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International Conference on Information Systems (ICIS)

12-31-1994

The Dynamics of Fit and the Fit of Dynamics: Aligning IT in a Dynamic Organization

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ABSTRACT

Models of the fit of IT systems to their organization are predominantly static contingency models. A rational, top-down dynamic is assumed: first from strategy to structure, then to IT, management processes and work roles and skills. Recent research has presented "deviant" pathways to fit as a challenge to this rational view of dynamics. This paper extends our understanding of dynamics by exposing the hidden assumption that only a single change process, or Dynamic, is undertaken at one time. A case is used to illustrate multiple, concurrent Dynamics. Analysis reveals that concurrent Dynamics may have incompatible fit configurations and also that they may have competitive paths to fit as a result of temporal and interaction effects. An extended account of the dynamics of fit is summarized and areas for future theoretical development outlined.

1. INTRODUCTION

It doesn't matter whether you talk about individual systems, portfolios of systems or an overall Information Technology strategy, nor does it matter whereabouts you do your talking, the one certainty is that you'll find a strong body of opinion that the system/portfolio/strategy must *fit* its organizational context. Like organization theorists who have sought to explain organizational performance by the fit of structure to organizational context (Donaldson 1985; Mintzberg 1979; Perrow 1986), IS/IT researchers have tried to explain the problematic variability of IS/IT performance by the fit of IT to its context. Although various organizational components are proposed as constituents of context, including technology, task, strategy, structure, management processes, individual roles and skills, environment, culture, and size (Camillus and Lederer 1985; Scott-Morton 1988, 1991; Weill and Olson 1989), there is agreement across theories that whatever the proposed constituents of context, they should be consistent with each other. Walton's (1989) strategic triangle exemplifies this kind of theory in requiring the fit of business strategy, organizational structure and IT.

The main problem addressed by existing theories of IS/IT fit is the identification of an end state in which IS/IT and the organization are matched to achieve a desired level or type of performance. By default, such theories appear to assume that once the end state is identified it can be achieved in a straightforward fashion. However, this misrepresents the difficulty of bringing multiple organizational components into fit. Worlds in which change was an occasional punctuation to an otherwise stable organizational lifestyle have passed into history. Stability itself is now defined in terms of capacity to accommodate continual change (Boynton 1993; Boynton and Victor 1991; Hamel and Prahalad 1989; Pettigrew and Whipp 1991). Bringing an organization and its IT into fit is therefore not simply a matter of taking a stable organization and shuffling its components into another stable configuration. Rather, it is the outcome of complex dynamics involving those organizational components which static models identify as needing to be aligned to achieve a fit configuration.

Recent work has sought to open up the dynamics of fit by exploring the paths to configurations of fit and the possibility of multiple contexts to which the information systems portfolio must align itself (Craig and Yetton 1992; Johnston and Yetton 1994; Yetton 1994; Yetton and Johnston 1994a, 1994b; Yetton, Johnston and Craig 1994; Yetton, Southon and Craig 1994). In similar vein, Ciborra (1991) has argued for a bottom-up alternative to the traditional top-

down dynamics assumed by writers on strategic information systems. While all this work provides a basis for an understanding of the dynamics of IT fit, it does not yet constitute a full and complete account.

The current research also paints only part of the picture. It concentrates on the dynamics rather than on the end fit configuration achieved through those dynamics. This research therefore does not commit itself to any specific definition of fit. However, for the purposes of the case analysis it does make a working assumption of a systems approach (Van de Ven and Drazin 1985) to internal fit (Miller 1992) where internal fit involves consistency among *organizational components* rather than with environmental variables; for example, the MIT90s program was concerned with the consistent configuration of strategy, structure, IT, management processes, and roles and skills (Allen and Scott Morton 1994; Scott Morton 1991). The systems approach to internal fit recognizes that all of these components generate effective organizational performance by combining systemically so that fit involves consistency *among* the whole set of organizational components such that a change in just one component will probably require compensatory changes in all of the others.

Our research also assumes the external, or environmental, fit (Miller 1992) of the IT system, i.e., its compatibility with environmental attributes such as uncertainty, complexity, and competitiveness. This assumption will have to be relaxed in due course, but at this early stage of theory development it is a desirable simplification. For the purposes of our current research, which is essentially exploratory, it is not necessary to be more explicit about fit. The actual achievement of a fit configuration, and hence the precise concept of fit, is unimportant to our findings which centre on observed dynamics rather than end state configurations.

The case research reported here adds to our existing understanding of the dynamics of IS/IT fit by considering the commonplace phenomenon of multiple, concurrent change processes. A typical example might be the introduction of quality processes on the shopfloor at the same time as the implementation of a CAD/CAM system. Analysis of the case shows how our models can be enriched by including the possibility of other change processes in addition to the IS/IT change that is the primary focus.

This paper proceeds by placing the current research in the context of what is currently known. It defines the familiar concept of dynamics and introduces its capitalised companion, Dynamics. This permits us to identify some problems not so far addressed by the literature on the dynamics of IS/IT fit. The case details are presented along with the research method and an analysis is offered highlighting difficulties posed by the existence of concurrent Dynamics. On the basis of this analysis, the idea of fit between Dynamics is elaborated and its implications discussed. To conclude, our more extended account of the dynamics of fit is summarized and areas for further research and theoretical development are outlined.

2. THE DYNAMICS OF FIT AND THE FIT OF DYNAMICS

Exploration of the dynamics of fit is in its early stages. In the context of the MIT90s framework, it has been noted that there is a presupposition in the literature that there is a unique path to fit which is a rational, top-down sequence from strategy to structure to information technology, management processes and individual tasks and skills (Yetton, Johnston and Craig 1994): Scott-Morton (1988) admits as much. In contrast, empirical study reveals that "deviant" paths to fit may be successful: "deviant" paths contrast with rational, top-down paths. Yetton, Johnston and Craig show that the sequence of change in an architectural practice was IT first, then tasks and skills, followed by structure, and management processes, with strategy ultimately emergent.

In further research on a hospital, qua professional bureaucracy, Yetton and his colleagues (Yetton and Johnston 1994a; Yetton, Southon and Craig 1994) have identified a structural barrier to establishing a path to fit: dual, opposed strategies with correspondingly different structures, types of technology, management processes and work roles. In this case IT is at the junction of the professional and bureaucratic organizations and is correspondingly unable to satisfy either because it cannot increase its fit with one without reducing its fit with the other.

So far, then, the research on the dynamics of IT/IS fit has identified an empirically unvalidated rational path to fit; observed that paths which deviate from this rational norm can nonetheless lead to fit; and recognized that there may be major obstacles on the way. All this research shares an implicit acceptance that only one change process is at work at a time.

The case described here stimulated the researchers' awareness that this is an unrealistic assumption; many, if not most, organizations pursue several changes at the same time. In this paper, we use the term *Dynamic* to refer to a single change process which may consist of multiple constituent activities, the overall goal of which is some

specific change, for example, the implementation of an information system or the restructuring of a marketing department. The Dynamic is considered to conclude when the organizational fit configuration appropriate to its goal is reached. It may also stop when all work on the change is terminated. An example of a Dynamic is an architectural practice's change from pencil and paper to CAD (e.g., Yetton, Johnston and Craig 1994). In that example, the goal of the change was the CAD implementation. The sequence or path of organizational changes the architect pursued to achieve fit is referred to as the *dynamics* associated with that particular Dynamic.

The possibility of concurrent Dynamics makes a difference to any theory of the dynamics of fit in two ways. First, it is possible that concurrent Dynamics will have incompatible end fit configurations. Second, changes which occur on the path of one Dynamic may affect other concurrent Dynamics.

The above discussion can be summarized as three assumptions. First, a Dynamic should lead to a new fit configuration which generates improved performance as the elements of that configuration are implemented and mastered. Second, the final fit configuration for a Dynamic needs to be compatible with that of any concurrent Dynamic. Third, the path by which a Dynamic is implemented also needs to be compatible with that of any concurrent Dynamic. The following case study illustrates the problem of both incompatible final fit configurations and incompatible paths between a focal IT Dynamic and one other concurrent Dynamic. It gives us a concrete example from which to extend and improve our account of the dynamics of IT fit.

3. IS FOR MANUFACTURING: A CASE STUDY

This case study focuses on a Dynamic directed toward the continuing implementation and use of a business information system incorporating MRPII in a mid-sized, Australian manufacturing company, Utilux Pty Ltd. The study found that although a major reason for acquiring the information system had been to support manufacturing processes, this was the area of the business in which it was least well established. A review of the company's situation revealed considerable complexity. After peeling away a number of relevant but masking factors it became apparent that there were, in addition to the focal Dynamic of the IT system, several concurrent Dynamics acting on the internal processes of the company. The current study seeks to explore the interaction of the IT Dynamic with just one of those concurrent Dynamics.

3.1 Research Method

The field research commenced in late August, 1993, and was completed in January 1994. Twenty-two formal interviews were conducted with eighteen different staff at the managerial or supervisory level (informal comments were solicited on occasion from lower levels). Interviews were conducted in Utilux's two product management groups, in its subsidiary, GPC, in the corporate headquarters, and in two of its three regional offices. All interviews were recorded and transcribed for analysis. Documentation from the MRPII implementation group was also reviewed.

One limitation was that the study was unable to consider the financial element of the company's investment. Instead, performance was largely viewed in terms of one of the standard contingency theoretic dimensions of system performance: system use.

The analysis of the case was developed through a series of iterations. These started early in the process with a formal meeting of Fujitsu Centre researchers. This highlighted the importance of Utilux's competitive situation and led the researchers to recognize that the company had in progress a number of concurrent Dynamics aimed at improving its position vis-a-vis its environment. An initial draft of the paper was commented on by the Managing Director (MD), one General Manager (GM), and an internal consultant. A more mature version of essentially the same analysis was presented to the senior management team in March, 1994, where two GMs and the internal consultant firmly supported it. The two participants with the largest stake in the compatibility of the concurrent Dynamics (the MD and a third GM) were less disposed to accept that there was competition between them. The MD nonetheless accepted the analysis sufficiently to approve publication of this paper.

In order to make its points more clearly, this paper simplifies the analysis by confining its attention to two concurrent Dynamics although in fact there were others, such as an organizational restructuring Dynamic.

3.2 Case Description

The case concerns Utilux Pty Ltd, the Australian part of the Utilux group which includes companies in New Zealand, Asia, and the UK. Utilux Pty Ltd (hereafter just Utilux) is a family owned firm, established for more than 75 years, employing approximately 400 staff. It describes itself as being in the interconnections business because it manufactures and supplies electrical terminations and solutions to a

variety of industries including white goods, automotive, power and telecommunications. The components it supplies include terminals and connectors for the internals of white goods, bus connectors for equipment such as PCs, a moisture resistant connector for telecommunications, trailer connectors for cars, hose clamps and the like. It supplies approximately 7,000 items.

Since the current MD assumed control in 1980 major changes have been undertaken. Some were aimed at modernizing the internal environment while many others were aimed at an increasingly turbulent external environment. According to the MD, "When I first started we were very centralized. We had a GM with over a dozen people reporting to him. The first thing I did in 1980 was to change it into a functional organization." Another internally directed initiative was the company's first computer purchase, a Data General computer to run tailored software for accounts, order processing and stock control.

In the years since 1980, the external environment has been marked by increased competition, greater customer power, and major uncertainties in both supply and demand. In response to a trend which saw customers moving offshore, Utilux's MD has pursued a considerable expansion in the group's international activities in order to "get access to...leading edge customers."

Since 1989, the pace of change has been especially rapid. The company has modernized and extended its IT systems, adopted a product management structure, launched a quality systems initiative, undertaken a cultural development program, implemented Kanban systems, and developed a new vision of its future business. In this sense it is a very dynamic organization.

The IT change involved replacing Utilux's information systems. Rather than merely seeking an up to date version of the existing systems, the brief from the MD to his task force was that, in order to better equip manufacturing to respond to the demands of the company's environment, support for manufacturing should be its highest priority. The eventual choice was Business Planning and Control System (BPCS — pronounced Beepix), an integrated MRPII system which provided order processing and accounts functions as well as planning, purchasing, scheduling, and warehousing support for manufacturing. The hardware selected was an IBM AS/400.

Prior to implementation, staff and management were given intensive training both in the generic virtues of MRPII and in the specific value and use of BPCS for Utilux. The implementation of a total of fourteen modules of BPCS was completed in a period of twenty months.

Three months after capital for the new system was approved in June 1989 the MD announced that Utilux would be restructured on the basis of its markets and manufacturing technologies. In order to rationalize its dealings with its various markets and to better organize its production, Utilux split its main activities into two product management groups which it has moved toward transforming into full business units: Industrial and Electronics (I&E) and Power and Switchgear (P&S). P&S was moved to a site thirty kilometers from the corporate head office. The product management groups' core activities were to be marketing, business development, and manufacturing; in addition, they were given some engineering responsibilities. Finance and accounting, information systems, personnel, and the main engineering activities were retained as centralized functions. Sales for the whole product range are dealt with by three regional offices.

While the restructuring had no effect on the functionality required of BPCS, it did necessitate a number of technical changes such as the creation of duplicate and shared files. For example, production planning and scheduling for the two product groups became separate operations and so needed separate files and processes. Subsequently a separate P&S warehouse was established, further order processing functions were devolved to the regions, and in 1993 the subsidiary, General Power Controls (GPC), was added to the system. All these changes, together with some expansion, increased the load on the computer and significantly slowed terminal response times.

By mid-1993, BPCS was processing a high volume of transactions. Most of these were quite routine. Users had learned to use the system for their basic, everyday needs but had not explored its breadth or mastered it in depth. One reason cited was the lack of both follow-up training and induction training for new staff.

High transaction volumes and limited machine capacity brought problems. Response times were the dominant issue: responses would often take fifteen seconds and could be minutes according to the time of day. Customer Service staff were particularly affected. The response to customer enquiries was slow with consequential damage to business, company reputation, and staff morale.

Shortage of processing power was only part of the reason that the system did not yield all the expected benefits. A prime concern was that delivery performance was falling short of the targets set and there was too much stock waste. Part of the reason was that machine load meant that at the main warehouse picking tickets could only be printed once a day, so orders either had to be dealt with manually or would be delayed by at least a day. In addition, forecasts

were uncertain, which resulted in inaccurate scheduling and product being manufactured in excess of demand. One response was workarounds involving the submission of duplicate orders by sales so as to increase the likelihood of customers receiving deliveries on time.

An indirect effect of the capacity problem was that special user requests went unmet because the small Information Services staff was totally absorbed tuning the operational system and preparing a new release of the software.

At the same time as these difficulties were emerging, manufacturing management was showing considerable interest in Kanban systems partly because of customer demand and partly because of a preference for "visible" management systems. During 1993, I&E in particular, but also P&S, worked at introducing Kanban into its manufacturing activities. This involved creating min/max figures for existing stocks of its high volume products. The min figure is the minimum stock level which when reached triggers the scheduling of a manufacturing job to replenish the stock to its maximum (max) level. To ease the pressure on its manufacturing schedule I&E also introduced Kanban into some key customers' ordering procedures so as to ensure that orders would be received in sufficient time for them to be filled on time. At one stage it contemplated a process whereby customers would fax their Kanban-triggered orders direct to the warehouse rather than through Customer Services. One reason this proposal was not pursued was the recognition of the need to evaluate local developments in a company wide context. The GM (Finance) was given a coordinating role for this purpose.

In the months since Kanban was introduced to I&E, there has been a significant improvement in the percentage of customer orders shipped on time. The project to implement Kanban continues with raw material purchasing to be triggered by a similar min/max procedure.

Late in 1993, Utilux decided to upgrade its hardware and, at the time of writing (early 1994), the response time problem had been solved and with it certain associated problems such as the frequency of production of picking tickets.

The alignment of the MRPII systems with the Kanban systems in manufacturing remains an issue because the scope of Kanban systems may yet expand. Continued refinement of BPCS is certainly on the agenda and there is talk of "reimplementing" the system. However, within manufacturing, Kanban is seen as delivering what the company needs, whereas BPCS is not. Kanban is attractive to staff because of its immediacy and visibility, and because it reflects demand. It also has the advantage that some staff have been reluctant to transfer their allegiance from the old Data General system to BPCS while others have joined the company with their own views on MRPII and without the benefit of the initial training to help them understand the role of BPCS. One manager in manufacturing indicated that he did not believe BPCS could be reimplemented.

3.3 Analysis

By the standards of many other manufacturing companies' experience with MRPII, Utilux's system has been implemented successfully. It is integral to and intensively used in a number of functions, particularly accounting, warehouse operations, and customer service. However, it has not become established in the shopfloor management of the company's core manufacturing operations. Our analysis explores this by examining two Dynamics. The focal Dynamic was directed toward the implementation of the BPCS system and its integration into the rest of the organization. Concurrent with it since 1993 has been the Dynamic directed to the implementation and integration of Kanban systems into the various manufacturing areas at Utilux. How did the Kanban Dynamic affect the BPCS Dynamic?

Plainly, Utilux's intention in allowing the BPCS and Kanban Dynamics to run concurrently is to develop a hybrid solution integrating BPCS and Kanban. Kanban appears to complement BPCS by compensating for its limited use in manufacturing. On the surface, a hybrid seems a workable approach. Karmarkar (1989) argues for a hybrid of Kanban for daily operations and MRPII for long-term planning.

The appearance of compatibility is misleading. While it may be possible to successfully interface the two technologies, the incompatibility lies in the different configurations required by each for full organizational fit. On the one hand, BPCS is an integrative technology. It is a sophisticated, automated technology emphasizing information processing. It has complex functionality, relies on detailed, accurate forecasts and immaculate data quality, and operates at a relatively high level of abstraction. Because of the number and diversity of the functions it supports, user interdependence is high. It therefore requires tight organizational integration, sophisticated forecasting and highly disciplined use of specific data management skills.

By contrast, Kanban is not integrative. It is oriented to effective service delivery at the local level. It is not automated; it drives production by a sequential process of visible triggering devices (Kanban cards) where slack in the

form of minimum inventory levels substitutes for accurate demand forecasts and visible stock levels substitute for purity of data. Kanban requires less coordination and much less sophisticated skills to operate. The requirements of the fit configurations for the two systems are quite different. To be effective together, the two Dynamics would need to achieve incompatible organizational changes.

A partial solution to this difficulty is to partition both the functionality of the two systems so that they are technically complementary and the organizational changes so that they are as independent as possible. The limitation of this solution is that it is not possible to partition different forms of dependence. Kanban is based on sequential dependence while interdependence is crucial to BPCS. Manufacturing cannot enjoy the advantages of sequential dependence while the rest of the company benefits from interdependent processes. For example, if Kanban provides operational systems for manufacturing, shopfloor staff will have little incentive to provide information such as schedule dates to the BPCS database even though it is needed by other parts of the firm. Any damage to data quality will have consequential effects on a variety of users. Thus, there are incompatibilities which partitioning the organization cannot solve.

Incompatible organizational fit requirements of the two technical systems means that a Kanban Dynamic that has reached a fit configuration will thereby prevent the BPCS Dynamic from reaching its fit configuration. If incompatible end fit configurations are not recognized, concurrent Dynamics will begin to compete along their respective paths. What are the dynamics by which Kanban and BPCS have come to compete?

In the first instance, competitive pressures in Utilux's markets led it to explore ways of better managing its production processes. BPCS was selected as both providing MRPII facilities and substantially replacing its existing information systems. The BPCS software implementation was unproblematic. A substantial training program was conducted and through the twenty month implementation period staff progressively learned to use BPCS to the minimum level necessary to carry out their work. Training was not continued after the initial period so there was no topping-up and consolidation through a formal process of shared learning and new staff received no formal indoctrination or training but learned on the job. In consequence, few if any staff sought to master the system in breadth and depth.

By the end of 1992, although BPCS was serving some organizational functions well, there were a number of concerns emerging. Increased system coverage had stretched hardware capacity to the point where response times were severely impaired and available BPCS functionality was limited. As a result, difficulties were experienced in providing adequate customer service, sales staff employed workarounds, and for this and other reasons purchasing and production scheduling suffered. The rate of change undertaken in association with BPCS slowed to a crawl and was in some respects stalled. A new release of the software was prepared and implemented but there was no significant organizational change to accelerate the exploitation of the system and there was no incentive to achieve mastery of the system because of its limited functionality and poor response.

Moreover, it was becoming increasingly evident that the system was not supporting shop-floor decision-making concerning the day to day manufacturing job schedules. It is unclear how far this was an outcome of lack of fit between the technology and a problematic business environment, viz its markets and suppliers, and how far it was a problem in the development and understanding of roles and skills and of the provision of the necessary management processes. In other words, it is not clear whether, with different management decision-making, it would have been possible to make BPCS work for job scheduling. This matter is not pursued here because, as indicated earlier, environmental fit is a working assumption.

Market pressures made it necessary to improve delivery to order figures before BPCS had reached maturity. The Kanban Dynamic was initiated when BPCS was stalled while the upgrade was considered and so it was possible to develop and pilot Kanban without competition over resources. The roles and skills necessary for Kanban were readily assimilated by existing staff and even the new management systems, such as the setting of min/max figures, drew on an established set of knowledge based on the company's operations in earlier years. For all that, because it is being introduced incrementally, Kanban has not yet been fully mastered so its fit configuration has still to be reached.

By the end of 1993, following the decision to reinvest in BPCS, there was impetus for both Dynamics but neither had matured to fit. The hardware upgrade had removed a number of barriers to pursuing BPCS mastery. Utilux was thus faced with developing the employee roles and skills and the management processes required for fully effective use of both BPCS and Kanban. At the same time, the extent of their functional applicability was unresolved. So, BPCS and Kanban are now competing for the same pool of scarce resources: time spent extending and mastering Kanban is time not spent mastering BPCS.

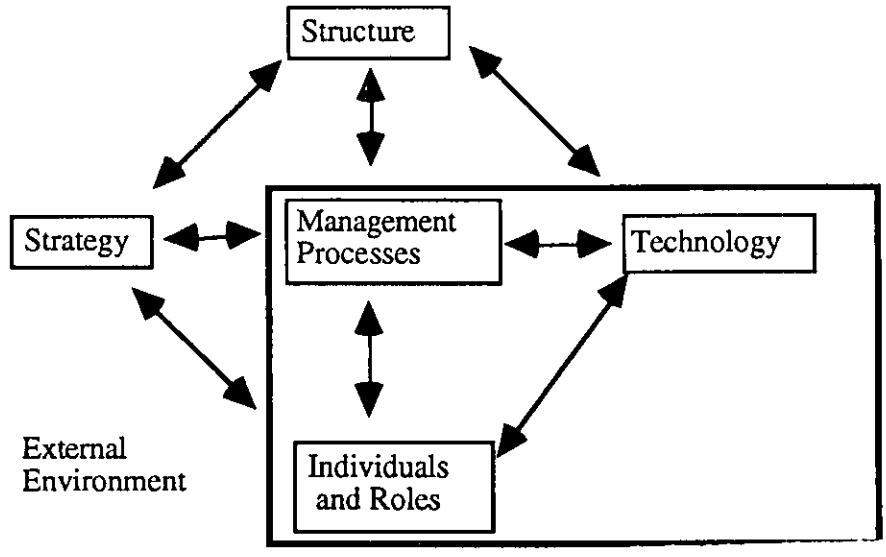

Figure 1. Locus of Competition bewteen the Dynamics
(Adapted from Scott Morton 1991)

The lack of definition of the scope of the two systems is also a source of uncertainty as to which areas of BPCS have to be mastered. This lack of definition also inhibits the development of a robust interface between operational management and production planning functions. It is also a source of potential conflict: witness the proposal to bypass Customer Service by customers faxing the warehouse. In assigning a special oversight and coordination responsibility to the GM (Finance), the MD at Utilux has recognized the likelihood that this will generate difficult problems. In view of the fact that Kanban is strongly supported by the GM (I&E) — he assigned his Manufacturing Manager to develop it — it is likely that a significant cost will be faced in negotiating a workable compromise between centralized and decentralized interests based around BPCS and Kanban respectively.

4. DISCUSSION

It is hardly news that change can be damaging to information systems. What is more surprising, and what the Utilux case demonstrates, is that an apparently compatible change can impede the dynamics of fit for an IT system. In worlds where organizational change is the norm it will be helpful to have some basis for analysis of the various Dynamics. This discussion aims to draw out features of the Utilux case which may generalize to the analysis of other cases where a second Dynamic exists concurrently with that for an IT system.

The example of Utilux involves two Dynamics competing over management processes and work roles and skills. In terms of the MIT90s framework, this is the bottom right triangle only (enclosed by the bold rectangle in Figure 1). However, it should not be thought that competing Dynamics are necessarily confined to this part of the framework. For example, in the spirit of "deviant" pathways to fit (Yetton, Johnston and Craig 1994), we can readily imagine a case in which an IT system is part of a Dynamic which, by making electronic business links with external organizations, locks the company into fixed relationships that are counter to its strategy of adaptive flexibility. More generally, then, we should note that incompatibilities of the fit configurations of two Dynamics can occur anywhere in the components of the MIT90s framework. Conversely, for two Dynamics to be compatible, it is necessary that all the various organizational components (strategy, structure, technology, management processes, and roles and skills) be compatible.

Compatibility of fit configurations does not imply sameness. For example, the skills required for working with Kanban can be assumed to exist in anyone capable of working with MRPII. Although they are not the same, they are compatible. Moreover, apparent incompatibilities can in

fact be compatible if they can be appropriately partitioned spatially or functionally: control processes requiring tight supervision may coexist with more autonomous processes so long as they apply to different functions or different geographical sites. Fit between two Dynamics, then, is essential if both are to yield the full, desired performance benefits. Fit between Dynamics may be reached when there is compatibility of the fit configurations appropriate to the goals of the changes which drive the two Dynamics.

There is, however, a second element to the fit between Dynamics. Analysis of the case showed that not only must there be compatibility of end fit configurations, but also there must be compatibility of the dynamics of the two Dynamics — is, the constituent change activities of which each Dynamic is composed must not compete. The analysis showed timing and interaction to be important.

Time was important to the Utilux Dynamics in two ways. First, delays in supporting the relevant changes, including both the delay in resolving the capacity problem and that in providing long-term follow-up training, caused a reduction in momentum and discouraged the pursuit of mastery. Second, the sequential pursuit of the BPCS and Kanban Dynamics meant that, when BPCS was revitalized at the end of 1993 both Dynamics were established but not mature, thereby ensuring that they are competitor Dynamics rather than Kanban being subsumed by BPCS.

Utilux's situation also demonstrates some of the interaction effects of concurrent Dynamics. One of these is to create competition over the scope of each system and hence over the responsibilities of different functions. The proposal to introduce a procedure in which customer orders were faxed to the warehouse was a proposal to increase the scope of Kanban and to bypass Customer Service. In this case, the existing BPCS order processing procedure won out.

The same competition has created uncertainty over scope. This almost certainly has consequences for the mastery of the two systems. Uncertainty as to the scope of the data and processes each will eventually encompass means that any attempt to exploit either system to its full potential may prove fruitless.

Thus we can see that for concurrent Dynamics to be in fit, not only is compatibility necessary between their end fit states but also that their constituent dynamics must be compatible. The case shows that timing and interaction over scope are both elements which may affect this latter compatibility. It is likely that further research will identify more.

Finally, it is important to draw out a hidden implication of our discussion, viz that incompatible Dynamics can result in a lose-lose outcome in which both Dynamics fail to reach fit. This possibility arises because the extended duration of Dynamics means that, when two Dynamics are not in fit, there will not necessarily be a rapid resolution of their competition. It will not be immediately apparent which of them should or will achieve fit. Lack of mastery will exacerbate uncertainty about scope which will further discourage mastery. In consequence, neither Dynamic matures, stalemate develops, and sub-optimal performance follows. Thus understanding the dynamics of fit in circumstances of incompatible Dynamics leads us to the possibility, or even likelihood, of a lose-lose outcome.

5. CONCLUSIONS AND FURTHER RESEARCH

Previously, the dynamics of IT fit have been thought of in terms of the different possible sequences of change which can lead to fit. This understanding must now be extended.

In moving toward the construction of a theory of the dynamics of IT fit, we now have the following account. IT Dynamics may pursue their organizational fit configuration by differing pathways. A Dynamic reaches maturity when all of the changes have been thoroughly mastered, this mastery being the basis for the performance advantages of the fit configuration. However, there may be barriers to achieving maturity and fit. These include impediments internal to the focal Dynamic as well as concurrent, competitor Dynamics. For IT fit to be reached, any concurrent Dynamics must fit the focal IT Dynamic. Where the fit configuration of a Dynamic is a matter of consistency among organizational components, fit between Dynamics relates to the internal fit requirements of corresponding organizational components and the compatibility of its constituent activities — the management processes required by a fit configuration for the focal Dynamic must be compatible with the management processes required for a fit configuration for the concurrent Dynamic; likewise the roles and skills for the two Dynamics, and so on. Also, the activities which take place in the process of pursuing the two Dynamics must be compatible in respect of their timing and their interactions.

Three conclusions stand out. One, the pursuit of a concurrent Dynamic whose fit configuration is incompatible with that of the focal IT Dynamic will prevent the focal Dynamic from reaching fit with adverse consequences for performance. Two, if the dynamics associated with concurrent Dynamics are not compatible, then the focal IT Dynamic may be impeded from reaching fit. Three, interaction and temporal effects of the dynamics associated with concurrent Dynamics can lead to neither Dynamic reaching fit.

While these three major conclusions contribute to our understanding of the dynamics of IT/IS fit, more research is needed to explore different cases and to develop our concepts further. Some detailed recommendations follow.

In seeking further theory development through research, it will be necessary to relax at least two existing assumptions. First, it has been assumed that there is a fit configuration for any IT Dynamic. This need not be the case if the IT system is not fitted to the organization's wider context. In such situations, there will be a variety of implications for the dynamics of both the focal IT Dynamic and concurrent Dynamics.

Second, it has been assumed that achievement of a fit configuration for compatible Dynamics is path independent in the sense that there are no effects associated with the timing or sequence in which organizational change is made. However, it is quite plausible that two Dynamics might require change to the same organizational component simultaneously but the organization be prepared or able only to change one at a time. The result of this would be to stall one of the Dynamics with adverse consequences for its subsequent continuation. It is likely that such scenarios do occur. When these are observed, the theory will have to be extended to allow for a concept of the fit of Dynamics which also incorporates the synchronization of paths.

Further research can also observe how managers deal with the problems created by concurrent Dynamics. The Utilux case, in which a second Dynamic compensates for shortcomings in the focal Dynamic, is likely to be relatively common. It will therefore pay to discover what are the dominant problems presented by hybrids built from different Dynamics and what are the conditions under which hybrid solutions produce their best performance. For the time being, the analysis and discussion presented here gives the cautious IT manager some pointers as to what to look for when new organizational initiatives are launched alongside existing IT Dynamics.

6. ACKNOWLEDGEMENTS

The authors are grateful to Peter Janssen, Managing Director of Utilux, for permission to research and write about his company. They are also grateful to Jane Craig, Peter Janssen, Kim Johnston, Brian Lee and an anonymous reviewer for constructive comment on earlier drafts.

7. REFERENCES

Allen, T. J., and Scott Morton, M., Editors. *Information Technology and the Corporation of the 1990s: Research Studies*. New York: Oxford University Press, 1994.

Boynton, A. C. "Beyond Flexibility: The Dynamically Stable Organization." *California Management Review*, Volume 35, Number 2, Fall 1993, pp. 58-77.

Boynton, A. C., and Victor, B. "Achieving Dynamic Stability through Information Technology." *California Management Review*, Volume 36, Number 1, Winter 1991, pp. 53-66.

Camillus, J. C., and Lederer, A. L. "Corporate Strategy and the Design of Computerized Information Systems,." *Sloan Management Review*, Volume 26, Number 3, 1985.

Ciborra, C. U. "From Thinking to Tinkering: The Grassroots of Strategic Information Systems." In J. I. DeGross, I. Benbasat, G. DeSanctis, and C. M. Beath (Editors), *Proceedings of the Twelfth International Conference on Information Systems*, New York, 16-18 December 1991, pp. 283-291.

Craig, J., and Yetton, P. "Business Process Redesign: A Critique of Process Innovation." *Australian Journal of Management*, Volume 17, Number 2, 1992, pp. 285-306.

Donaldson, L. *In Defence of Organisation Theory*. Cambridge, England: Cambridge University Press, 1985.

Hamel, G., and Prahalad, C. K. "Strategic Intent." *Harvard Business Review*, May-June 1989, pp. 63-76.

Johnston, K., and Yetton, P. "Managing Information Technology." In T. Coyle (Editor), *Management Manual*. CCH, New Zealand, 1994.

Karmarkar, U. "Getting Control of Just-in-Time." *Harvard Business Review*, September-October 1989, pp. 122-131.

Miller, D. "Environmental Fit versus Internal Fit." *Organization Science*, Volume 3, Number 2, May 1992, pp. 159-178.

Mintzberg, H. *The Structuring of Organizations: A Synthesis of the Research*. Englewood Cliffs, New Jersey: Prentice-Hall, 1979.

Perrow, C. *Complex Organizations: A Critical Essay*, Third Edition. New York: McGraw-Hill, 1986.

Pettigrew, A., and Whipp, R. *Managing Change for Competitive Success*, Oxford: B. H. Blackwell, 1991.

Scott Morton, M., Editor. *The Corporation of the '90s*. Oxford: Oxford University Press, 1991.

Scott Morton, M. "Strategy Formulation Methodologies and IT." Chapter 3 in M. J. Earl (Editor), *Information Management: The Strategic Dimension.* Oxford: Clarendon Press, 1988, pp. 54-67.

Van de Ven, A. H., and Drazin, R. "The Concept of Fit in Contingency Theory." *Research in Organizational Behavior*, Volume 7, 1985, pp. 333-365.

Walton, R. E. *Up and Running: Integrating Information Technology and the Organization.* Boston: Harvard Business School Press, 1989.

Weill, P., and Olson, M. H. "An Assessment of the Contingency Theory of Management Information Systems." *Journal of Management Information Systems*, Volume 6, Number 1, 1989, pp. 59-85.

Yetton, P. W. "False Prophecies, Successful Practice and Future Directions in IT Management." In B. C. Glasson, I. T. Hawryszkiewycz, B. A. Underwood, R. A. and Weber (Editors), *Proceedings of IFIP TC8 Open Conference on Business Process Re-Engineering: Opportunities and Challenges*, Gold Coast, Queensland, May 8-11, 1994.

Yetton, P., and Johnston, K. D. "Competing Forms of Fit in a Professional Bureaucracy: Implications for IT Management." Working Paper 94-013, Australian Graduate School of Management, University of New South Wales, Kensington, 1994(a).

Yetton, P., and Johnston, K. D. "Information Technology and the Dynamics of Strategic Fit." Paper presented to the Academy of Management Meeting, Dallas, Texas, August 1994(b). Also published as Working Paper 93-022, Australian Graduate School of Management, University of New South Wales, Kensington.

Yetton, P.; Johnston, K. D.; and Craig, J. F. "Computer-Aided Architects: A Case Study of Strategic Change and IT." *Sloan Management Review*, Summer 1994.

Yetton, P.; Southon, G.; and Craig, J. "The Impact of Strategic Conflict on the Management of Information Technology in a Hospital." Working Paper 94-003, Australian Graduate School of Management, University of New South Wales, Kensington, 1994.