

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[74] Personal interview with three senior executives in different business divisions (15 September, 1997)
[75] Group interviews with three product managers in the same division (16 September, 1997).

not appreciate the beauty of such a coherent IT infrastructure. It was equally frustrating to know that most product managers were using "low end" software rather than "high end" technology. The head of the Information Division thought that enhanced communication was needed to convince product managers of the improved system coherency that would result from the new IT architecture.[76]

The increasing pressure from top management urged the SPD to rectify the situation. The SPD believed that the Information Division was unable to cope with the rapidly changing demands of user requirements because of the process redesign. The SPD concluded that a best practice model was needed to resolve this problem. As noted by one senior executive:

> We learn that the introduction of IT-enabled change must accompany process reengineering...The best way of implementing process reengineering is to use a current packaged application such as SAP or Oracle. This kind of software has a best practice model built-in within the software. Therefore, if we implement such an information system, we can transfer the knowledge of best practice as well as the information systems at the same time. (Personal interview with a senior executive in the SPD, 24 September 1997)

Furthermore, the advice of the SPD included a reformulation of the IT-aligned business strategy. The SPD believed that one major reason for the previous setback was the lack of an effective alignment between the planning of IT infrastructure and

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[76] Personal interview with one senior manager and one channel manager (10 September, 1997)

business strategy. Such an alignment should incorporate changes in different organisational factors such as culture, structure and products.

The Outbreak of Technical Difficulties

The dispute about IT-enabled change persisted as the instability of the information systems grew. The Information Division found that their engineers had to deal with a vast array of hardware and software problems. On the user side, some product managers began to grumble openly. They resented the instability and inconvenience caused by the recurrent changes in information systems. The software engineers (the Information Division) explained that such a condition was not entirely their fault, but was, in part due to the changing expectations about information systems, and in part due to technical problems with the system when it was installed. One software programmer explained his disappointment:

> We could not maintain what we had done, but we were given almost no concrete information to make future plans. Everything was always in flux... It's unfair to blame us for not doing the job. We have done our best to meet the deadline and deliver the required systems. (Personal interview with a software programmer, 13 September 1997)

In this highly stressful working environment, many product managers simply chose not to use information systems. The "smart machine" metaphor in President began to ring hollow. For product managers, the Information Division's decision to make the improvement and upgrading of the technical infrastructure a primary concern was

unreasonable. This meant throwing product managers and other users into confusion. By 1994, the information systems came to be seen as one more unnecessarily inflicted evil. Consequently, most users give up the use of information systems in response to the outbreak of system problems. This situation led the SPD to seek a remedy by introducing further IT-enabled change.

An Idea in Good Currency: Supply Chain Management

In 1997, the SPD was attracted to a recent idea proposed by another consulting firm: that of supply chain management. The senior executives in the SPD believed that this fashionable concept could help President to introduce a best practice model of supply chain management in order to invigorate business performance. An extensive survey was conducted by the SPD to evaluate this idea. After the survey, the SPD concluded that the previous setbacks were mainly due to the lack of effective strategic alignment between IT and business strategy. The supply chain initiative, also known as ERP (Enterprise Resource Planning), thus was guided under a triangular strategic alignment framework based on three enablers.[77]

The first was the strategy enabler, which required a consideration of market/product services and customers. The second was the organisational enabler, which involved

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[77] Internal Report: Strategic Alignment of Supply Chain in President, 1996.

the integration of culture and structure. The third was concerned with the system enabler that dealt with management processes and technology. In collaboration with a major consulting firm, Price Waterhouse, the strategic alignment framework was proposed to guide the transition and implementation of the next stage of IT-enabled change. The key idea was to introduce an IT-based supply chain management, providing information links between production, distribution and retailing. In so doing, the aim was to shorten the planning life-cycle within the supply chain and thereby achieve a quick response to customer demands.

At this stage, the SPD seemed to prefer to employ an external consulting service (including IT introduction and change management) to outsourcing IT to a single supplier or in-house development. As one senior executive commented:

> We need professional IT consulting firms to help us with change management. Our business divisions are incapable of doing complicated process reengineering. Their thought [divisional managers] needs to be updated. (Personal interview, 9 September 1997)

Returning from a workshop presented by Michael Hammer (the founder of the reengineering concept), the SPD's staff enthusiastically advocated the need for top management's commitment to effect successful change. Subsequently, the SPD set up a committee to review major decisions about the initiatives of IT-enabled change. Nevertheless, although many divisional managers were included in the committee,

most decisions were bypassed without consulting them. Divisional managers came to feel that they were marginalised, and stopped contributing to committee meetings. In the end, only a few senior executives in the headquarters attended the committee meeting. Some divisional managers publicly threatened to boycott the SPD's decisions. As a result, the complaint reached the Vice President, and the head of the SPD was replaced. The new head undertook a major reshuffle of staff and redesigned the strategic mission of supply chain management.

The changes in the SPD did not affect the operation of the Information Division. The system analysts' main concern was still to make business divisions appreciate the beauty of the new technology. There were three key objectives. The first was to move toward user-centred system development. The Information Division recognised the importance of user participation and thus organised several initiatives seeking to collaborate with product managers. The second objective was to integrate different system platforms. The upgrading of the IT infrastructure required a series of system migrations in hardware (from WANG to IBM AS400) and software (from COBOL to RDBM). These migrations involved database conversion, hardware-to-software conversion (IBM AS400 is not compatible with the Unix-based Oracle application), and Windows NT platform conversion (the Windows system was not compatible with the Oracle platform). From the viewpoint of application, system analysts had to

deal with the integration of new technology (such as data warehousing, a flexible data processing technology which supports real-time decision making, and EDI), user requirement definition (to fit to best practice), and IS project management.

The Information Division and the SPD had to choose between the Oracle and SAP systems. The dilemma was that if Oracle Application™ was chosen, the firm would have to deal with the Oracle's problematic warehouse system; but, if SAP was chosen, the firm would run the risk of undertaking a major restructuring (from a hierarchical to a process-oriented structure). Other technical problems included the use of Chinese fonts. If the firm were to apply English software, this might resolve the global application problem, but the domestic employees might resist use of the system, due to the language barrier. Moreover, the Information Division had to deal with more sophisticated problems such as choosing between a loose- or close-couple system, configuring GUI (Graphic User Interface) for operating systems, balancing the batch and real-time modes of data transmission, and installing Intranet applications. Finally, system analysts also had to assist IT consultants in system implementation, and ideally, to transfer consultants' IT competencies during the implementation process. Obviously, the Information Division wanted to avoid another IT failure, but many divisional managers seemed to have no sympathy with these efforts.

The Illusion and the Reality of IT-enabled Change

Most users (product managers) thought the emphasis on the technical issue stressed that resources had been wrongly allocated. They believed that the SPD was squandering management attention on projects that looked like winners, but it was incapable of producing major results for the business unit as a whole. The grand promise of supply chain management, Enterprise Resource Planning, was nothing more than management rhetoric and an illusion.

Increasingly, the conflicts between business divisions and the SPD widened. The divisions thought that the SPD was spending money unwisely. As far as the product managers were concerned, the priority was not about IT-related problems, but about resolving product-related problems. As one senior product manager stated:

> The whole business of IT-enabled change is an illusion. What we need to change is not just the software development of ERP (Enterprise Resource Planning), but the spirit of ERP, a way of doing things guided by a customer-oriented mentality. They [SPD] don't know what is important in the market. The supply chain management is nothing but a planning exercise on paper... They know what they want, but not what we and the market want. SPD is naïve enough in believing IT can solve all our problems. We may as well just ignore the "supply chain management" and see if they can finally find out their stupidity. (Personal interview, 10 September 1997)

This rising conflict turned into distrust among business divisions and further de-motivated many senior product managers when they found out how much the consultants were paid. Another senior product managers angrily noted:

> Our poor salary is nothing comparable to the snappy consultants. The money they get in working one day is what we have to earn hard for one month. Why don't we just let them perform the miracle of reengineering? (Personal interview, 23 September, 1997)

As the initiative of supply chain management moved forward, the workload of product managers was mounting again. Several factors contributed to this. On the one hand, product managers had to deal with continuous software development and IT infrastructure upgrading. On the other hand, they had to cope with the increasing product failure caused by the introduction of more new products (e.g. a technology transfer project with Australia). In addition, as a result of staff turnover, they had to spare time to train new recruits.

To respond to such a challenge, divisional managers decided to give up support for any IT-related tasks in order to release product managers. Basically, divisional managers did not believe the IT-based supply chain management could assist them in coping with the future challenges. This was based on their view of future production. As one divisional manager explained:

> We [President] are moving toward a different business orientation: from a forecast-based production to demand-based production, from mass manufacturing to mass customisation. What we really need to change is to adjust and define such business orientation, not IT. (Personal interview, 17 September 1997)

For divisional managers, operational bottlenecks were more concerned with the discontinuity of organisational knowledge. The continuous loss of senior staff meant

the stagnation of accumulated industrial knowledge. There was not enough time for new staff to assimilate the valuable experiences of senior staff. Most new staff had to deal with problem from scratch. This included filling in administrative forms, dealing with retailers, resolving delay in the distribution processes, and initiating marketing promotion. This discontinuity of knowledge meant that the inherent problems were still embedded in the processes. As more and more senior staff left, the problems were buried in software and persisted in operational processes.

Fixes that Fail

Distrust and conflict seemed to perpetuate. The SPD still focused on the strategic alignment framework, and by the end of 1998 it had introduced another interface software i2™ to support the transition of moving towards Oracle. The Information Division's priority was to build information systems based on a coherent technological platform. But, for the business divisions, the escalating conflicts turned into clandestine resistance to IT-enabled change. Some product managers even began to provide wrong information to IT consultants and the SPD in order to protect their "trade secrets". For most divisional managers, IT-enabled change was just an "expensive calculator". As product failures reached an alarming level, most resources were reallocated to resolve this problem. In consequence, IT-enabled change seemed to fall into another vicious circle: repeated million-dollar investment

in inescapable failures.

5.2.2 THE UNDERLYING LOGIC OF IT SOLUTION BACKFIRE

In this section, a higher order of analysis is provided in order to reflect upon the recurring patterns of events in the context of IT-enabled change. This involves a re-examination of the processual data described above in order to capture the underlying reciprocal causality. Such an approach attempts to experiment with an alternative way of analysing processual patterns so that analysts may be able to reflect on structural constraints at a higher level. Iinfluence diagrams are used to illustrate the problem of IT solution backfire from a systemic perspective. The analysis of underlying logic is based on the model exhibited in Figure 18.

The Provision of an IT Solution

In the early stage, President's inefficient processes incurred operational bottlenecks and an increase in operating costs. To regain competitiveness, the SPD formulated various initiatives relating to IT-enabled change. These included software for distribution systems, the introduction of the WANG system and in-house developed software, a major upgrade in IT infrastructure (into Oracle RDBM platform), and recent (1997/98) supply chain management. The "IT Solution Loop" (in Figure 18) represents this balancing behaviour. IT-based solutions are applied to improve

operational bottlenecks. If operational bottlenecks remain, more IT solutions are needed.

The First Side Effect

The provision of IT solutions unexpectedly increases the staff workload at a divisional level (see "Side Effect 1 Loop" in Figure 18). The level of workload is initially maintained by the old (hard-work) culture and caused by the firm's ineffective work practices. These ineffective work practices include, for example, tedious meetings held regularly at a divisional level and outmoded administrative processes (product managers have to share a fax machine to receive and send orders). The result of the continuous provision of IT solutions is that product managers have to deal with both their ineffective routine tasks and the added IT-related jobs. Such contextual factors (see the two factors "Stickiness of Old Culture" and "Product Failures") represent historical burdens of President. In consequence, such an accumulated workload invariably decreases the process efficiency in operations, leading to more operational bottlenecks.

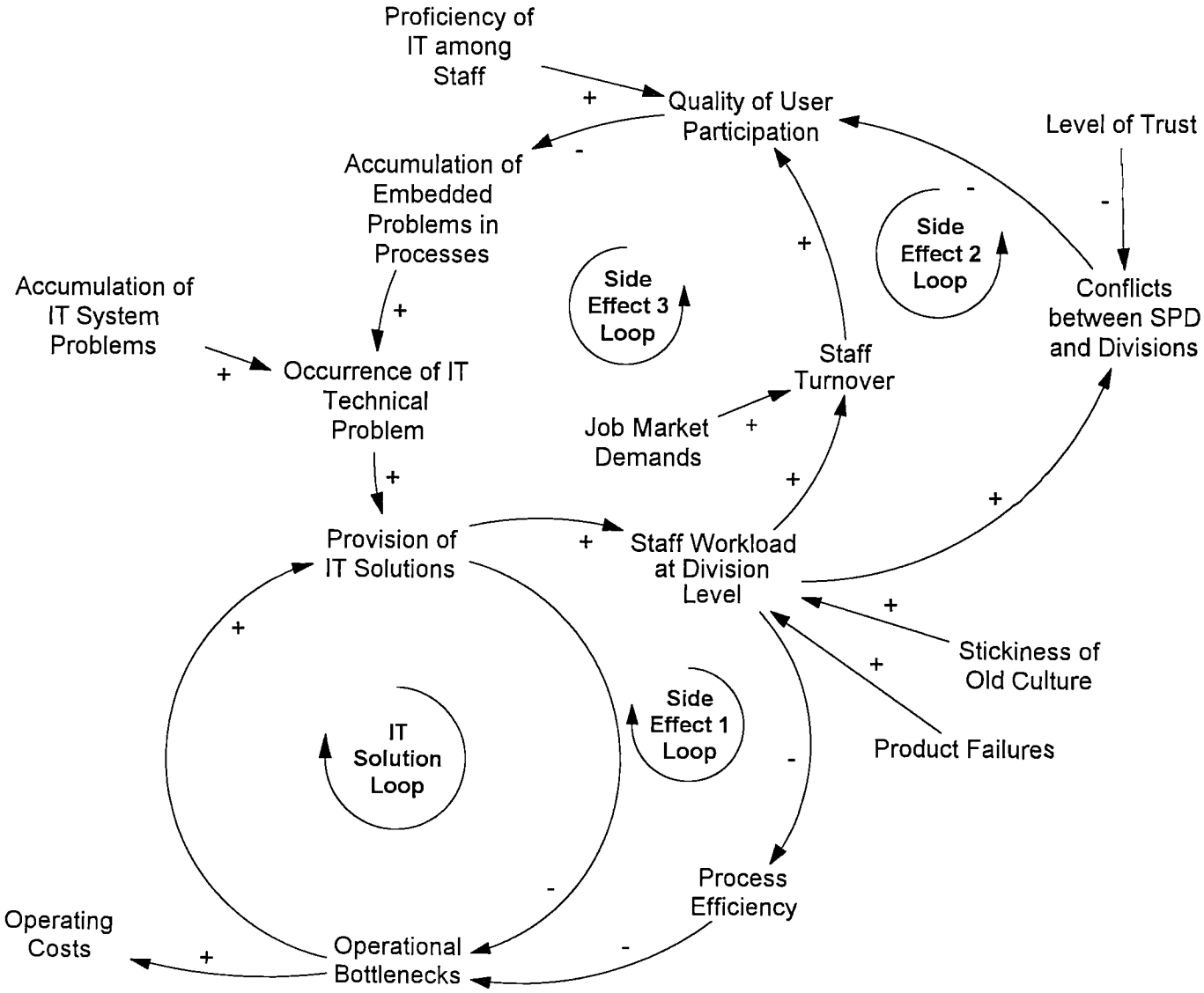

FIGURE 18. The Dynamics of IT Solution Backfire

From the SPD's perspective, the remaining bottlenecks demand more IT solutions. For example, this may mean shifting from IT outsourcing to in-house design, and introducing a third party (IT consultants such as Price Waterhouse) to build an IT alignment strategy. This effect forms a reinforcing loop (Side Effect 1 Loop) that perpetuates operational bottlenecks, urging the SPD to implement more IT solutions. Inevitably, this initiates another cycle of workload increase, further process efficiency and more operational bottlenecks.

The Second Side Effect

Another unintended consequence is the internal conflict between business divisions (the user side), the Information Division (the supply side) and the SPD (the mastermind side). Initially, referring to the "Side Effect 2 Loop", the effect of the increase staff workload (at divisional level) leads to an increase of conflict between the SPD and users. This has a second reinforcing effect on the staff workload, the conflicts between SPD and business divisions, the quality of user participation, the accumulation of embedded problems in processes, and the occurrence of IT technical problems, thereby perpetuating the system instability. In general, users feel that the SPD's fruitless IT solutions jeopardise their performance in sales and interrupt their routine work. At worst, the continuous failure of IT solutions results in a distrust of the SPD's competence in effecting IT-enabled change (refer to the factor "Level of

Trust"). A major consequence of this is that users are less willing to participate in the design of information systems (refer to the factor "Quality of User Participation"). The decreasing quality of user involvement leads to two major problems.

First, because users (in particular the senior product managers) are not fully involved in redesigning processes, they provide only partial information to system analysts. Many problems are still embedded in these ineffective processes. When system analysts fail to incorporate these problems into process redesign, these problems are less detectable. As a result, these process-based problems are transformed into technical problems (refer to the factor "Accumulation of Embedded Problems in Processes"). From a users' perspective, information systems are not reliable and their instability becomes ever more difficult to tolerate. Secondly, when users later find that IT consultants are paid astronomically and SPD staff have abundant resources (to travel abroad, for example), their commitment turns sour. This leads to their alienation from subsequent IT-related projects. More and more users provide system analysts with the wrong specifications to sabotage the whole IT-enabled change.

There is another noteworthy contextual factor: the "Proficiency of IT among Staff". In President, most staff lack IT-related training. This makes it more difficult for users to articulate their real information needs. Users can only explain old processes (how things have already been done) to system analysts rather than convince them to

consider the underlying policies (such as the retailing policy). Furthermore, the participation of novice staff also undermines the quality of system development. However, system analysts assume that users can objectively and correctly articulate their system requirement. These specifications, once designed into various information systems, will only automate the incorrect administrative processes, thus causing further IT-related problems. Moreover, system analysts have to spend more time dealing with these IT-related problems, rather than investigating the fundamental process-related issues. As a result, when information systems are used in divisions, users often find that they are unstable and hence more "IT-related" problems are discovered. Users then report these IT-related (technical) problems to system analysts for further improvement. This then urges the SPD to provide more IT solutions.

"Side Effect 2 Loop" explains a second reinforcing behaviour of IT-induced organisational dysfunction, which explains the conflicting perceptions between the user side and the supply side. Such dynamics require detailed attention. The increased workload leads to rising conflicts and accumulated distrust between the SPD and users. When the Information Division begins the development of an information system, it has to deal with users' resistance. In addition to the lack of IT-related knowledge of users, the quality of user participation is extremely poor. This

results in more embedded problems of ineffective processes. Once these problems are designed into the information system, they lead users to report system unreliability as a result of technical IT problems. They also lead the Information Division to interpret these problems as system incompetence, thus leading to more changes of IT infrastructure. In addition, frequent changes of IT infrastructure in the name of system coherence mean more work on system migration (e.g. on translating data structure from COBOL to RDBM), and this leads to an accumulation of further IT problems (see the factor "Accumulation of IT Technical Problems"). Altogether, the SPD and the Information Division feel a stronger need to resolve the occurrences of technical problems by providing more IT solutions.

The Third Side Effect

The increased workload at a divisional level also has a third effect on President's IT-enabled change (see "Side Effect 3 Loop"). The increase of staff workload makes employees suffer from serious health problems and family pressures. As the job market offers more attractive packages, more and more senior staff are turning to competitors. The turnover of senior staff, further, leads to a lose of organisational knowledge. The turnover is equivalent to the loss of years of industrial experience in handling the supply chain, product management and relationships with retailers. The pressure of senior staff turnover and the accumulating workload force divisional

managers to start sending junior staff to participate in user requirement meetings in order to minimise staff turnover and allocate resources to more urgent problems – product failures stemming from ineffective departmental coordination.

Although some senior product managers recognise that those IT-related problems actually stem from unsatisfactory processes, they feel powerless to make any improvements. The structural constraints (i.e. the reciprocal nature of the three side effects) prohibit them from undertaking the necessary changes.

Interwoven Patterns of Problems

The model of the underlying logic presented in Figure 18 provides a case-specific causal pattern that explains the dynamics of IT solution backfire in President. In this model, the "IT Solution Loop" represents the SPD's well-intended IT-enabled change to resolve operational bottlenecks. However, this change is counteracted by the three self-reinforcing side-effects. The first side-effect is concerned with the staff's engagement in outmoded processes. The IT solution, due to inappropriate implementation, brings in more workload for staff at a divisional level, thus making the already ineffective processes even worse, leading to rising operational bottlenecks. Although the SPD and the Information Division have attempted to improve user participation by setting up a committee and strengthening system analysts' direct communication with users, there is a second major side effect.

The escalation of the "Side Effect 1 Loop" engenders the conflicts between the SPD and users (see "Side Effect 2 Loop"). This directly undermines the quality of user participation and transforms the problematic process into information systems, which makes the existing process-related problems ever more difficult to detect. Furthermore, once information systems are implemented in different functional areas, the embedded problems spread all over the firm. When system analysts react to the outbreak of technical difficulties, they delay the required attention to this situation. In addition, staff turnover (see "Side Effect 3 Loop") only worsens the situation. These three reinforcing loops all contribute, in different ways, to the need for more IT solutions and undermine the well-intended change initiatives. In consequence, IT solutions do not improve operational bottlenecks and reduce operating costs, but conversely increase costs, while more and more expensive IT investments are wasted.

Historical Burdens Emerging from the Contexts

Apart from such interwoven dynamics precipitating an IT solution backfire, there are also four contextual factors which allow the dilemma to persist. First, the "Stickiness of Old Culture" seems to prevent users from undertaking departmental improvements. As the hard-work culture persists, employees feel that they are unable to introduce any changes. Secondly, due to the previous failures of IT-enabled change, users are

less confident in working with the SPD and the Information Division. The low "Level of Trust" becomes a crucial barrier to enable collaboration between the parties. Thirdly, generally users have no previous knowledge in IT-related applications, which makes it difficult for them to participate effectively in system development. Therefore, although they are willing to collaborate, it is still difficult to improve the "Quality of User Participation". Fourthly, the accumulation of previous problems in IT infrastructure (e.g. incompatibility between hardware and software) also adds to the technical problem in information systems. System analysts and programmers have to respond to both system migration and system development problems. As they can no longer cope with both sources of pressure, the implemented information systems become ever more unreliable and unstable. However, users are not concerned with such dilemmas. They only conclude that IT is simply an expensive calculator, leading to less trust in IT-enabled change.

In this case, the influence of the outer context urges the introduction of IT solutions, but the inner context seems to have a critical impact on IT-enabled change. The above four factors explain the contextual constraints that accumulate historical burdens and hamper further resolution. Consequently, these burdens delay timely remedies and make problems even harder to resolve. A vicious circle thus perpetuates. Therefore, although President has invested millions of dollars in change

projects over a ten-year period, the firm still suffers from great initiatives inefficiency, product failures, high operating costs, and the backfire of IT-enabled change.

5.2.3 FRAME REFLECTION

The above analysis may tempt researchers to draw premature conclusions and suggest *the* solution for dealing with IT solution backfire in President. However, it is not the purpose of this study to suggest any easy answer. Furthermore, the influence diagram model (in Figure 18), a means of representing the underlying logic of the situation in President, should not be seen as a prescriptive tool to render optimal answers. Rather, the model is developed for the purpose of *reflection* rather not *solution*.

In the first section, a processual analysis is used to explore events (critical incidents of IT-enabled change), strung together as a series over time, in order to appreciate the accumulated patterns of these events. These recurring patterns are translated into a higher level abstraction through an influence diagram model to represent the concept of underlying logic. The underlying logic can be viewed as a set of "event generators" because they are responsible for producing these patterns of events. Nevertheless, in order to reveal the formation of such an underlying logic, an

analysis is required to investigate further the hidden action frames of reference.

To undertake such a frame analysis, it is necessary to view the underlying logic as a product of conflicting frames of key social actors, rather than an aggregated institutional frame (see, for example, Goffman, 1974; Gioia and Chittipeddi, 1991; Reger et al., 1994; Schön and Rein, 1994). The discussion below examines the conflicting frames through the perspectives of three groups of social actors: the SPD, the Information Division, and users (product managers and divisional managers), and seeks to explain the use of the underlying logic for appreciating dilemmas in President (rather than proposing solutions).

Rhetoric versus Action Frames

Table 17 summarises the rhetorical frames (what they believe) and action frames (what they actually do) of social actors (see Silveman, 1970; Argyris, 1993; Schön and Rein, 1994). The purpose is not to offer a neutral view of the situation through objectified statements by the researcher. Rather, the comparison aims to illustrate how the researcher, through a triangulation process, observes the conflicting frames among different groups of social actors in the implementation of IT-enabled change. Moreover, the analysis seeks to trace the conflicting frames behind the underlying logic (as exhibited in Figure 18) and their consequences in order to appreciate the hidden controversies (Schön and Rein, 1994, 1994).

Table 17 should not be seen as an oversimplification of the three dominant frames in President; nor should the comparison of conflicting frames be used as a prescriptive tool to propose solutions.

	Rhetorical frame	Action Frames and Consequences
SPD	IT-enabled change requires an integrative alignment of IT and strategy (a strategic rationalism perspective).	The SPD introduced various strategic frameworks to guide continual IT solutions in order to resolve operational bottlenecks. However, this ignored the situated problems in President's context and led to three major side effects.
Information Division	IT-enabled change is concerned with system coherency and software development (a technological imperative perspective).	System analysts' attention was fixed on the beauty of system coherency and the implementation of system development. This prevented them from taking action to address the political, cultural and social factors at the divisional level.
Users (divisional level)	IT-enabled change should help us to overcome our operational bottlenecks in the supply chain.	The ineffective processes and heavy routine workload inhibited product managers from undertaking changes in underlying policies. As the historical burden accumulated over time, product managers felt powerless to take any remedial actions. Consequently, such powerlessness resulted in indignant emotion and internal fighting.

TABLE 17. A Frame Analysis of IT Solution Backfires

In contrast to the programmatic change approach, this frame analysis seeks to provide a framework for social actors to reflect on these problems and dilemmas. Although reflection itself does not guarantee a solution, but, without reflection, the proposed solutions may tend to oversimplify a complex situation. For example, in the period of field study, another research team (from a business school in the USA) was also investigating the same situation. Given the same access and research question

(why have IT-enabled changes in President been unsuccessful?), the research team concluded that the main cause stemmed from ineffective processes reengineering. The suggestion was to initiate another extensive survey of the supply chain by mapping in detail the interface of the administrative processes. Unsurprisingly, most IT consulting firms also suggested similar actions. Both the resolutions above fail to take into account a systemic view of the historical burdens and conflicting frames, but consider separately the factors of strategy, processes or IT.

Nevertheless, reflection is hardly attainable without the cooperation of key social actors. Based on the analysis presented in this study, researchers may be tempted to conclude that the problem of President's IT-enabled change is mainly a matter of miscommunication between divisions, causing conflicts between suppliers and users. However, such a conclusion would be presented. For example, taking account of the SPD's view, researchers may suggest the resolution lies in a better strategic alignment framework, the replacement of the current advisor by better IT consultants, restructuring, top management commitment, and cultural transformation. But for the Information Division, the resolution involves the enhancement of user involvement, the improvement of system compatibility, and an upgrade to a more advanced computer system. As for the users, they may take a more radical view and decide to abandon the whole system, get rid of SPD, replace senior executives in the

Information Division, improve incentive systems, and concentrate on the redesign of retailing policy. The individual solutions may seem right, but the synthesis of them is nonetheless unattainable. There are two main reasons for understanding why such solutions are often used.

In the first place, the provision of quick solutions is often based on oversimplification of the problem situation. It is valid to suggest that to integrate President's large-scale changes, strategic alignment is necessary; but the alignment model will not be effective if it does not align with other organisational factors. It is also valid to argue that President needs to undertake supply chain reengineering. However, the fossilised hard-work culture needs to be resolved before any redesign of the supply chain is undertaken. There is another dilemma: to take time to achieve a cultural transformation may delay the introduction of IT-enabled change, a significant determinant for future business growth. On the other hand, it is also valid to suggest that a coherent system infrastructure is necessary; but the changes in IT infrastructure result in an accumulation of system migration problems, and also a coherent system design may not appeal to users' need. Similarly, to improve user involvement requires the SPD to gain the buy-in of divisional and product managers, but the accumulated conflict and distrust cannot be dispelled easily. These problems are reciprocally intertwined, whereupon they evolve into dilemmas. Change

managers cannot deal with one specific problem without considering its reciprocal impacts; otherwise, the solution may simply create more problems.

The second reason is concerned with the systemic quality of these problems. Simplified solutions may merely shift one problem to another area. For example, the Information Division attempted to get the users involved in system development. Without considering the stickiness of the old culture and the fact that the problem was embedded in ineffective processes, the increased user involvement actually shifted the problem in processes to the problem in system design. System analysts acquired incorrect process information from junior staffs (because more IT solutions led to more workload for senior product managers). The implemented information systems thus became bug-ridden and unstable. Moreover, this shifted the problem to another area, while developing more incompatible systems. Increasingly, users had a frustrating experience of using information systems. They then initiated their own departmental IS projects to deal with such a reimbursement problem. This not only complicated the original process-based problems but also generated more system coherency difficulties. These further added to the accumulation of IT system problems and worsened the technical coherency of the whole information system.

Leverage Points?

The traditional approach of system dynamics analysis is to build an influence

diagram model and then identify leverage points, thereupon suggesting solutions (see, for example, Coyle, 1996; Sterman, et al., 1997). This prescriptive viewpoint is not shared in this study. Such a normative approach invariably gives an omnipotent role to researchers in deciding which solution is the "right" one. This study recognises that a leverage point has to be developed through an appreciative process of self-evaluation in which key social actors must participate in the reflection of dilemmas. It is not only necessary to reflect on the reciprocal nature of cause-and-effect, but also the conflicting frames. The underlying logic, as shown in Figure 18, is not to be taken as an objectified model based on which to investigate the interdependent variables. Rather, it needs to be used as a mechanism to appreciate the dynamics of organisational changes, and to understand how IT comes to reify into counterproductive social forces.

The process of reflection will be discussed in section 5.4. But, a detailed approach to conducting a frame-reflective inquiry (Schön and Rein, 1994: 196) is beyond the scope of this research. This study can only suggest a preliminary leverage from the outcome of reflective inquiry through discussion with the key social actors. Nonetheless, it must be born in mind that the reflection below does not determine the most effective way of implementing the next stage IT-enabled change in President. The purpose is to present the outcome of key social actors' mental learning process

through such a reflective inquiry.

According to the reflections of several divisional managers, the problem of IT solution backfire lies in the involvement of users with their own particular expectations. The deterministic view of IT solutions neglects the impact of contextual factors (that is, the stickiness of the old culture, the level of trust, the proficiency of IT knowledge and the accumulation of IT system problems). Therefore, even though business divisions are aware of the importance of immediate change, they cannot effectively support it. To leverage user involvement in President, it is necessary to rethink the role of the SPD and the Information Division. For example, top management may need to transfer the responsibility for organisational change to divisions, with the Information Division and the SPD playing a facilitating role.

Although a committee has been set up to monitor the implementation, divisional managers are not included in the decision-making process of strategic change. The impact of this is twofold: Firstly, at a divisional level, employees are reluctant to change their old way of working because of the lack of involvement of the divisional managers. This results in a second impact. The lack of user involvement leads to an ineffective redesign of process. Process redesign depends entirely upon IT consultants and system analysts. These redesigned processes do not reflect the reality

of the situation. An information system built upon such foundations is risky because it spreads not only IT problems but also perpetuates the process problems embedded in the IT system. Problems thus become more difficult to detect and correct.

Although the above reflection is limited, it can be seen as an important breakthrough in how users appreciate the interaction of problems. Unfortunately, the SPD and the Information Division had a strong "defensive routine" (Argyris, 1985), so that this study is unable to conduct frame-reflective inquiry with the other groups of social actors. Nonetheless, such a reflective inquiry gives rise to an important lesson about the role of research and the researched. It is also worth emphasising again that in a complex situation like this case, organisational change is more concerned with an appreciation of the dynamic interaction of multiple forces created by conflicting frames. An underlying logic can be constructed to help social actors to reflect on the dilemmas. The researchers' role is more to facilitate the appreciation of intertwined problems than to prescribe solutions. Researchers are outsiders and know relatively little about the inside resource allocation compared with social actors who are involved. The responsibility of researchers should be to help social actors to reflect on dilemmas (not just problems) and thereby facilitate the formulation of a creative resolution by considering intertwined problems and historical burdens. Most importantly, in such a reflective process, what really benefits social actors is the

awareness of the hidden structural constraints that cause them to feel powerless. Although such a reflective analysis may not necessarily promise immediate resolution of the problem (and often it is more difficult to see any resolution), it does help social actors to avoid an oversimplification of problems involved in the context-specific change. In this way, social actors have at least the possibility to emancipate themselves from strategic stalemate.

Finally, it may be attractive for researchers to engage solely in the underlying logic model to find leverage points and facilitate social actors in a learning process. But this may lead to yet another oversimplified prescription. The key concern is to apply the three-layer analysis (processual analysis, underlying logic and frame reflection) as a whole in order to avoid reducing the complexity of organisational change.

5.3 INTRA-CASE ANALYSIS: WHAT IS CONTEXTUAL CHANGE?

The preceding analysis uses influence diagrams to describe the reciprocal interdependence in a problem situation. This provides a non-linear, feedback mode of analysing processual data, and thus seeks to respond to the analysis of underlying logic of change processes suggested by Van de Ven (1988, 1992) and Pettigrew (1990, 1997). This involves not only an examination of processual patterns over time, but also a higher level reflection on change processes. Building on Pettigrew's (1973,

1985, 1987, 1990, 1992, 1997) contextualist perspective, this section attempts to analyse change processes from a social-scientific viewpoint. The intra-case analysis here focuses on hypothesis development in order to enhance the existing understanding of the contextualist view of change.

The four main themes are underlying logic, reciprocal causality, time effect, and frame awareness. Together, these provide an enhanced conceptualisation of contextual change. Since the contextualist view remains insufficiently examined, any endeavour that addresses this underdeveloped area is bound to be conceptual. Hence, these hypotheses are explanatory rather than prescriptive. The purpose, however, is to understand the nature of contextual change, rather than to propound a prematurely sophisticated theory by empirical substantiation.

5.3.1 THEME 1: UNDERLYING LOGIC

A Systemic View of the Deeper Pathway

The first theme emphasises the concept of underlying logic in order to understand contextual influences in a particular organisational setting. Underlying logic is a context-specific causal structure rather than a generalisable rule, and seeks to explain the unique problems situated in organisations and produced by specific groups of individuals. The understanding of underlying logic can assist analysts to appreciate

why certain processual patterns are generated. As noted by Pettigrew:

> [Change] is to be understood not just as events and chronology; there may be *deeper pathways* if the analyst searches for structure and underlying logics. (Pettigrew, 1990: 270)

From an organisational learning perspective, Senge (1990) also points out that the concept of underlying logic can be seen as a structure that implicitly influences the behaviour of a human system. This concept encourages us to look beyond events and processual patterns of events, and to search for the underlying structures that shape individual actions and create structural constraints to condition the outcome of change. Senge (1990: chapter 4) also stresses that these structural constraints may offset well-intentioned changes and lead to counterproductive consequences and hence to situations of powerlessness that frustrate social actors. In consequence, the harder social actors push changes in the system, the harder the system pushes back; and the more effort managers put into problem resolution, the more a remedy seems to be required. Senge warns that such an underlying logic is particularly difficult for social actors to identify and appreciate. He notes:

> Business and other human endeavors are also systems. They, too, are bound by invisible fabrics of interrelated actions, which often take years to fully play out their effects on each other. Since we are part of that lacework ourselves, it's doubly hard to see the whole pattern of change. Instead, we tend to focus on snapshots of isolated parts of the system, and wonder why our deepest problems never seem to get solved. (Senge, 1990: 7)

Inspirations from other Theoretical Perspectives

As social actors are woven into the system they produce, the "deeper pathway" needed to look beyond patterns of events is certainly difficult to find. Furthermore, another problem is to view the concept of underlying logic as a mechanism for transcending the understanding of change processes. Collier (1994: 6,7) explains that the difficulty of gaining transcendental understanding lies in four concerns. First, social actors may not be able to identify what is "real" in social phenomena; that is, an underlying logic may be real without appearing at all. Second, such an underlying logic is not about the infallible data of appearance, but about something that goes beyond the data. Third, knowledge of change may not only consist of appearances, but also of the underlying structures which generate and endure longer than the appearances themselves. Thus, analysts may have knowledge not just of historical events but of social systems; not just of family likeness but of the molecular structure of DNA; and not just of earthquake but of the movement of plate tectonics (where visible earthquakes are caused by the invisible movement of the continental plates floating on the earth's molten inner core; see Thurow, 1996:6). Fourth, knowledge of such underlying structures of change may not just explain, but also contradict appearances. Colliers (1994) argues that such contradiction between appearance and reality may facilitate the attainment of "human emancipation" advocated by Bhaskar

(1978, 1986).

The field of system dynamics also provides useful insights for understanding the concept of underlying logic. As Forrester's (1969, 1971: 55) study in urban policy shows, actions taken to alleviate the difficulties of a city can actually make matters worse and cause exactly the reverse of the desired outcome. This requires an investigation of not only the historical events and patterns of these events, but of the underlying structure of the interdependent social dynamics. In such situations, the search for an underlying structure aims to provide leverage points rather than optimal solutions. In Forrester's and the subsequent MIT studies (Sterman and Morecroft, 1994), the system dynamics method is developed to facilitate the investigation of underlying structure in order to derive counterintuitive insights for human emancipation.

One may note that these different names (such as underlying structure, motor, deep structure or underlying mechanism) often confuse the concept of underlying logic. Therefore, this study will only refer to the idea of underlying logic for the sake of consistency.

The Representation of Underlying Logic

In the present study, the concept of underlying logic is represented by an influence diagram model. However, such modeling is different from the current applications of

system dynamics. The practice of system dynamics has been dominated by the hard modelling school, which emphasises the use of simulation to suggest a leverage policy (see, for example, Sterman et al., 1997). However, the hypothesis-testing approach of the hard school seems to provide singly prescriptive solutions, rather than adequately explaining the problem situated in a firm-specific context.

Although a growing recognition of soft (or qualitative) modelling is advocated by a few system dynamics scholars (e.g. Wolsteinholme, 1990; Senge, 1990; Coyle, 1996), this soft approach seems to bring in singly the social factors (such as culture, conflicts or leadership) into the model. The soft school maintains that it is feasible to produce policy insights without the necessity of quantification. However, the soft approach still adopts hypothesis-testing modelling process to generalise normative system dynamics models, thus oversimplifying organisational dynamics by the use of qualitative influence diagrams. Some attempts have even been made to incorporate other system thinking methods into the soft approach, such as cognitive mapping (Eden, 1994), soft OR (Lane, 1994) and Soft System Method (Coyle and Alexander, 1997), but these methods tend to add confusion rather than clarification. By and large, the current practice of system dynamics modelling seems to be confined by instrumental rationality, and ignores the interaction between purposive social actors and contexts. What is needed is a worldview that appreciates social actors' frames of

references and their co-production of action and context over time. This study represents such an attempt from a contextualist perspective.

Structural Constraints

In the case study of IT solution backfire, an empirical examination is offered to understand the concept of underlying logic. For example, President implemented solutions such as the WANG system (coupled with COBOL-base applications), RDBM tools and IT-based supply chain management. These solutions were implemented over a seven-year period to improve operational efficiency and to reduce costs. This can be seen as a balanced feedback loop operating between two constructs: "Provision of IT Solutions" and "Operational Bottlenecks" (refer to "IT Solution Loop" in Figure 18). Furthermore, IT-enabled change is supported by many change initiatives, such as strategic change (from production-based to niche market), restructuring (from profit centres to strategic business units), processes (from distribution to supply chain), people (from welfare system to career system). Although these patterns of events were recurring over time, they were nonetheless governed by the underlying logic represented by the balanced feedback loop. Failure to understand this underlying logic may lead analysts to attribute the cause to inefficient processes in the early stage and an outmoded information system in the late stage.

Similarly, the recurring patterns of workload and conflict also formulated three reinforcing mechanisms (refer to Side Effect Loop 1, 2 and 3 in Figure 18), leading to unintended reactions to IT-enabled change. The historical burdens, such as old cultural stickiness, product premature death and staff turnover, also added to the frustration of product managers. These feedback mechanisms, when functioning together, form a constraining structure that perpetuates problems and prevent the improvement of the situation.

The underlying logic of the IT solution backfire in President provides an effective way of untangling the problems beyond the patterns of events. In this case, the analysts' emphasis is no longer on the introduction of IT, the resolution of process efficiency, the overcoming of technical migration, and the pursuit of product innovation. Rather, analysts should give primacy to how the underlying causes interact in a synthetic way that creates recurring problems over time. As such, the underlying logic offers a detailed explanation of how IT solutions create workload, how historical burdens inhibit effective interventions, how conflicts escalate without being noticed, how staff turnover becomes more than a human resource problem, and how rational implementation of information systems turns into technical difficulties. This underlying logic, like the example of DNA and plate tectonics, helps to understand of the root of change, rather than just the surface structure of change

processes.

The concept of underlying logic also explains a causal structure of which social actors are unaware and in which they are constrained. To identify such an underlying logic can enable social actors to be aware of such a constraining structure and to understand the source of frustration. Social actors may thereby begin a process of freeing themselves from the previously unseen forces. Ultimately, they may emancipate themselves from such constraints, leading to a *deeper pathway* to understanding organisational change.

Nonetheless, a deeper pathway does not guarantee a convenient path to reach the best solution. The purpose of investigating underlying logic is to suggest leverage points for change, through the process of appreciation (Vickers, 1965). For example, the resolution of sales difficulties may seem to rely on more IT-based solutions. But leverage may actually lie in the redesign of retailing policies that currently disable product managers' capability to manage change. In similar vein, the resolution of operational bottlenecks, by introducing expensive consulting services and advanced information systems may reduce the level of trust between the SPD/Information Division and divisional managers. A leverage point may be to allocate more resources and provide some incentives to product managers. At the same time, the old human resource system prevents capable senior executives from advancing their

careers. Their frustration may lead to increased staff turnover, and hence a major crisis in product sales. In all situations, it is almost impossible to prescribe a "right solution" for the firm. Rather, this underlying logic offers analysts a chance to simulate the problems and the associated dilemmas when intervention comes into play. Such a simulation is not a quantitative manipulation but a scenario-based learning process.

Given the above discussion, an initial explanatory hypothesis can be stated as follows to address the concept of underlying logic.

> Hypothesis 1: The fundamental cause of change goes beyond the patterns of events and lies in the underlying logic of context-specific social phenomena. This underlying logic may exist as an interdependent causal structure that is capable of explaining the creation of patterns of events and is affected by contextual influences unfolding in change processes. The purpose of searching for an underlying logic is not to provide a prescriptive solution, but to obtain a deeper understanding in order to facilitate reflection.

5.3.2 THEME 2: RECIPROCAL CAUSALITY

The second theme addresses the interdependent influences in organisational change. The holistic treatment of change needs to be seen as dynamic and reciprocal, which makes it necessary to capture the multiple causal relationships rather than to reduce the organisational complexity into a set of dependent-and-independent variables. As emphasised by Pettigrew:

> Causation is neither linear nor singular. There is no attempt to search for the

> illusory single grand theory of change, or indeed of how and why a single independent variables causes, or even impacts on a dependent or outcome variable. Changes have multiple causes and are to be explained more by loops than lines. (Pettigrew, 1990: 270)

For example, in President's case, a system engineer may attribute IT solution backfire to poor system development. A product manager may blame retailing policies and ineffective processes. On the other hand, the SPD may prioritise the need to align IT and business strategy. An organisational development consultant may emphasise the resolution of conflicts between SPD and business divisions in order to smooth the implementation of change. Each cause-and-effect inference is right, but the dilemma lies in the synthesis of all. For instance, if the IT manager implements a better software engineering method, this may speed up the system development cycle; but it may also cause an increase of staff workload, leading to more staff turnover and internal conflicts. In addition, the technical difficulties may increase, and systems may become even unstable. Furthermore, if the SPD introduces better consultants to assist President's strategic alignment, this may provide a coherent design for integrating IT and business strategy; but it may also escalate the internal conflicts and delay the remedies in distribution channel, given the context in President.

Hence, solutions that fail to recognise the reciprocal nature of change may lead to more undetected problems, thus merely shifting problems from one part of a system

to another. In some situations, a solution may become a problem of its own; at worst, a problem may become buried in the historical context when those who handled the first problem were replaced by those who inherited the new problem.

The Feedback Loop Concept

Moreover, such study of reciprocal causality often may develop counterintuitive insights by observing the social dynamics in terms of feedback behaviour (Morecroft, 1985; Richardson, 1991). The purpose of feedback loop analysis is to understand how well-intentioned intervention may bring forth responses from the system that offset the benefits of the intervention. For example, the enhancement of user participation may eventually accumulate embedded problem in processes if users have little IT knowledge. The introduction of another strategic exercise (by consultants) may only make product managers more resistant to any changes that are brought in by the SPD. The introduction of IT solutions may cause more workload rather than resolving the operational bottlenecks, if the problem of the old culture and product failures are not considered. By appreciating the reciprocal causality of a problematic situation, analysts can effectively reflect on the complex interaction of problems and sources of dilemmas, thereby conceiving enduring improvements.

The second explanatory hypothesis may be stated as follows:

Hypothesis 2: The underlying logic can be represented by interdependent

> variables which describe a social system in terms of reinforcing and balancing feedback loops. This reciprocal representation aims to provide a reflective analysis that leads to counterintuitive insights into dilemmas.

5.3.3 THEME 3: TIME EFFECT

The third theme, time effect, is an essential factor in understanding the reciprocal causation of change. The study of organisational change requires the investigation of temporal interconnectedness rather than just an observation of snapshots of events. As noted by Pettigrew:

> There is a search to catch reality in flight. Antecedent conditions shape the present and the emerging future...history is not just an event in the past but is alive in the present and may shape the future. (Pettigrew, 1990:270)

Historical Burdens

Understanding the chronological effect of time can help us to trace the evolution and accumulation of problems and to see how these problems become historical burdens shaping future changes. An organisation may accumulate strengths or weaknesses over time, thereby affecting the trajectory of change. For instance, one of President's strengths is attributed to the company's traditional hard-work culture, but this culture eventually turned into a prohibiting force. Employees were stuck in the old hard-work culture that prevented them from resolving inefficient processes. Employees repeated everyday routines and tiresome meetings that produced little productivity. Although SPD managers attempted to introduce IT for future business growth,

nonetheless the historical burden of "cultural stickiness" implicitly undermined the implementation. Although the SPD introduced the best consulting firms to assist change, the implementation was bound to fail repeatedly without an appreciation of such an historical burden.

Moreover, another historical burden observed in this case is the rising system instability. This historical burden has evolved and accumulated from the past. As long as these problems are not solved effectively and within an appropriate time scales, the effort invested in IT-enabled change is bound to be countered by the mounting difficulties. The underlying dilemma is that that if analysts deal with historical burdens, (inappropriate) solutions may only shift burdens to other parts of the firm and continue to accumulate; but, if analysts do not deal with these burdens in a timely manner, they may become too difficult to resolve.

Based on this understanding, a third explanatory hypothesis may be proposed:

> Hypothesis 3: Organisational change is an ongoing process. The selection of a certain time horizon will determine the system behaviour one intends to observe. Therefore, to capture fully the reciprocal causality of an underlying logic, it is necessary to explore the impact of time in terms of chronology. The effect of chronology requires us to understand the historical impact (strengths and burdens of an organisation).

Furthermore, another important feature of the time effect is the social construction of time. History consists not just of events and chronology, but it is carried forward in

human consciousness (Kimberly and Bouchikhi, 1995; Pettigrew, 1997: 340). Thus, to study change in organisations is to understand the transition of the human knowledge base, which in turn signifies the change of members and the change of mental models in an organisation. Thus, analysts need to examine the conflicting mental models behind the underlying logic, thus avoiding the objectification of processual patterns as products of a unitary institutional frame. This leads us to the fourth theme.

5.3.4 THEME 4: FRAME AWARENESS

Frame: the Hidden Controversy

The fourth theme is concerned with the effect of the individual's frame. Here the frame refers to the mental model of an individual that helps him/her to perceive meaning in order to make sense and give meaning to situations.[78] Patterns of events are created through an underlying logic, and an underlying logic is influenced by a set of frames. The social actors' frame determines the complexity of a problem situation in relation to (1) whether social actors agree that there is a problem and (2) what the problem is.

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[78] Other scholars refer to this idea as cognitive re-framing (Reger et al., 1994), cognitive map (Eden, 1988; Huff, 1990), frame-induced interpretation (Goffman, 1974; Schön and Rein, 1994), and dominant logic (Prahalad and Bettis, 1986).

As seen in the problem of IT solutions backfire in President, the Information Division staff perceived only the need to involve users in order to minimise the internal resistance and the effectiveness of process redesign. The SPD staff perceived mainly the need to develop a better strategic alignment framework for guiding the implementation of IT-enabled change. Similarly, divisional managers perceived mainly the need to deal with product failure and increasing workload. The diverse perceptions among these social actors prevented them from seeing these problems as a whole.

Therefore, effective change is closely related to how individual actors can reflect on their frames. When a problem is under scrutiny, it should not be treated as only the firm's problem. Rather, it is a problem involving the social actors who tend to act according to their frames. To rephrase Forrester (1971), social actors do not have an organisation in their heads; they have only selected concepts and relationships which they use to represent the "real" system. Their decisions and actions are based on such mental models. Only through reflection on the social actors' frames is it possible to obtain a deeper understanding of the problem situation and thus identify leverage points.

The underlying logic derived from the President's case represents a synthesis of frames from different social actors. The purpose of frame analysis is to reveal the

hidden values behind the reciprocal impacts within the underlying logic. This is concerned with two kinds of disputes: disagreement and controversy (Schön and Rein, 1994: 4, 5). *Disagreement* refers to disputes in which the contentious parties are able to resolve their problems by examining the facts of the situation. Such disputes can be settled by analysing evidence to which all of the contending parties will agree. In contrast, controversial disputes are immune to resolution by appeal to the facts. Such disputes tend to be intractable, enduring and are seldom resolved. The President case reflects the latter kind of problem. Without frame awareness, the failure of IT-enabled change may perpetuate in President.

The fourth explanatory hypothesis may be stated as follows:

> Hypothesis 4: In a problematic situation where organisational change involves a dynamic complexity of human agency, a frame analysis is required in order to identify the conflicting frames within the underlying logic. The primary aim of frame analysis is to enable reflections rather than to generate premature solutions.

5.4 DISCUSSION

There are three major lessons to be derived from phase two. The first concerns a rethinking of the theory of contextual change, explaining the enhanced contextualist viewpoint of organisational change. The second lesson relates to a reflective transfer approach (compared with the planned approach) to change management. The third

involves reconsidering the issue of the IT productivity paradox, which offers an enhanced contextualist perspective to help us rediscover why the paradox occurs.

5.4.1 Enhancing the Theory of Contextual Change

This study provides an alternative, empirical illustration of contextualism in terms of underlying logic, reciprocal causality, time effect, and frame awareness. The four hypotheses presented provide an enhanced conceptualisation of the organisational change characterised by complex interaction of actions and contexts. The reflection here is concerned with how contextualism may position itself in wider paradigms and how such a study may contribute to current processual research.

The Underlying Propositions of Contextual Change

This study contributes to a change paradigm that is based on the assumption of the organisation as a social system. This is different from the mechanistic and organismic system paradigms, which are anchored in rational and ecological assumptions. The perspective of contextual change can be highlighted by exploring the underpinning propositions in terms of change approach, time effect, causality and change capability (see Table 18).

Paradigms	**Mechanistic System**	**Organismic System**	**Social System**
Perspectives	Programmatic change	Situated, punctuated and chaotic change	Contextual change
Assumptions	Rational systems	Ecological systems	Human systems
Approach to Change	Goal-directed (planned)	Goal-seeking (planned)	Leverage-searching (emergent and reflective)
Time Effect	Snap-shot	Life cycle	Historical burdens
Causality of Change	Linear causality	Linear (in situated and punctuated change) or non-linear (in chaotic change)	Reciprocal causality (as a result of conflicting frames)
Capability of Change	Managerial voluntarism or technological determinism	Environmental determinism	Frame awareness (by reflecting on conflicting frames)

TABLE 18. The Underpinning Propositions of the Three Change Paradigms

First, the "approach to change" refers to the planned or emergent mode of change. Both the mechanistic and organismic system paradigms assume a planned (goal-directed or goal-seeking) model, searching for a generalisable rule under a set of predefined goals to initiate organisational change. The difference between them is that the mechanistic system emphasises the control of change activities to cope with existing problems whereas the organismic system stresses the internal adaptation to the external influences in the environment. From the viewpoint of contextual change, the focus is on the leverage-searching approach, which seeks to gain a deeper understanding of the problem situation through an emergent and reflective process, thereby identifying leverage points.

The second dimension is the "time effect" of organisational change. According to the mechanistic system assumption, change is mainly concerned with the present

problem situation, so that time is considered as a snapshot. According to the organismic system assumption, time is predetermined by the particular nature of the environment and is therefore subject to certain imposed life-cycle patterns. According to the social system assumption, in order to understand the impact of human agency, the study of organisational change needs to consider the longitudinal effect of time in terms of historical burdens.

The third dimension relates to the "causality of change". From the perspective of programmatic, punctuated and situated change, the emphasis is placed on the linear causal effect of organisational change. In contrast, according to the chaotic and contextual change standpoint, organisational change needs to take into account the non-linear behaviour of social systems. However, the chaotic change perspective is based on the assumption that autonomous (organic) agents respond to the external environment in order to survive. Under this assumption, human actors have little influences over change, and the environment determines the rule of survival. From the viewpoint of contextual change, reciprocal behaviour is a co-production of contexts and social actors' subjective frames. The study of organisational change must therefore trace the conflicting frames in order to understand how reciprocal causality is formulated.

The fourth dimension is that of "capability of change". According to the mechanistic

system assumption, effective changes are determined by managerial voluntarism (strong leadership can direct organisational change through a defined goal) or technological determinism (advanced technology can bring about successful change). On the basis of the organismic system assumption, the environment predetermines the course of organisational change (i.e. environmental determinism). An alternative view may be offered by the social system assumption. The perspective of contextual change addresses the importance of reflecting on conflicting frames so as to prevent "frame-induced blindness" (Schön and Rein, 1994) in a situated context. This study proposes an alternative view to the polarised concept of voluntarism and determinism. The idea is that organisational change depends on "frame awareness", a capability which facilitates the understanding of the hidden underlying mechanism, so that social actors are no longer bound by it and become free to disobey it (Watzlawick et al., 1974: 100; Levy, 1986). In this situation, the capability of initiating an effective change does not depend on managerial voluntarism, technological determinism, or environmental determinism; rather it depends on social actors' ability to be aware of structural constraints by reflecting on their conflicting frames. This frame awareness can thus bring forth an appreciation of the problem situation and the identification of leverage points.

Responding to the Challenges of Current Processual Research

Building on Pettigrew's work, the present study can be seen as one attempt to respond to the challenges of processual research (described in chapter three). This study suggests that processual research must not only investigate processes over time, but must also embrace a different worldview, entailing a set of assumptions about change and organisations set out in the four hypotheses stated above. In addition, to undertaking processual research, it is insufficient to clarify the object being studied, to apply a systematic method to observe change in object over time, and to choose a way to represent raw processual data. Rather, it requires analysts to understand the underlying logic that governs the behaviour of change processes (Van de Ven, 1988; Pettigrew, 1990).

To achieve this end, analysts need to apply a dynamic representation of processual data in order to identify processual patterns. This study suggests a three-fold approach. First, processual analysis should be used to arrange raw data in a problem-oriented way, describing the evolution and accumulation of problems. The processual data can then be further coded by key topics to provide a narrative explanation that offers a rich account of the problem situation. Secondly, the recurring processual patterns can be translated into underlying logic through the use of influence diagrams (by applying the system dynamics modelling method). This is a continuous process

of model-building and model-revision, aiming to appreciate how different social actors create actions and the resultant impacts. It is not a hypothesis-testing process. Rather, such a modelling process attempts to understand the reciprocal relationships of actions and the conflicting frames that lead to those actions.

Such an approach also responds to the problem of second-order error (Argyris, 1988). Argyris points out that processual researchers often fail to detect "defensive routines" of key social actors, thus deriving generalisation based on flaw processual data. This second-order error can be dealt with through the use of frame analysis (the third stage of the analysis in the study), in which organisational learning can take place through frame reflection. Researchers may minimise second-order errors by reflecting on the dynamic interaction of conflicting frames among key social actors.

The present study also seeks to respond to Starkey's (1987) challenge concerning the reasoning logic of processual research. He strongly refuses to equate correlation in processual patterns with causation between events. The present study suggests that this challenge may be responded to by adding an intermediary analysis to build context-specific constructs and develop logical connections between events and actual changes. Raw processual data can be analysed by the evolution of critical incidents. Meanings and rich accounts can be given by narrative explanation through coded themes of these incidents. This then provides recurring patterns to enable the

construction of an underlying logic through system dynamics techniques. Finally, the underlying logic can be examined by appreciating the dilemmas through conflicting frames.

5.4.2 A Reflective Framework for Change Management

In contrast to the planned approach (goal-directed and goal-seeking), the present study suggests a reflective mode of change management which proposes a leverage-searching approach for analysing hidden controversies. The reflective mode of analysis can be understood in terms of the transfer path (of change initiatives) and a three-stage framework.

Three Paths in the Transfer of Change Initiatives

The introduction of IT-enabled change can be seen from the viewpoint of the transfer of change initiatives. Why is such a transfer difficult? The work of Szulanski (1996) offers an important answer. He found that this inquiry can be explored by investigating the concept of "internal stickiness" – barriers to best practice transfer. Transfer can be seen from two sides: source and recipient. On the source side, Szulanski's study identifies two major origins of stickiness. First, a source may fear losing ownership and thus become unwilling to support the transfer. Secondly, when the source unit is not perceived as reliable, initiatives to transfer change practice may

be undermined. On the recipient side, the failure of transfer may be due the reluctance of recipients to accept changes from outside. In addition, recipients may also lack the absorptive capacity (also see Cohen and Levinthal, 1990: 128) and retentive competence necessary to receive and retain transferred change initiatives.

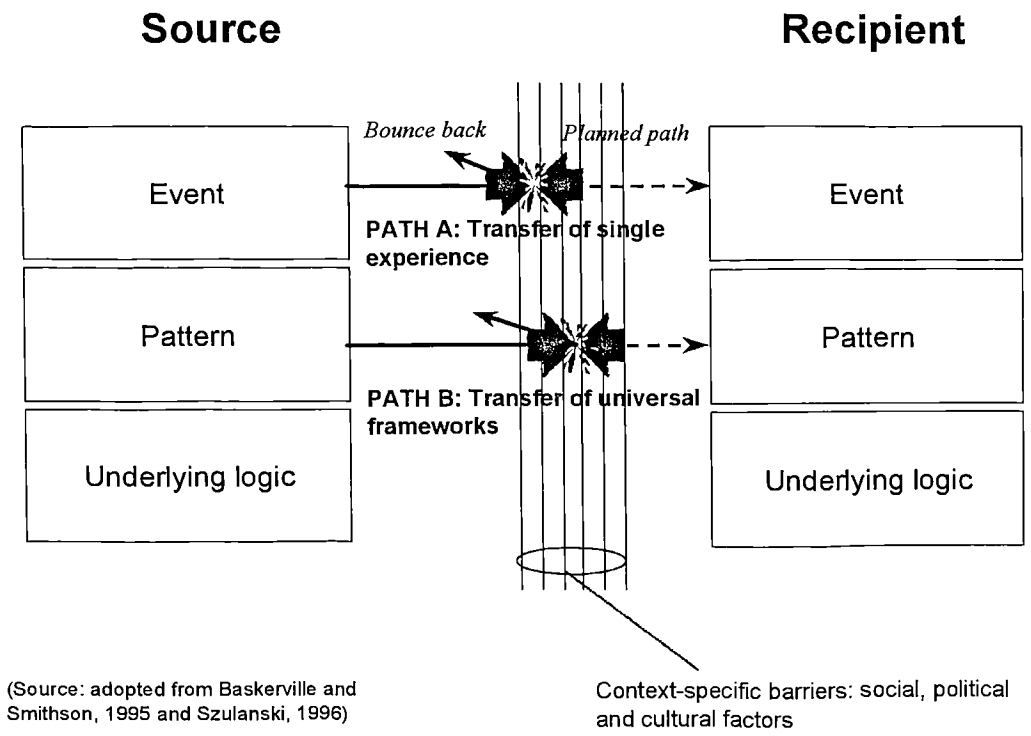


FIGURE 19. The Two Paths of Transfer Failure

However, such an approach seems unable to appreciate fully the organisational dynamics in which transfer occurs. Returning to the argument of Baskerville and Smithson (1995), they maintain that such a factor-based, planned approach may invariably overlook the context-specific barriers situated in organisations. In this way, transfer of best practice only can deal with single experience (focusing on one

specific factor) or universal frameworks (extending to a set of generalisable factors).

According to Baskerville and Smithson (1995), the two main ways of transfer can be shown as Paths A and B (see Figure 19), which cover only the transfer at the level of event (see Path A) and pattern (see Path B). The transfer of "event" refers to the implementation of change based on a single experience. At the next level, the transfer of "pattern" refers to the all-embracing (universal framework) approach for conducting company-wide transformation. However, firms often neglect the contextual problems situated in organisational dynamics. Therefore, even though the organisational change itself is well implemented, it might still not resolve the escalating problems.

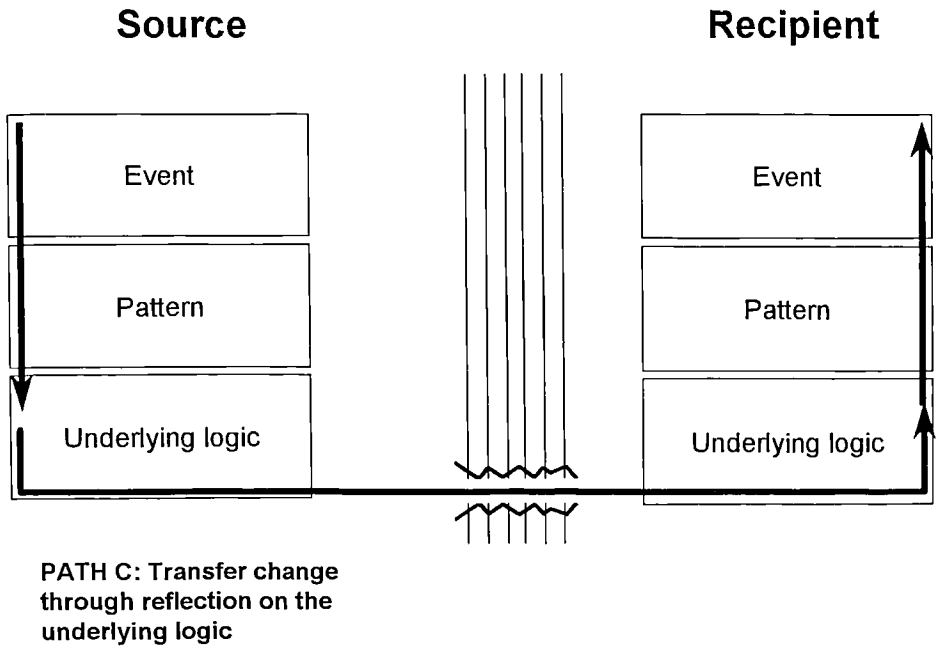


FIGURE 20. The Third Path Suggested by this Study

Baskerville and Smithson (1995) propose that the effective transfer of change practice may need to move beyond these two paths. Neither a single experience nor a universal framework approach transfers the crucial understanding of change dynamics. They both hold a context-free assumption which fails to consider the situated dynamics of contextual factors, such as the politics between divisional managers and SPD staff, the entrenched hard-work culture, and the Information Division staff's deep-seated belief in technical excellence. Therefore, although Path B may extend further than Path A, both paths often bounce back due to the failure to resolve the contextual barriers stemming from an organisation. Baskerville and Smithson (1995) suggest a third path that considers context-specific situations, taking into account problems embedded in the level of underlying logic. Unfortunately, this insight has not yet been examined empirically, and thus far no applicable answer is offered. It is thus a purpose of the present study to relate the concept of this "third path" to practical application.

The presented three-fold analysis (event, pattern, underlying logic) allows this study to postulate a third path, in order to take account of Baskerville and Smithson's (1995) argument. Referring to Path C in Figure 20, the effective transfer of change initiatives requires an investigation of the context-specific problems through underlying logic. Only by reflecting upon problems in relation to the contexts and

conflicting frames can analysts devise effective transfer. In other words, such a reflective transfer is concerned with the transfer of double-loop learning (Argyris, 1977, 1996), second-order change (Watzlawick et al., 1974), and counterintuitive behaviour (Forrester, 1971). Such a reflective transfer approach requires discovery through a continuous learning journey of experience accumulation to transfer change between different contexts.

A Reflective Transfer Framework

The understanding of transfer behaviour thus enables us to propose a three-stage framework as shown in Figure 21. The first stage, *leverage-searching*, requires a processual analysis of historical events, considering how actions and contexts interact and evolve over time. Subsequently, patterns of events can be identified to explore the underlying logic in order to facilitate the search for leverage points. Although this does not mean that managers can always find certain leverage points for remedies, the underlying logic often provides a basis for collective learning and reflection on the complex situation. This involves an iterative process of processual analysis, pattern recognition and developing systemic learning.

The second stage *(reflection)* involves the communication of the systemic learning derived from the leverage-searching. Once the dynamics of change (via underlying logic) are made explicit, social actors can collectively reflect on the reciprocal

impacts of problems. The underlying logic thus provides a basis for strategic debates in order to understand the interplay of historical burdens, conflicting frames, and contextual influences. However, this is no easy task. Unlike communicating technical problems, the communication of an individual's subjective frame involves a reconciliation of different assumptions and beliefs.

This may involve two crucial steps in the communication process. The first is to reflect upon the individual's subjective interpretation of the problems (see also Isabella, 1990), which calls for a deep appreciation of how problems evolve and accumulate. The second step is to identify potential leverage points that contribute to problem resolution. In this view, problem resolution is not simply about the rate (whether incremental change is better than radical change), scope (department-based or company-wide), and orientation (leader-driven or technology-led) of change, but is more concerned with the awareness of the structural constraints. Analysts should not expect an optimal solution; instead, they should seek to develop a deeper understanding to assist in unfreezing the deep-seated beliefs among social actors. One important task at this stage is to involve the social actors in the process of reflection and thus generate creative solutions based upon their profound knowledge with regard to the limitation, resources availability and complexity of the context-specific situation. This is in contrast to the planned approach, where researchers or

consultants often play an omnipotent role in providing prescriptions.

The third stage, that of *transfer*, involves a transfer of learning from the reflection in order to achieve effective resolution. Ideally, social actors may achieve a mental consensus and identify leverage points after frame reflection. This reflection then needs to be translated into an integrated change agenda, taking into consideration strategy, structure, processes, people and technology as a whole. Remedies based on such a systemic reflection may help social actors to examine dilemmas, design creative resolution, and formulate a holistic agenda for action.

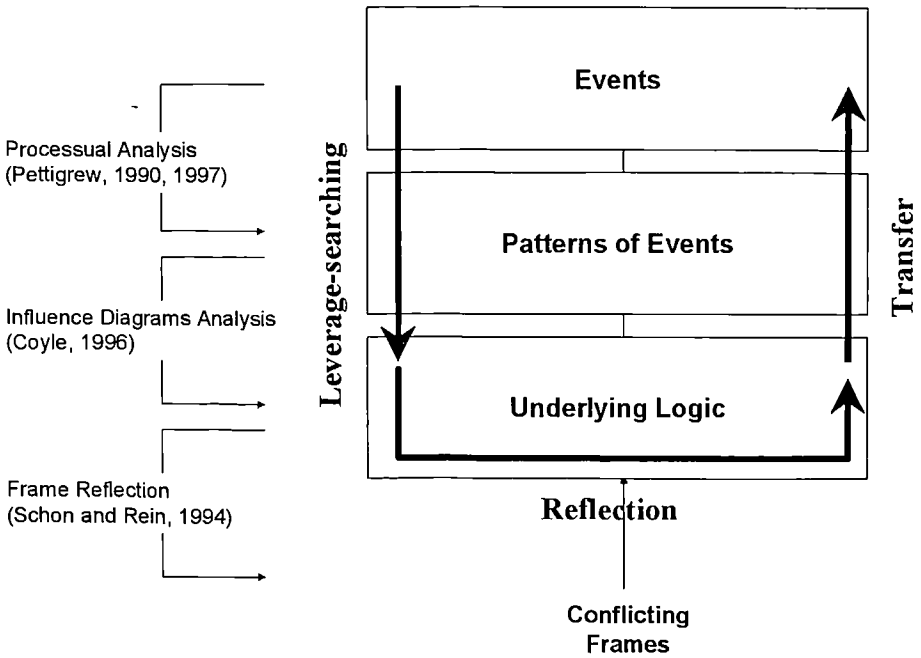


FIGURE 21. The Reflective Transfer Framework Suggested by this Study

This reflective transfer framework can be contrasted with the dominant planned approach to change management. Table 19 suggests a comparison of the underlying

propositions. The planned approach is mainly concerned with the emphasis on the transfer of change initiatives in a linear model (i.e. follow plan-do-see-check approach). The transfer may follow Path A or Path B, but both paths stress an objective benchmarking for the transfer. This planned approach is effective insofar as the problem situation remains static and controversies are contained. However, when a problem situation becomes more dynamic, this planned approach becomes insufficient to deal with the complexity. The reflective transfer framework can enhance this insufficiency through the reflection of social actors' conflicting frames. This involves a discovery process (leverage-searching, reflection and transfer) to transfer the lesson of the underlying logic from one particular context to another (i.e. through Path C), thereby devising an effective change agenda for resolution. This reflective transfer framework thus offers a more effective way to deal with situations where complex controversy is exhibited.

Finally, Table 19 also reveals two important findings suggested by this study. These two models, the planned approach and the reflective transfer, may enhance the understanding of how change initiatives are transferred into organisations through the conventional (Path A and B) or the reflective path (Path C).

	Planned Approach	Reflective Transfer
Change approach	Planned	Emergent (and to complement planned approach)
Change Management	Best practices (imitation)	Frame reflection (context-specific)
Change implementation	Plan-do-see-check	Leverage-search, reflection and transfer
Transfer Path	Path A or Path B (see Figure 19)	Path C (see Figure 20)

TABLE 19. The Planned Approach versus the Reflective Transfer

It must be noted that the reflective transfer framework aims to complement rather than to dismiss the planned approach. According to this model, once the leverage point is identified, organisations can start to design appropriate packaged programmes to resolve the problems. The purpose of such a reflective mode of analysis is to facilitate frame awareness in order to unravel the hidden controversies in a unique context. The final resolution will still require a planned approach.

5.4.3 Rediscovering the IT Productivity Paradox

The enhanced theory of contextual change also provides a new insight into the IT productivity paradox. The existing understanding is mainly concerned with the problem of consultants' processes, the management fashion cycle, the way of measuring productivity, the linkage of individual with organisational productivity, or soft factors that prohibit effective changes. From the contextualism perspective, the IT productivity paradox can be seen as a failure to acknowledge controversies generated by conflicting frames in a context-specific situation.

The contextualist view also highlights the importance of a higher order change, a change that requires an alteration in the body of rules governing an organisation's internal order. Without recognising this complex nature, solutions to change may lead to counteracting results. Therefore, to resolve the IT productivity paradox, managers need to consider the impact of conflicting frames and contextual influences. Otherwise, solutions to IT-enabled change may be counterproductive. To resolve the fundamental controversies, analysts must not simply devise goals for systematic implementation. Rather, the primary task is to unravel the underlying logic that governs the hidden controversies, thereby identifying leverage points in order to disentangle problems created by the complicated social dynamics.

To illustrate this point, Figure 22 provides a summarised model. As seen in Loop 1, firms originally invest money and resources in technical solutions (i.e. IT-enabled change) to resolve the perceived problems. However, firms may fail to recognise the intangible factors, stemming from social, political and cultural contexts, which magnify organisational complexity. In Loop 2, this complexity increases the difficulties of maintaining the coherence of organisational infrastructure. Without acknowledging such dynamics, the introduction of IT solutions may undermine the coherence of infrastructure, thereby creating more dysfunction. This in turn creates more problems that lead managers to implement further IT-enabled change, thus

escalating problems further. Failure to recognise such reciprocal influences means that IT-enabled change can only ameliorate problems temporarily, but in the long run more problems are created. As a consequence, the more change is implemented, the more fire-fighting is needed.

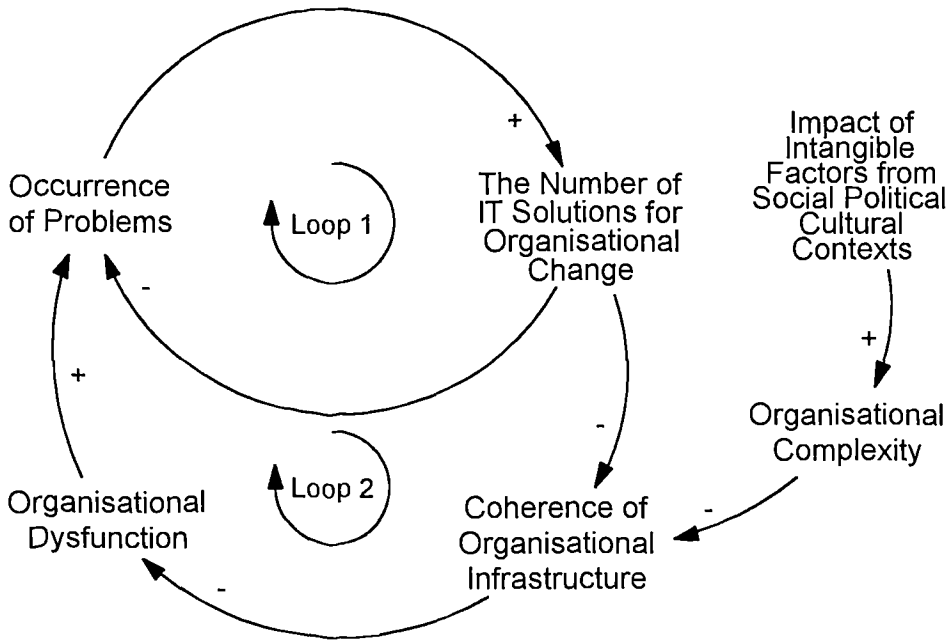


FIGURE 22. Rediscovering the IT Productivity Paradox: A Contextualist View

The contextualist view highlights two important lessons concerning the IT productivity paradox. First, contextual influences may stem from the interdependent nature of human agency; secondly, as a consequence, organisational change may exhibit reciprocal behaviour and continuously generate hidden controversies. Therefore, failure to acknowledge these two lessons will result in the IT productivity

paradox.

5.5 SUMMARY

The objective of phase two is to enhance the theory of contextual change characterised by multiple causal effect and conflicting frames. Through an in-depth case study, phase two suggests a set of hypotheses in terms of underlying logic, reciprocal causality, time effect, and frame awareness. This also seeks to clarify the theoretical position of contextual change in the social system paradigm, in contrast to the current views of organisational change (the mechanistic and organismic system paradigms). The contextualist view of change offers a reconsideration of the IT productivity paradox. As a result, a reflective transfer framework is proposed to suggest a complementary method of supporting the planned approach to change management.

Chapter 6: Conclusion

This final chapter reviews the initial inquiry into the IT productivity paradox. As demonstrated by the two-phase design, this study re-examines the current understanding of the paradox in terms of change alignment (in chapter 4) and change dynamics (in chapter 5). It adds two important lessons to current understanding. First, from the viewpoint of implementation, the IT productivity paradox may be caused by the neglect of the sequential reaction through its stress on a single experience of change (such as process reengineering). A result of this, there is a disparity between different organisational factors. Secondly, from the viewpoint of underlying dynamics, the IT productivity paradox may be created by the ignorance of contextual influences and conflicting frames. Thus, on many occasions, solutions do not achieve desirable outcomes but themselves turn into problems.

To provide a summary of these two lessons, this chapter is divided into two parts. The first revisits the proposed framework of inquiry and explores the IT productivity paradox at a conceptual level. The second part summarises the contributions of this study in terms of the academic, practical and methodological implications in the two phases, and explains the potential limitations and future directions.

6.1 REDISCOVERING THE IT PRODUCTIVITY PARADOX

The first intellectual challenge concerns the alignment of change. This gives rise to a series of questions: What factors drive change? How can this driver affect alignment behaviour? What is the centre of change alignment? Should the mode of change be planned or emergent? The second challenge comes from an understanding of change dynamics. This also poses a set of questions: What alternative conceptualisation of

change can be provided under the social system paradigm (in comparison to the mechanistic and organismic system paradigms)? What is the role of human actors? What is the effect of time on organisational change? How can the success of change relate to the four dichotomies: improvement versus transformation, incremental versus radical change, and divisional versus company-wide change? In addition, if organisations can achieve fundamental change, is such change determined or voluntary, and in what way? Before these questions are reviewed, a summary of the initial inquiry framework will be useful.

6.1.1 The Inquiry Framework

As is shown in Figure 23, the study reviews the current understanding of the IT productivity paradox to attempt to discover the question, "why does IT-enabled change often fail?" The review covers six categories of answer: technical failure, management fashions, the witch doctor syndrome, economists' views, OB (Organisational Behaviour) theorists' studies, and contextualism's insights. The current response to the IT productivity paradox tends to focus on the alignment and dynamics of change. Therefore, the present study sets out to inquire in these two directions by a two-phase research design. Phase one examines different methods of change alignment, and phase two analyses the underlying dynamics of organisational change.

The study suggests two tentative answers to add to the current understanding of the IT productivity paradox. Firstly, to effect IT-enabled change, one needs to take into consideration the sequential alignment of change rather than to address a single change initiative. In particular, it is necessary to take into account the chain reaction of change implementation between different organisational factors.

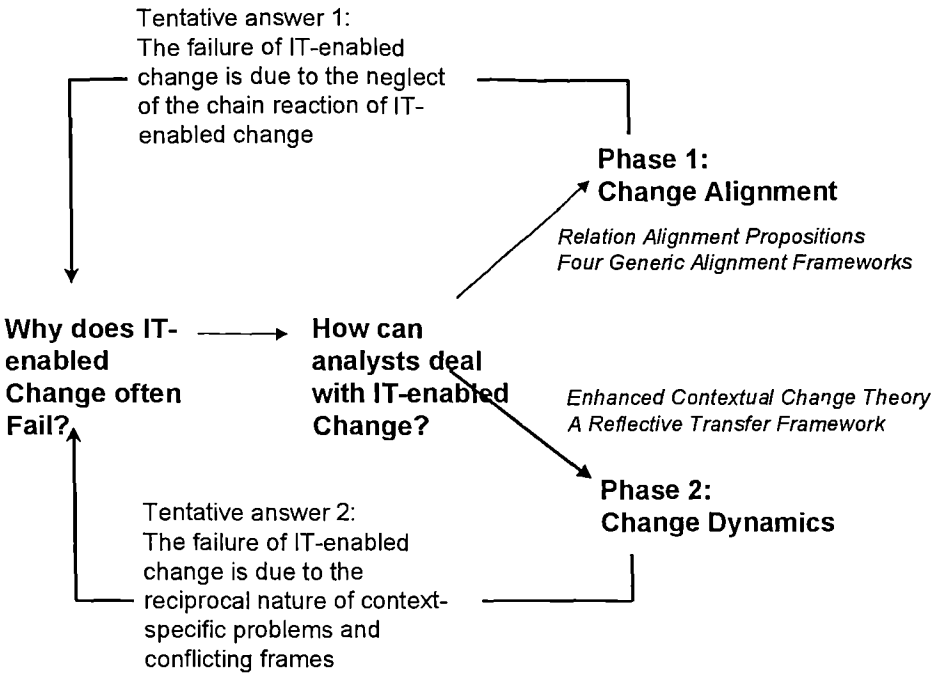


FIGURE 23. An Inquiry Framework for Understanding the IT Productivity Paradox

Secondly, the IT productivity paradox occurs when analysts ignore the effect of change characterised by contextual influences brought to be as by social actors and their interactions. This results in solutions that do not address the problems, thus creating the IT productivity paradox. Problems may become insoluble, not only because of accumulated technical difficulties, but also because of escalating dilemmas in the social barriers to change. Therefore, a frame-reflective inquiry is needed in terms of leverage-searching, reflection and transfer. To complement the planned approach to IT-enabled change, a reflective transfer approach is proposed to examine the underlying assumptions of a problem, rather than singly concentrating on individual symptoms. The examination of the underlying assumptions involves an analysis of the conflicting frames of the key social actors. Table 20 provides a summary of the underpinning theories, types of research, methodology and major contributions developed in each phase.

	Phase One	Phase Two
Focus	The alignment patterns of change	The underlying dynamics of change
Underpinning theories	MIT1990s and Yetton's framework	Contextualism (Pettigrew, 1990), system dynamics, and frame reflection
Purpose	Theory enhancing	Theory building
Methodology	Case study research using change path mapping	In-depth case study using processual analysis and influence diagrams
Contributions	Four generic patterns of alignment and their use as change agenda building	Four explanatory hypotheses for contextual change theory and a reflective transfer framework for change management

TABLE 20. A Summary of the Research Contributions

6.1.2 THE INITIAL INQUIRIES REVISITED

Phase one deals with the first set of intellectual challenges with regard to the alignment of change: (1) What factors drive change? (2) What is the centre of change alignment? (3) Should the mode of alignment be planned or emergent? (4) What is the role of IT? These questions present a list of problem entailed in the implementation of IT-enabled change. This study offers a tentative answer to these questions from a relational alignment perspective.

Response to the First Inquiry: Change Alignment

The present study suggests that the driving factors of IT-enabled change should not be confined to strategy, technology or learning, with their centres in structure, processes and people respectively. Similarly, the alignment of change should not be narrowly defined as IT-imposed, strategy-driven, strategy/technology fit, or learning-assimilated, where the mode of change is either planned or emergent. The relational alignment perspective extends a type of change alignment characterised by four generic patterns: . Process Reengineering, Structural Reconfiguration, Human Renewal, and IT Transformation. Such conceptualisations conceive of alignment as a sequential implementation of changes, navigated through a planned or emergent

mode of change according to how change is triggered. Both the patterns of Process Reengineering and Structural Reconfiguration tend to lead to a planned mode of change, while the patterns of Human Renewal and IT Transformation tend to lead to an emergent mode of change.

Phase one indicates that IT-enabled change needs an integrated viewpoint: the implementation of change may include different drivers guiding change over time. These drivers, with the help of various levers, will have an impact on a particular factor, thereby achieving change at that particular stage. As the context alters, new change initiatives will evolve through either the planned or emergent mode of strategy, and will be driven by another organisational factors (processes, technology, structure or people). The management of change needs thus to be considered in terms of different change patterns over time, within which different organisational factors are aligned in a particular way.

However, the relational alignment perspective also entails some potential difficulties which must be overcome. First, analysts need to critically reflect on the sequential nature of change alignment. Sequential implementation means that firms have to take time to complete a set of changes. In practice, this may encounter difficulties, as internal social actors often demand that priority be given to their particular interests. To complicate the matter, there may be changes with multiple paths in each processual pattern; for example, changes may demonstrate different paths (technology-human-process-structure) or repeated paths (technology-human-process-technology-structure-human). Secondly, the relational alignment perspective does not address insufficiently the rate of change, i.e. the issue of whether change should be implemented in a radical or incremental fashion. The five case studies illustrate that some cases (for example, the middle stage of the Semiconductor case) may adopt a

dramatic approach to process reengineering or restructuring, while others may prefer a progressive approach. This study is less confident in relating the change alignment to the incremental or radical mode of change. For instance, the Process Reengineering pattern tends to adopt radical change, and the Human Renewal pattern tends to create incremental change. Finally, based on the path mapping method, the study still insufficiently addresses Knight's criticism concerning the social impact of IT-enabled change. The four generic patterns require further analysis to examine the integration of actions and contexts. Such an analysis requires us to adopt a social-scientific viewpoint in order to understand organisational change situated in a social context that is technology-ridden. Such an inquiry directly highlights the importance of investigating the underlying dynamics of change, an issue which is empirically examined in phase two.

Response to the Second Inquiry: Change Dynamics

The second source of challenges comes from an understanding of change dynamics: (1) What alternative conceptualisation of change can be provided under the social system paradigm? (2) What is the role of human actors? (3) What is the effect of time in organisational change? (4) How can the success of change be related to the four dichotomies: improvement versus transformation, incremental versus radical change, and divisional versus company-wide change? (5) Is change determined (by technology/environment) or voluntary (subject to visionary leaders)? These questions will be dealt with in turn.

What alternative conceptualisation of change can be provided under the social system paradigm? The social system paradigm provides an alternative assumption (to those of the mechanistic and organismic paradigms) for the study of organisational change, because it addresses the role of human actors in a social

context. The contextualist viewpoint may seem to suggest a social-scientific worldview that addresses the interaction between context-specific influence and social actors' subjective interpretation. However, the present application of contextualism tends to be used narrowly in the form of processual analysis to develop the hypothesis-testing types of theories (see critiques in 3.1.3). This practice pays little attention to the epistemological issue of examining the underlying assumptions in the use of processual analysis. One important aspect of this is to consider the analysis of the role of human actors and conflicting frames in a context-specific situation.

What is the role of human actors? From the perspective of the social system paradigm, human actors should not to be seen merely as rational actors who choose the best strategic action, based on analytical reasoning, to achieve desirable outcomes (March and Simon, 1958; Schön and Rein, 1994: 10). Such an instrumental rationality treats the interests of actors in the process of strategic change as objective and given, and it neither explains the intractability of policy controversies nor offers a plausible approach to their resolution. Rather, human actors should be seen as subjective beings whose actions are situated in the richness and uniqueness of a concrete situation. As Argyris (1993: 3) suggests, there will always be a "knowledge gap" between human actors' stored knowledge (how the social actor perceives the problem) and the knowledge-in-action (knowledge needed to act effectively in a given situation). Different groups of human actors are bound to react to the same situation differently. Thus, the analysis of change must consider the perceptions of those human actors and how they are affected by social interactions in the technical, political and cultural contexts. The neglect of this may lead to an oversimplification of problems and lead to further controversies. The example of the outbreak of IT

difficulties in President's case illustrates such behaviour: a simple technical design problem can turn into dilemmas, because analysts ignore the conflicting frames of human actors in a unique context. To this end, such an analysis needs an emphatic attention to the time element.

What is the effect of time in organisational change? To investigate change in the above situation, a snapshot study of problems would be insufficient. What is needed, rather, is a longitudinal examination of how problems arise and evolve in a situated context. Only through an appreciation of the evolution and accumulation of problems over time can analysts understand how those problems turn into dilemmas. This requires giving primacy to an understanding of the historical burdens and the shift of the human knowledge base over time.

How can the success of change be related to the four dichotomies: improvement vs. transformation, incremental vs. radical change, and divisional vs. company-wide change? As the present study indicates, when the perspective of contextual change is considered, effective change is less concerned with change that is incremental improvement (such as the initiative of TQM) or radical transformation (such as the process reengineering will claim). Additionally, the success of change lies neither in the scope of change (divisional or company-wide), nor is it lie simply determined by technology or environment, nor is it held in the visionary leaders. Instead, organisational change is confined by intangible structural constraints. These are often difficult to discern and require a systemic understanding of the situated problems through an awareness of social actors' frame-induced blindness (Forrester, 1965; Schön and Rein, 1994: 10; or as Argyris, 1993 calls it, "defense routine"). The key lesson is that successful change must take into account the evolving, holistic behaviour of human actors rather than the summation of their actions.

6.2 A REVIEW OF RESEARCH CONTRIBUTIONS AND LIMITATIONS

This overview provides a basis for understanding the intellectual challenges underlying the IT productivity paradox. To attain a more detailed understanding, the next section deals with specific contributions and discusses the potential limitations of this study.

6.2.1 PHASE ONE RESEARCH REVIEW

Relational Alignment of IT-enabled Change

Four distinctive change patterns are identified from the processual mapping of the sequence of change paths. The phase-one study suggests that each change pattern can be conceptualised into four basic components: one driver, two levers and one impact. The mode of change is planned when the change begins with restructuring or process reengineering, and is emergent when change is initiated by the introduction of technology or cultural change. These findings have important implications for IT-enabled change, as these patterns illustrate how, in combination, different modes of change (planned and emergent) are intertwined in a limited set of distinct patterns. Additionally, the behaviour of change alignment may be better explained through various contingent models rather than simply through one universal framework. The proposed change patterns thus provide an integrated method of alignment and suggest an enhancement of the MIT 1990s framework (shown in Figure 24).

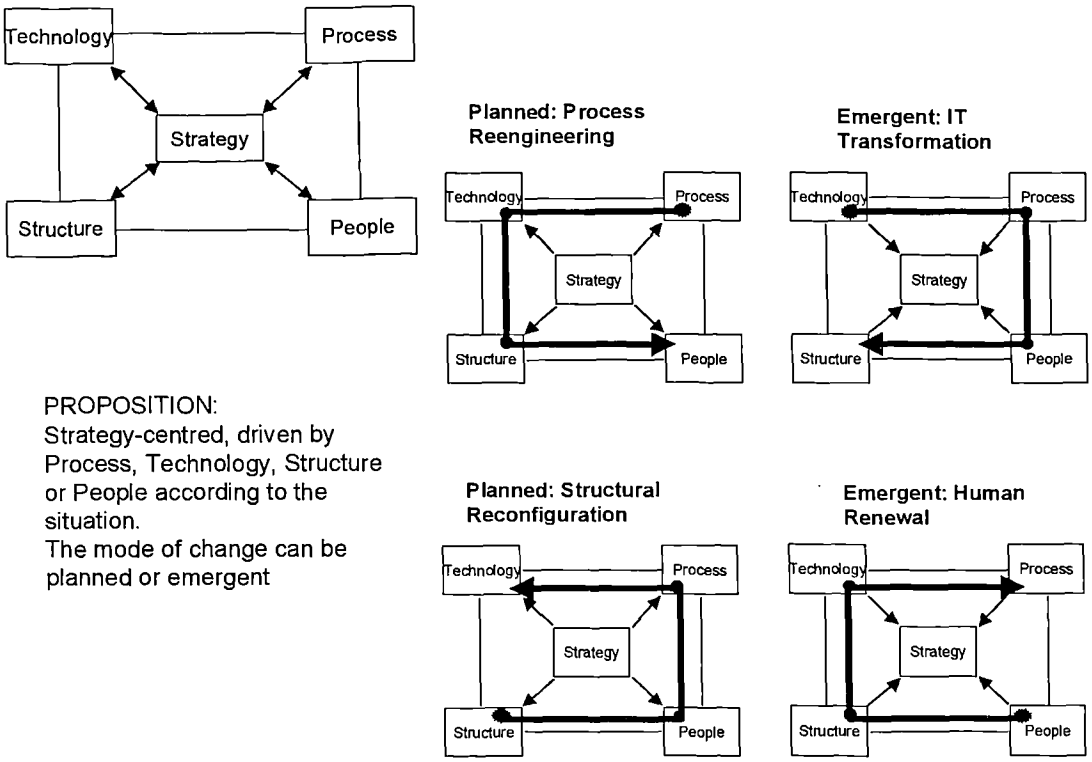


FIGURE 24. The Relational Alignment Perspective: Four Generic Change Patterns

Change Agenda Building

The practical contribution of phase one is to provide an integrated alignment framework in order to offer managers different ways of setting change agendas for their firms. The research suggests four modes of change agenda-building: Process Reengineering, Structural Reconfiguration, Human Renewal and IT Transformation. The alignment of change may present several alternatives, depending on the situation companies face. For example, managers who wish to conduct emergent change may adopt the IT Transformation or Human Renewal modes. By contrast, managers who want to make a planned approach may want to consider the Process Reengineering or Structural Reconfiguration modes. However, both approaches need to consider the subsequent impacts, on all key organisational factors.

Sequential Path Mapping

Phase one offers a method of processual analysis that extends the path mapping method suggested by Yetton et al. (1994). Through the combined use of visual mapping and temporal bracketing techniques (see Pettigrew, 1990; Langley, 1998), phase one expands the change path into three stages (early, middle, late) in order to examine its processual patterns. The five case studies offer fifteen path patterns within which four processual patterns are identified. The processual analysis of phase one adds to the methodological pool of processual analysis. Analysts may use such a sequential path mapping method to understand the alignment of change and as a platform from which to observe processual patterns.

Limitations and Future Directions

There are two major issues in phase one. The first is the enhancement of the four generic patterns which further the understanding of change alignment. The validity of empirical observation is subject to the limited number and scope of the case studies. More research is required to investigate whether more generic patterns exist and, if so, to identify their policy impacts on change management. Although the conclusions raised by this research are sufficiently important to warrant wider discussion, more generic patterns are required to seek counter examples and to examine other cases in the literature. In particular, these four patterns need further empirical examination to test their applicability. The second issue is concerned with the organisational infrastructure of IT-enabled change. The redesign of the MIT 1990s framework (see Figure 24) is useful in considering how to build a coherent infrastructure between organisation and technology so that balanced change alignment can be achieved. Therefore, it would be valuable to investigate more closely the links between the key factors in order to understand better how the

organisational infrastructure can support the alignment of change.

6.2.2 PHASE TWO RESEARCH REVIEW

The Theory of Contextual Change

In phase two, it is suggested that the predominant change theories (i.e. the mechanistic and organismic system paradigms) need to be complemented by a contextual change perspective (reflecting the social system paradigm). Current theories of change propose that change can be broken down into independent events and causes which generate independent effects. This thinking leads to a goal-directed and goal-seeking analysis which emphasises implementation and performance measurement. In consequence, such a functionalist viewpoint often neglects the organisational dynamics and the role of human agency. The viewpoint of contextual change provides an alternative way of conceptualising change in a social context. Based on Pettigrew's contextualist propositions (which draws on various sociological ideas such as Pepper, 1942, Giddens, 1984; Sztompka, 1991, 1993), four explanatory hypotheses are refined from the study:

The first hypothesis is concerned with the concept of "underlying logic", and suggests that the understanding of change needs to go beyond the patterns of events. This underlying logic may exist as a causal structure that is capable of explaining the actual pattern that unfolds in change processes. The purpose of searching for an underlying logic is not to provide a prescriptive solution, but to obtain a deeper understanding of the causal behaviour of the social phenomena under investigation. The second hypothesis deals with the notion of "reciprocal causality". The concept of underlying logic can be represented by interdependent variables which describe a social system in terms of reinforcing and balancing feedback loops. This feedback-

loop representation may add to the analysis, providing counterintuitive insights into non-linear behaviour in a social context. The third hypothesis concerns the "time" element. On the basis of the assumption that change is an ongoing process, the selection of a certain time horizon will invariably determine the observation of systemic behaviour. Therefore, to capture fully the dynamic causality of an underlying logic, it is necessary to explore the historical impact of time. The effect of time requires us to understand the influence of historical burdens generated by conflicting frames of social actors. This leads to the fourth and last hypothesis. In a problematic situation where organisational change involves a dynamic complexity of human agency, a frame-reflective analysis is required in order to identify the leverage points of the hidden controversy within organisations. On such occasions, an optimal solution is not preferable, but analysts should be concerned with the collective reflection among social actors.

The four explanatory hypotheses of contextual change enable the comparison of two different modes of analysis: the rational approach and reflective transfer. In contrast to the rational approach, which sets a clear goal to guide change implementation, the reflective transfer analysis addresses the context-specific situation. This reflective transfer analysis requires the development of an in-depth understanding of the complexity of problems by reflecting on key social actors' conflicting frames.

The role of reflection is to raise the embedded social and technical problems, and to highlight the potential dilemmas. This helps to recognise the conflicting perceptions in the individual mental model. This research suggests that an underlying logic constructed by influence diagrams can be used as a basis for reflection, thereby understanding social behaviour from a systemic viewpoint. The purpose is to appreciate the plausible future actions and consequences rather than to predict and

control. It is noteworthy that such a reflective transfer approach does not guarantee "correct" remedies. Rather, it provides a basis for collective learning and reflection on the complex situation characterised by social interaction. The potential benefit of the reflective transfer approach is that, for contextual change, the diagnosis may need to take a great amount of time, but, once the leverage points are found, the solution may be relatively simple. The ultimate purpose is to achieve a "double vision" (as Lisa Peattie calls it, see Schön and Rein, 1994, xvii), a kind of ability to act from one frame while cultivating awareness of alternative frames. Such a reflection will enhance analysts' ability in the resolution of intractable policy controversies.

A Reflective Transfer Framework

The suggested framework, reflective transfer, should not be seen as a universal framework (see Figure 21). Rather, it is a projective model that is used in a situation-specific context. Competent change analysts treat each reflective transfer as a unique case. They are able to carry over learning from one unique episode of organisational change to others (Schön and Rein, 1994: 204). The purpose is not to adopt the framework for normative prescription, but to use it to increase "intellectual efficiency" (Paich, 1985), thereby enhancing the ability to reflect on difficult problems. As a result, the pattern carried over from an earlier situation and the understanding formed in the new one is transformed.

A reflective transfer framework would suggest that organisational transformation could be proactive only if analysts deal with change at the level of underlying logic. Resolutions based on the event or pattern level can produce merely reactive and adoptive change; at worst, they create problems rather than solutions to organisations. Phase two proposes that through a three-stage approach (leverage-searching, reflection and transfer), organisations can deal with contextual change effectively.

A Contextualist View of Processual Research

Phase two also enhances the current practice of processual analysis (see the critique suggested by Argyris, 1988; Van de Ven, 1988; Pettigrew, 1990, 1997). Current processual research tends to concentrate on the technical issue of analysing processual data. These techniques can be seen in the work of Langley (1998), where she summarises seven strategies for theorising process data with regard to narrative, quantification, alternative templates, grounded theory, visual mapping, temporal bracketing and synthetic strategy. However, there are two major problems with current processual analysis: (1) the failure to consider the implications from the viewpoint of social construction and structuration (Van de Ven, 1988), and (2) the problem of "second-order error" (Argyris, 1988). These two problems arise from an epistemological discrepancy, which requires a social-scientific worldview of change and organisations. Although Pettigrew (1990, 1997) advocates a contextualist viewpoint to deal with the two problems, little effort is made to apply a social-scientific worldview to processual analysis. Phase two seeks to fill this gap by proposing a four-step methodology:

(1) To provide a chronological explanation (narrative strategy) of how problems arise and evolve. This will offer a baseline from which to understand the evolution and accumulation of historical burdens.

(2) To code topical themes by the causal tracing of organisational events (also via narrative strategy) in order to explore the dynamics of the problems under investigation. Therefore, it is not enough to assert that the problem with the IT solution backfire is due to an ineffective information systems and internal conflicts. Analysts need to trace the dynamics of, for example, the outmoded processes, the impact of old culture, and their interaction with staff turnover and

product failures.

(3) The causal tracing of events can be synthesised into recurring patterns. This enables the construction of an underlying logic (via influence diagrams) that seeks to explain the governing structural constraints. Such an underlying logic can help analysts to understand the underlying dynamics of a situated social phenomenon.

(4) The underlying logic can then be used to analyse conflicting frames. This is a deconstruction of the conflicting frames behind the underlying logic, seeking to appreciate the emergence of problems. On the basis of this assumption, problems cannot be resolved like the disassembly of a machine into pieces each to be dealt with separately. Rather, a more appropriate metaphor for this resolution is a prism which helps scientists to deconstruct invisible light into seven components of colour.

Nonetheless, the proposed processual method can be easily confused with analysis based on standard systems theory, such as Thompson's (1967: 14) analysis of the impact of divergent "preferred outcomes" and "cause-effect beliefs". Such a systems theory perspective still holds to instrumental rationality, rather than viewing organisational change from a contextualist view with reference to the context-specific situations, the historical progression and conflicting frames.

Research Limitations and Future Directions

In phase two, although the four hypotheses help to demonstrate that organisations are social systems, further empirical justification is required to enhance their explanatory capacity. These propositions stress the role of reflection in change resolution. However, this does not take into account the counter viewpoints. For example, Schön

and Rein (1994) highlight four such anti-reflection arguments.

First, Hannah Arendt maintains that reflection belongs not to the participants themselves, but to the objective bystanders. Thus researchers must withdraw from the "festival of life" in order to achieve an "objective" reflection. Nevertheless, the dilemma is that once researchers do withdraw, they are never able to attain the social dynamics necessary to the practice of reflection (Arendt, 1971: 93). She concludes that true reflection is thus never possible. Secondly, Albert Hirschman (1967: 29) also argues that action is embedded in a broader context that limits the scope of action. The more practitioners understand the difficulties, the more they are discouraged from taking any actions. Therefore, reflection may only paralyse actions rather than assisting in their resolution. The third point comes from Renata Mayntz, who contends that reflection among actors can only lead to a win-lose situation. If actors pursue reflection, any action may lead to a hopeless stalemate because the opposition will know the thinking of the other side. Thus, more reflection may lead to more impasses. Fourthly, Jon Elster (1979) suggests that there is no direct benefit from reflection. The insights of reflection cannot resolve problems, but change analysts should nevertheless pursue it. The resolution of dilemmas often comes as a "byproduct", arising as unintended consequence of action undertaken for the sake of other ends. These four arguments add to the depth of reflective thinking. But the answer to these questions must be left for future research.

Moreover, it would be valuable to explore the practical implication of the reflective transfer framework for change management characterised by human agency and controversies. Although the reflective transfer framework provides an effective way of analysing the complexity of change, it does not fully explain the detailed operation of how reflection can be undertaken and transferred. Therefore, a further empirical

validation of the framework is required, as well as a study of the strengths and weaknesses of this framework in practice. Furthermore, several questions need to be considered: How do practitioners know whether they have found the right leverage point as a product of reflection? Must every change situation have an underlying logic? Do companies need specialists to perform this reflective transfer analysis? What if the change dilemma has come to an impasse situation? Can managers still use the reflective transfer framework to achieve a turnaround? How can the defensive routine of key social actors be overcome so as to involve them in the process of frame reflection? Will it take too long to apply the reflective transfer concept to the analysis of a change situation, thus delaying the identification of appropriate remedies? These questions all require further empirical examination.

The methodology of such a reflective transfer inevitably gives rise to the issue of the "relativist trap" (Schön and Rein, 1994: 41). This methodological issue relates to the role of researchers and social actors involved in the reflection process. This can be posed as two questions: Is there an objective basis for analysing conflicting frames? Can analysts objectively propose the "correct" answer for a frame-reflective inquiry? To resolve conflicting frames requires an interpretation of reality. However, all interpretations are conditioned by the particular organisational, historical, and social contexts from which they originate. What researchers see and know depends on who they are, when they are, and where they are. As noted by Schön and Rein:

> There is no way of perceiving and making sense of social reality except through a frame, for the very task of making sense of complex, information rich situations requires an operation of selectivity and organisation, which is what "framing" means. ...those who construct the social reality of a situation through one frame can always ignore or reinterpret the "facts" that holders of a second frame present as decisive counterevidence to the first. (Schön and Rein, 1994: 30)

Therefore, any view of what is real and valid is relative. The interpretation of

conflicting frames can be approached from many different angles, changing along with historical evolution. Thus, there is little possibility of validating or falsifying a frame or an underlying logic. Instead, the validation of frame-reflective inquiry is more concerned with the usefulness of building a reflective model for continual learning among social actors. This issue has been a longstanding intellectual dilemma challenging social scientists. For future research, it is worth investigating the role of reflection through the use of appreciative inquiry, where the researcher and the researched all play a reflective role in the interpretation process.

6.3 CONCLUDING REMARKS

This research has explored the dynamics of IT-enabled change by asking the question: why does IT often fail to support change in achieving productivity growth and gaining competitive advantage? The research, as it has evolved over time, has reached two important conclusions. First, any effective resolution of the IT productivity paradox lies in a balanced relational alignment of organisational actors. Such a relational alignment perspective needs to consider the sequential impact on the implementation of organisational change. Change should not concentrate solely on one particular aspect (such as cultural transformation or process reengineering) but needs to take a holistic view in order to align different organisational factors in a contingent fashion in terms of planned or emergent modes of change.

Secondly, the resolution of controversial change should consider three levels of analysis: event, pattern and underlying logic. The three-level analysis supports a reflective transfer framework proposed in phase two for dealing with controversial change. Thus, on the basis of this perspective, the effective management of IT-enabled change depends not only on the technical resolution of problems, but also on

the transfer of reflective learning based on historical burdens and conflicting frames. One key implication to be drawn is that managers need to identify leverage points through the investigation of the change dynamics so as to minimise the potential IT productivity paradox. In conclusion, although the IT productivity paradox prevails in modern enterprises, organisations do not necessarily have to undertake a prescribed radical resolution (such as process reengineering). Organisational change should be seen as a complex social issue which requires a frame-reflective inquiry if effective resolution is to be accomplished. Thus, analysts need to consider both organisation and change from an enhanced contextualist perspective and apply a reflective transfer approach to change management.

Appendix

PHASE ONE QUESTIONNAIRE DESIGN

Interview questionnaires in phase one involved discussion with key change managers in five firms. Their responsibilities were mainly for strategic planning and formulation. They are involved with, or initiate, the strategic change project, organising activities cross-functionally. Each interview lasted for about one hour, and the following questions were asked:

1. Please describe and reflect upon the change project.

2. Why has such a strategic change been initiated?

3. Please explain why you implemented strategic change in such a sequence.

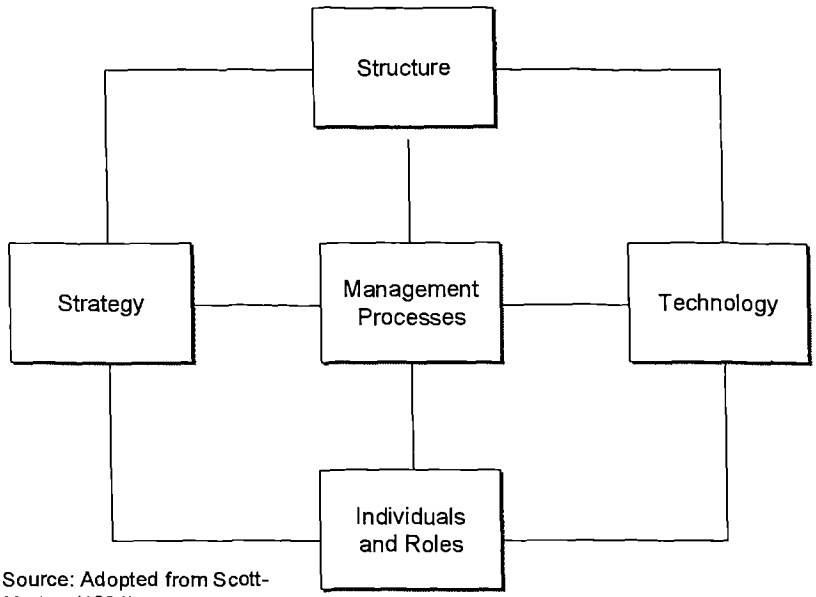
4. What change activities are involved in terms of strategy, structure, processes, people and technology? (These questions are posed as individual questions)

5. What is the role of IT in the process of strategic change?

6. Please reflect on all the change paths you mentioned and explain your understanding of the relationships as shown in the diagram below.

7. Why do you think these relationships are important?

8. What are the key lessons you have learned from this change?



Source: Adopted from Scott-Morton (1991)

PHASE TWO QUESTIONNAIRE DESIGN

The major probing questions in phase two are:

1. How long have you been working here? Could we talk about your experience of working in the firm? (exploring historical events and triangulation)

2. In your view, why has the firm been so successful?

3. What major change projects have you been involved in?

4. How does the firm evaluate your performance? (exploring reference modes for understanding patterns of change)

5. What are the challenges of the firm so far? Why? (exploring counterintuitive phenomena)

6. What change actions have been contemplated by the management? Are you aware of, or involved in, any of them? Could you explain these change initiatives? Are you happy with the present changes? (for triangulation purpose)

7. Why do you think the firm might fail in the future?

8. If you were ask to suggest three key changes to the CEO, what would they be?

9. (for senior managers only) If you could start the change process again, would you do anything differently?

There are also five guiding questions:

1. Strategy: What is the influence of corporate strategy (or divisional strategy)? How is performance measured?

2. Structure: How has organisational structure evolved over time?

3. Process: What areas of management process are under redesign?

4. People: What programmes are proposed to motivate people's commitment and to change organisational culture?

5. Technology: What IT projects have been introduced? What impact do these projects have on strategy, structure, process and people?

Phase two also sets out a post-research questionnaire for the key informants:

1. In the analysis suggested in the report, what do you agree with?

2. Please explain what parts of the report you disagree with.

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