

**SWP 5/98      IT IN ORGANISATIONS:  
A FRAMEWORK FOR ANALYSIS**

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# IT in Organisations: A Framework for Analysis

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## ABSTRACT

*Despite the vast amount of money spent each year on information technology we still have very little understanding of the impact of IT within organisations. Research findings are often contradictory, reflecting the different traditions of researcher and the different assumptions which underlies the conduct of the research. This paper develops a framework which positions the dominant school of thought in regard to IT related change enabling a worthwhile comparison between perspectives to be made. It also positions meta-theoretical perspectives providing a more complete picture of IT in organisations. The paper concludes by identifying research issues which this framework raises, identifies some practitioner implications and concludes with recommendations for further development.*

**Keywords:** IT implementation, IT impacts, change management

## **IT in Organisations: A Framework for Analysis**

Although Woodward (1958) first suggested the importance of technology in organisation design, organisational scientists continue to have difficulty in articulating its role. Over the last four decades there has been a burgeoning literature exploring IT in organisations with hypothesised organisational effects proposed by a number of researchers, including Whistler (1970), Ein-Dor and Segev (1980), Federico *et al.* (1985) and Swanson (1987). However, empirical research studying IT in organisations has so far produced inconclusive findings (Robey, 1981; Bjorn-Andersen *et al.*, 1986; Orlikowski, 1992). In a comprehensive review of information systems in organisation theory, Swanson (1987) concludes that few researchers are presently attending to the basic question of how information systems “work” in organisations. More recently, Wijnhoven and Wassenaar (1990) note that extra research is needed especially in making estimates of impacts and how they occur.

The very act of implementing any new IT-based information system results in organisational changes. While this may simply entail the automation of a previously performed manual task, the consequences of such action are likely to be far more wide ranging. Individuals may be assigned new roles or perhaps dispensed with altogether; work practices may change; authority may be delegated; new processes and structures may be designed to accommodate the new technology. Yet, when studying the IT impact literature, one often gets the impression of the computer as an autonomous force having some kind of predetermined effect. It is perhaps easy to recognise the impact of technology on tasks and processes within an organisation and hypothesise about performance improvement, business benefits or even competitive advantage brought about through IT. It is less easy to identify the changes it may effect on decision-making, communication patterns, formal and informal structures, authority and control, power and political systems.

The dynamics of IT related change are complex with the content of any change process having many dimensions. For example, within the context of business change from IT, outcomes can be considered as either being positive or negative and resulting from either a planned or emergent process (Ward *et al.*, 1996). Indeed, research continues to highlight that most managers are disappointed with the value which they perceive they are getting from their investments in IT (Grindley, 1991; Strassmann, 1990) and as a consequence many are choosing the outsourcing route as an alternative to providing information technology and information technology services to the organisation (Lacity and Hirschheim, 1995).

Change is a process producing a continuous stream of outcomes: some planned others emergent, some positive others negative. Yet despite the seemingly obsession with the notion of change and the vast array of prescriptions for its management, we really have very little understanding of its nature and process, particularly in relation to IT in organisations. In order to contribute to our understanding of IT related change, particularly in how business benefits and value can be leveraged through IT, it is important that we study IT-based

information systems in their organisational settings. There are a number of reasons for this assertion, including the fact that designers need to be aware of the consequences of their systems; it presents opportunities for learning and understanding the process of change; it provides mechanisms to anticipate the necessary organisational changes for effective systems implementation; and it can aid in developing strategies to manage change.

In this paper a conceptual framework which captures current research and perspectives on IT in organisations is developed. To provide a context for this framework the paper begins by examining the concept of organisation as how we view organisations has a considerable bearing on how we view the role and impact of information technology. The literature on IT impacts is then surveyed and the dominant schools of IT-related change are presented, each of which subscribes to a different ontological view of organisation and points to a different driver of the change process. Drawing on the work of Pettigrew (1987), a framework is developed which positions these perspectives. Recent research which draws on social theory is examined and also placed on this framework, thus enabling a more complete picture to be presented. The paper concludes with some observations, implications and suggestions for further development.

## **Ontological views of organisations**

With the exception of a very small minority of studies, the information systems literature devotes little to the concept of organisation in analysing the role of IT in the organisation. Yet, it seems sensible that if we are exploring computer-based information systems in their organisational context it is appropriate to consider the concept of organisation. Is so doing, we obtain a more systematic view of the crucial variables being affected by information technology. How we view organisations shapes our mindset and hence how we interpret the impact of technology.

Debate has raged among organisational theorists as to the ontological underpinnings of organisations. The literature on organisational analysis can be divided into two contrasting schools of thought: those who concentrate on 'objective' structures and those who subscribe to organisations as subjective constructions void of any reality beyond that which is in the mind.

The so called structuralists tend to concentrate their analysis on the objective structures of organisations and their environments as if these operated independently of, or merely to determine, the actions and interpretations of human beings. This end of the spectrum includes the structural approaches of the Aston School (Pugh *et al.*, 1968), Scott (1961), Thompson (1967) and others. Constructs such as centralisation, formalisation and differentiation are used to describe organisations.

Yet despite the agreement among the structuralists on common constructs, other scholars argue that these concepts only convey a partial and limited slice of organisations (Tichy, 1981; Weick, 1969). As organisations are composed of individuals other researchers have looked upon organisations as social systems and drawn inspiration from the social sciences, including politics, sociology and anthropology (Smircich, 1983).

More recently number of theorists have focused attention on the 'subjective' meaning and interpretations of actors as if these existed outside a historical and structural context. This

approach considers that the only reality of an organisation is to be found within our minds (Watson, 1986; Morgan, 1986). It contends that an organisation does not exist in any verifiable way but is formed in the minds of the members through their perceptions of its interactions. Included here is also the process perspective of Weick (1979) who described organising as a *consensually validated grammar for reducing equivocality by means of sensibly interlocked behaviours* (p. 3).

Proponents argue that it is impossible to point to an organisation like you can to a tree or a house. Within this genre an organisation is portrayed as the set of relationships that exists among the parts and which bind them together. As such, organisations are not bounded by a temporal framework in the same way that people are. Smith (1982) writes that

*it is the system of relations that makes the whole, which constitutes the essence of what we mean by the term organization. Without a system of relations to draw the parts together into a whole, there is no organization, just free floating parts. Hence, to talk about organizations is to talk about relationships, relations among parts, and relations among relations* (p. 326).

Information technology can have tremendous impact on relationships within organisations as very often relationships are based on the transfer and exchange of information which can exist outside of formal organisational structures. Implementing new technology can destabilise relationships which are based around information resulting in unintended consequences which can thwart the achievement of planned business benefits.

## IT related change: the dominant schools

Ever since IT was first used in organisations it has been an object of study. While early researchers attempted to posit a causal relationship between IT and organisational change, particularly structural change, later research has been less demanding and attempts more to understand the processes involved in change rather than attempting to be predictive.<sup>1</sup> Given the wide ranging impacts which can result in implementing an IT based system, some positive some negative, some planned, others emergent, if we can identify and trace them it should be possible to gain a deeper understanding of the process of change which can then help in the design and implementation of computer-based information systems, the management of the change process and the subsequent delivery of business benefits and value.

Examining the literature on IT related change, a number of distinct schools can be discerned. These are the technological deterministic school, the organisational choice school, the systemic school, and the interactionist school.<sup>2</sup> Table 1 summarises these perspectives, highlighting the view of organisation each subscribes to as well as the dominant influence on the change process. In the remainder of this section these schools are briefly reviewed.

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<sup>1</sup> This reflects a epistemological swing from the *harder* scientific approaches to softer interpretative stances which seek understanding rather than prediction.

<sup>2</sup> This is an extension and elaboration of Markus and Robey's (1988) categorisation.

Causal agency perspective	Description	View of organisation	Dominant influence on change process
Technological	IT induces structural change by redefining nonrelational roles.	Network of prescribed roles bound by formal structure	Incumbent roles
Organisational	IT is designed to satisfy the organisation's needs for information. The information as power interpretation is also supported	System of individuals with unequal power and divergent interests. Structure is prescribed and supported by IT.	Management process
Systemic	Impacts are due to compromise and social negotiation. Impacts are different and wider ranging than those of component parts.	System containing subsystems, of which IT is but one. Recognises the interdependency of organisational elements.	Extent of involvement and participation in design by stakeholders
Interactionist	Consequences of IT emerge unpredictably from complex social interactions.	Network of relationships	Social relations among participants

**Table 1** Summary of theoretical perspectives.

The *technological deterministic school* (or technological determinism or technological perspective in some literature) holds that technology is an exogenous force which determines or strongly constrains the behaviour of individuals and organisations. This perspective can be used to capture the early views of technology in organisations. For example, Leavitt and Whistler (1958) argued that IT would alter dramatically the shape of organisations and the nature of managerial jobs. In her research, Woodward (1958) reported that distinct relationships existed between technology and organisational structure, arguing that the dominant technology strongly determines the structure of the organisation. Building on this work, Simon (1977) saw computers re-centralising decision-making resulting in a shrinking of organisational line structures and a resulting decrease in management levels.

Many scholars have interpreted this perspective as positing a direct relationship between IT and structural change (for example, Markus and Robey, 1988). However, such a belief is to mis-interpret this perspective. While structural change may or may not occur, it is mediated by changes in managerial job tasks, skills and other non-relational aspects of roles<sup>3</sup>. As new technology emerges it is usually implemented because of its potential in addressing organisational problems. Managers will continue to perform tasks in which they have a comparative advantage and relinquish tasks where the computer has the comparative advantage. Impacts are thus modified by the non-relational roles of users.

Later research ground itself in the *organisational choice model* arguing that human actors design IS to satisfy organisational needs for information, particularly in reducing complexity (c.f. Galbraith, 1977). Following Child (1972) who stressed that it is people who create structures, IT impacts are seen as being determined by those who control computing and have the ability to use IT to achieve their interests - whether personal, professional or

<sup>3</sup> Nonrelational elements of a work role can be viewed as a set of recurrent activities that fall within the purview of a person who assumes a particular position or a job. ... In short, nonrelational roles encompass all the behaviours that individuals ordinarily perform as role incumbents, regardless of whether the behaviours are construed as obligations or are explicitly sanctioned (Barley, 1990, p. 69).

organisational.<sup>4</sup> Research efforts adopting this perspective are directed away from the change *per se*, towards managerial decision-making processes (Astley and Van de Ven, 1983). Organisational structures are assumed to be largely under the control of managers and shaped by their decisions and actions. Thus, IT is a dependent variable in the organisational perspective caused by the organisation's information processing needs and manager's choices about how to satisfy them.

Supporting this view, for example, Galbraith (1977) proposed a number of organisational design alternatives by which organisations can fill the information needs generated by uncertainty. He argued that managers may reduce the need to process information by managing the environment, by using slack resources, or by creating self-contained units. Managers may also increase the capacity of organisations to process information by developing lateral relations and building information systems.

While this perspective has been criticised for pushing IT out of the picture and for relying too much on human agency (McLoughlin and Clark, 1988; Wilkinson, 1983), it does treat IT as enabling desired changes, a necessity according to Earl (1992) if desired benefits from IT are to be delivered, a view also subscribed to by the seminal writings on business process re-engineering (Davenport and Short, 1990; Davenport, 1993; Hammer, 1990; Hammer and Champy, 1993).

This perspective also recognises the political nature of organisations where IT can be implemented to change the balance of power, as an attempt to increase or decrease power, or to strengthen the power base of the dominant coalition. The crucial point is that any implementation is a conscious decision or stream of decisions to achieve a desired outcome; the organisational imperative is the intentional application of technology for a specific objective.

The *systemic school* articulates impacts as being more wide ranging, recognising that there are opportunities created by IT which can be both positive and negative, depending on how technology is put to use. This systemic school adopts a relativist position which is neither pessimistic or optimistic in its view of IT impacts, but a compromise between the two, regarding the ends and means of IT implementation as inescapably linked to the culture and power of the local social system in which it takes place. The concern is with the development of criteria for social and technological acceptance. Impacts are determined through a process of social negotiation.

Unlike the technological perspective, this perspective does not believe technology is a *fait accompli*. For example, socio-technical theory recognises that if a technical system is created at the expense of a social system the results obtained will be sub-optimal. It aims to enhance productivity and learning by increasing participation in decision-making and individual control over the immediate work environment (Mumford, 1987). As such, it has a clear ethical principle associated with it. This is to increase the ability of the individual to participate in decision-taking and through this exercise a degree of control over the immediate work environment. Prescriptively, management were advised to tell groups what to do, but not how to do it. Perhaps the most widely operationalisation of socio-technical theory is

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<sup>4</sup> The strategic choice perspective, often attributed to Child (1972), was in fact perhaps first articulated by Trist *et al.* (1963).

ETHICS (Effective Technical and Human Implementation of Computer Systems) developed by Mumford (1983). While user involvement is important in any methodology, it is absolutely vital in ETHICS.

Socio-technical systems recognises the plurality of IT impacts but attempts to manage them to ensure that the potential of both the technology and human dimensions are recognised<sup>5</sup>; trade-off's will be inevitable. Underpinning this perspective is the assumption that system designers can manage the impacts of IS by attending to both technical and social concerns (Mumford and Weir, 1979). Without attempting to argue conflicting viewpoints, a number of studies have reported that many impacts are accidental, unintended, and uncontrolled (Bjorn-Andersen *et al.* 1986). In fact, both the organisational and systemic perspectives see IT-related change as largely something which can be planned and consequently managed.

The *interactionist perspective* (or emergent perspective in some literatures) contends that the use and consequence of IT emerge unpredictably from complex social interactions. Change is seen as arising due to changing social interaction patterns brought about through the implementation and use of IT. With this perspective the organisation is portrayed as a network of nodes held together by the exchange of information. This exchange takes place through many mechanisms, including memos, face-to-face meetings, telephone conversations, and formal reports. There are also exchanges which take place outside formal organisational mechanisms. IT not only changes the nature of these exchanges, particularly formal arrangements, but also redefines the organisations information network. The impacts of IT emerge out of these changing social interaction patterns. Research conducted in this perspective includes studies by Barley (1990), Burkhardt, (1994) and Burkhardt and Brass (1990).

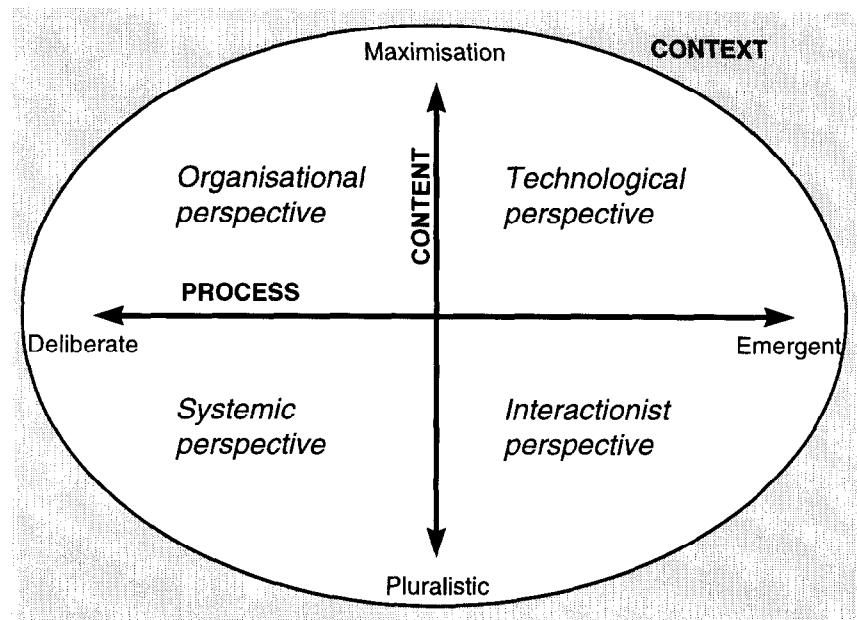
## **Content, context and process of change**

In order to structure these perspectives, the work of Pettigrew (1987) is drawn on for guidance. The basis of his work is that any useful research on organisational change should involve the continuous interplay between ideas about the context of change, the process of change and the content of change. Referring specifically to strategy, he argues that formulating the content of any new strategy inevitably entails managing its context and process. Much of the previous work on IS has concentrated mainly on the content of change, and has given insufficient emphasis to the process of change and its links with intra-organisational and broader contexts (Walsham, 1993, p. 52).

Figure 1 illustrates an interpretation of Pettigrew's content, context and process framework. On two axis, *content* (outcome) is mapped against *process*. The *contextual* aspects surround both these aspects. The dimensions of process range from deliberate to emergent, while content has the dimensions of maximisation and pluralism.<sup>6</sup> The four schools defined above are superimposed on this framework.

<sup>5</sup> Recently, Hirschheim and Klein (1994) explored how emancipatory principles can be applied in the process of information systems development suggesting that ETHICS is the most likely candidate to be extended or "reformulated" to achieve emancipatory ideals more comprehensively.

<sup>6</sup> In developing this framework inspiration was drawn from the work of Whittington (1993) in examining the various schools in the field of business strategy and policy, Burrell and Morgan (1979) in constructing a



**Figure 1** Content, context and process of IT impacts: positioning the theoretical perspectives.

The content of any change, i.e. the outcome, impacts themselves can be viewed along continuum ranging from the dimensions of maximisation to pluralistic. Within the context of this framework, maximisation refers to utilising IT to achieve a particular objective. It might refer to maximising a power position. Equally, it could also refer to optimising how a particular task is performed or how information accessed and delivered to the user. From a technical perspective it can refer to maximising a technical capability. The focus is therefore on maximising one single or a small set of objectives (organisational or technological) or stakeholder position. Compromise, particularly when it effects the overall desired objective is not an issue.

At the other end of the spectrum is the recognition that there are probably many stakeholders who are likely to be impacted by the introduction of an IT-based system. Any outcome is determined through negotiation and consensus among all stakeholders who may be affected by the technology. Therefore, rather than maximising the potential of the IT, the outcomes are more pluralistic and wide ranging. For example, deciding that only information above a certain managerial level would be available via an executive information system (EIS) or being sensitive to the consequences of redefining access to information. In both these cases greater benefits could potentially be achieved by capitalising on the potential which the technology offers, however, these would have been at the expense of other organisational problems.

The *emergent-maximisation* quadrant is where an IT based system is implemented for a particular goal with little understanding of the underlying technology. The belief is that by implementing the technology, benefits will be derived by right of the technology itself. Impacts are not planned for in any great sense. Rather, they are seen as being a function of the

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framework of sociological paradigms for organisational analysis, Hirschheim (1985) in exploring the epistemological and ontological underpinnings of office automation and Hirschheim and Klein (1989) in their articulation of four paradigms of IS development.

technology. Taking this view to the extreme, implementing the most up-to-date technology is deemed to have better, bigger and more beneficial outcomes than when less recent technology is implemented.

The *deliberate-maximisation* quadrant is where a deliberate process of change is instigated in pursuance of an objective or small set of objective. Outcomes are a result of deliberate action with IT implemented in support of these objectives. The *deliberate-pluralistic* quadrant recognises that there are many coalitions and stakeholders within an organisation, each with their own objectives. Impacts are recognised as being more pluralistic than merely maximisation of a desired outcome. The underlying belief is that compromise and social negotiation are crucial for the success of an system. This systematic school of thought is more optimistic in its outlook. While it recognises the plurality in desired outcomes, it also recognises that these are sociologically sensitive, and that cultural influences will play a major part in their determination.

In the *emergent-pluralistic* quadrant, impacts emerges from the interaction of the IT and the social network of the organisation. This social network is seen as being defined by the organisations information network. Thus, a fairly pragmatic view of the world is adopted. The argument is that IT impacts emerge, not directly from technology, but as a result of individual actions, which are themselves a series of compromises. While an IT project may have specific objectives, if the information network is redefined, for example by affecting access to information or changing the nature of organisational communication, for example from face-to-face to electronic, social interactions patterns can be affected and social disruption can ensue. It is not the intention to suggest that this is good or bad as the interpretation of such scenarios are clearly dependent on the context.

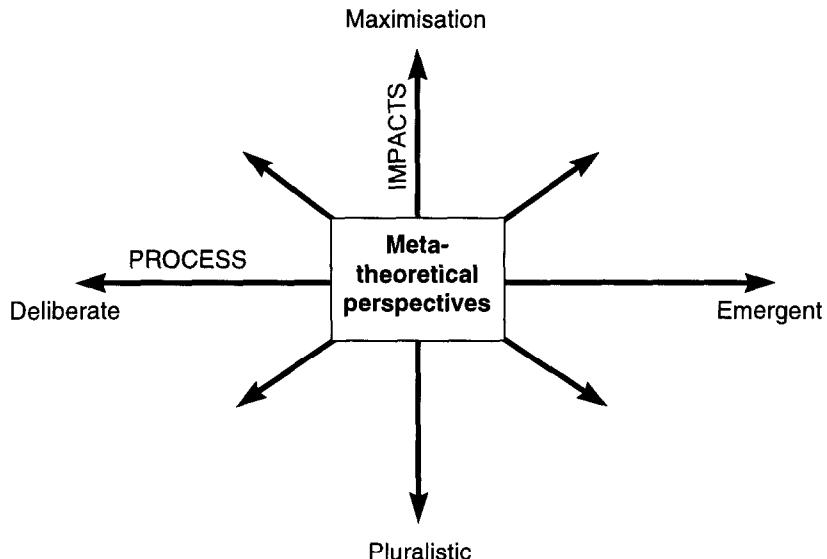
### *Meta-theoretical perspectives*

Recognising some of the limitations identified above in regard to IT related change, a number of scholars have looked towards social theory<sup>7</sup> for guidance in understanding IT related change, most notably drawing on Giddens's (1984) *Structuration Theory* (c.f. Barley, 1986; Orlikowski, 1992; Orlikowski and Robey, 1991; Walshaw, 1993) and *Actor Network Theory* (c.f. Monteiro and Hanseth, 1996) as espoused by Latour (1987) and Akrich (1992). Both ST and ANT are meta-theories attempting to bridge the ontological gap between subjectivism and objectivism. They admits greater complexity to the issue of causal agency and to the goal of predicting organisational change associated with information technology. By refusing to acknowledge a dominant cause of change, these studies differ quantitatively from the deterministic causal arguments of the four perspectives described above. For example, focusing on the structural dimension of centralisation, the key issue is not whether an increase or decrease in centralisation is observed but the reasons why it occurred in one organisation but not in another. Thus, by refusing to recognise that either of the other four perspectives are not possible, these meta-perspectives propose that predictions regarding impacts and outcomes are impossible, which accounts for the indeterminate and contradictory research findings about the impact of IT on organisations.

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<sup>7</sup> For an account of the use of social theory in studying IT in organisations see Latour (1996).

Yet these arguments do not invalidate the four theoretical perspectives discussed above. Rather they suggest that in any one implementation all four perspectives are likely to hold at any one point in time and at different points in time. Figure 2 positions these meta-theoretical perspectives on the framework developed earlier in the paper, blending both together. These meta-theoretical perspectives, while valuable in *interpreting* and *understanding* change, are difficult to operationalise pre-implementation and therefore provide little guidance in identifying and managing change. However, it is through interpreting changes that learning occurs.



**Figure 2** Positioning the meta-theoretical perspectives.

## Conclusions and further development

This paper has developed a framework which positions the dominant schools in relation to IT related change. It has also positioned on this framework more recent research in the IS field which draws on social theory for guidance.

A key starting point in developing this framework is that all IT implementations have outcomes; and with any IT implementation outcomes can be both deliberate and emergent. Deliberate decisions arising out of the management process can lead directly to emergent outcomes. The experience is that the process of change is characterised by a series of unfolding events, many of which are linked with proceeding events. In the context of the theoretical frameworks, the interpretation of outcomes is constantly moving between the four quadrants of the framework. Impacts may be planned for, others may emerge; the nature of the impacts also differs, some reinforcing planned outcomes, others undermining any outcomes which are sought.

As the four theoretical perspectives are drawn from the research literature, evidence can be produced in support of each. Yet each perspective offers only a limited slice of reality and all are necessary if a complete picture of the change process is to be painted. Outcomes can be explained by one of the four theoretical perspectives and with any IT implementation there will generally be many outcomes. For example, IT may be implemented to enhance the

position of a dominant coalition (the organisational perspective) but any such implementation may have more social consequences (the interactive perspective).

Each of the theoretical perspectives is only appropriate to understanding change in particular situations. The organisational perspective might be useful in explaining a planned change supported by IT, but does not explain changes induced by the use process, i.e. the non-relational changes. For example, one of the criticisms which can be levelled at the organisational imperative is that it only deals with rational design situations. The implication of this is that each theoretical perspective only caters for *first order effects*. Change is much more multi-dimensional and temporal.

Consider the analogy of a different technology: transportation.<sup>8</sup> A first-order effect of transportation technology was simply the substitution of new transportation technologies for the old. People began to ride in trains and automobiles rather than on horses and in horse-drawn carriages. As transportation technology continued to improve, people did not use it just to substitute for the transportation they had been using all along. Instead a second-order effect emerged: people began to travel more. They commuted farther to work each day. They were more likely to attend distant business meetings and to visit faraway friends and relatives. Then, as people used more and more transportation, a third-order effect eventually occurred: the emergence of a new "transportation-intensive" social and economic structures. These structures, such as suburbs and shopping malls, would not have been possible without the wide availability of cheap and convenient transportation.

Indeed, it is along somewhat similar lines that the recent MIT *Management in the 1990s* research program<sup>9</sup> developed a model of what it called "IT-induced business reconfiguration", suggesting that IT induces certain "structural" changes in an organisation (Venkatraman, 1991). This model proposes five levels of transformation induced by IT: localised exploitation, integration, business process redesign, business network redesign, and business scope redefinition. It doesn't explain why these 'transformations' occur, yet it does provide an extremely useful framework both for examining IT in organisations and for classifying categories of how IT can be used in an organisation. However, this framework adopts a rational stance and it is interesting that in a more recent paper Venkatraman (1994) has swapped *IT-induced* with *IT-enabled*, a subtle but revealing replacement.

A key challenge is therefore to operationalise this framework and use it as a lens to explore IT in organisation. The objective of this task would be to develop migration paths around the framework: to map out the life-cycle of IT-related change in an organisation. It is also important to define the conditions under which each of the perspectives hold. What causes the change process to migrate between the perspectives?

It should also be possible to utilise the framework at the outset of an IT implementation in order to identify possible likely outcomes, to assess their contribution towards the objectives of the implementation and to then develop strategies in order to minimise any negative consequences. Through viewing an IT project through the four lens it should be possible to develop possible scenarios which can then be assessed as to their likelihood of them occurring.

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<sup>8</sup> This analogy is taken from Malone and Rockart (1991).

<sup>9</sup> Summary of this project can be found in Scott Morton (1991).

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