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Planning Electronic Trading Systems: Re-Thinking IS Practices via Triple Loop Learning

PLANNING ELECTRONIC TRADING SYSTEMS: RE-THINKING IS PRACTICES VIA TRIPLE LOOP LEARNING

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ABSTRACT

It is appropriate for the IS field to examine the suitability of its practices in light of the complexity of developing electronic business systems. Research shows that planning and developing business-to-business electronic trading systems (ETS) is fraught with difficulties concerning the priorities and power of individual organisations. This paper evaluates the usefulness of Triple Loop Learning in managing the diversity associated with planning such systems. The study concludes that approaches associated with Triple Loop Learning can offer insight for managing inter-organisational complexities. The authors propose that such approaches could enhance planning methods for electronic trading systems.

1. INTRODUCTION

Business-to-business electronic commerce requires underlying trading systems. Electronic Trading Systems (ETS) exploit IT capabilities to improve the efficiency of communications or alter the nature of inter-organisational transactions [Kuula, 1995]. E-business has increased the profile of ETS resulting in a growing need to develop implementation guidelines. Planning can contribute significantly to the successful implementation of ETS [Finnegan et al., 1998]. However, it suffers from a paucity of empirical research. Researchers advocate a move towards externally-oriented IS planning processes as the importance of the environment increases. Indeed, emergent approaches to strategy formulation place emphasis on considering external entities. However, developing an electronic trading system involves more than this. As systems become more complex, situations

where one organisation develops a system and simply extends it to others will be inadequate, especially when business processes have to be altered. Early inter-organisational systems (IOS) were developed internally and extended to others. Success had as much to do with serendipity as with planning [Ciborra, 1991]. Such systems had little impact on processes, and used existing IT. As complexity grows, planning is as much inter- as it is intra-organisational.

The perspective of existing systems planning approaches is from a single organisation and its environment, assuming that inter-organisational complexity can be reconciled. In particular, approaches such as those found by Earl [1993] neglect an inter-organisational perspective on design, development, technology management and integration, data storage, manipulation, and sharing. In addition, no explicit consideration is given to non-technical factors - accounting, measurement and reward systems, culture, people, competencies, project management as well as decisions that are more complex inter-organisationally [Ashkenas *et al*., 1995]. This does not mean that planning for electronic business systems and traditional IS practices have nothing in common. Rather, their inter-organisational evolution requires a rethinking of systems planning methods to accommodate an inter-organisational perspective.

In line with Galliers [1999], we propose a reexamination of the appropriateness of existing IS strategy methods and frameworks in electronic business environments. Previous research [Finnegan *et al*. 1999] determined that IOS planning is underpinned by the leveraging of participants' power. This paper examines the worth of Triple Loop Learning [Flood and Romm, 1996] in the context of developing ETS in three networks. Such approaches are a starting point for developing planning guidelines for ETS as they address the power relationship issues that dominate design and debate management.

Following this introduction the paper discusses the theoretical underpinning in terms of IOS planning and triple loop learning. A section dealing with the research method and the case context follows. The three cases are then analyzed in relation to the triple loop learning concept, and conclusions are drawn for ETS planning theory and practice.

2. THEORETICAL GROUNDING

2.1 Inter-Organisational Systems Planning

Research [Finnegan et al, 1999] illustrates that inter-organisational systems planning has more to do with spheres of influence within networks than with technology or organisational structures. Planning processes emerge as a result of an evolving set of inter-organisational planning environments characterised according to the dispersal of power and influence. Inter-organisational planning environments can be typified along a continuum ranging from monarchist to club. The "monarchist" environment is based on a strong organisation with power over others. Planning is traditional, as the dominant organisation can set objectives and design a process that others must meet. The "club" environment is based on the premise that no organisation holds much power. The process is participative as others' needs and expectations must be accommodated. This is a learning environment where strategies tend to evolve [*ibid*].

Planning environments are not structures such as those proposed by Konsynski and McFarlan [1990]; rather they relate to the dispersal of power. Planning environments are consequently an appropriate basis from which to develop planning guidelines as they affect the approaches open to participants and deal with the negotiation/co-operation aspects. Finnegan et al. [1999] propose that planning systems on an inter-organisational basis can usefully focus on nine issues as shown in table 1.

Planning guidelines should:
1. enable organisations to investigate their network position and determine their role in the planning environments
2. facilitate design of planning processes for individual organisations, and at a network level, appropriate for their role in the planning environment
3. delineate inter-organisational roles and assigning people to these consistent with the planning environment
4. co-ordinate network participants in efforts to match business requirements with systems infrastructure consistent with appropriate planning environments
5. determine effects of IOS on organisational activity recognising the dependence of such considerations on planning environments
6. proactively determine organisational changes that facilitate the consideration of external parties
7. aid inter-organisational planning for structural integration recognising substantive issue as being beyond systems and technology
8. cover data planning issues of ownership, sharing methods and editing rights
9. facilitate systems and technology planning that is inclusive of all stakeholders, considering communications standards, protocols and integration with internal systems

Table 1: Planning guidelines

These guidelines require organisations to evaluate the appropriateness of their actions within the context of inter-organisational power relationships. While guidelines propose what organisation might do, they do not show how. There is a need to analyze organisational experience in light of understanding of existing methods in order to hypothesise the types of potential intervention. It is suggested that IOS planning should encourage learning about diverse requirements, while being conscious of the impact of organisational priorities and influence. Triple Loop Learning [Flood and Romm, 1996] offers potential as IOS planning is dominated by spheres of influence termed 'planning environments', which necessitate learning and the consideration of power play in the planning process.

2.2 Diversity Management and Triple Loop Learning

Flood and Romm [1996] propose that "Diversity management is about managing the increasing diversity of issues that confront humankind…– how to choose between models, methodologies and theories…Management means that these choices…are thought through intelligently and made responsibly. Intelligence and responsibility are the defining features of Triple Loop Learning". There are three types of single loop learning, each with a specific focus. The first asks whether something is being done right, i.e. design management. The second asks whether the right things are being done, in recognition that the identification of things to do is problematic i.e. debate management. The third centers the issue that rightness is often buttressed by mightness, and mightness by rightness, resulting in very little learning at all, i.e. might-right management [*ibid*]. Triple loop learning establishes tolerance between these three loops. Useful approaches are shown in table 2.

Loops	Useful Approaches
Design Management	Hierarchical Relationships [Ackoff, 1994] Democratic Hierarchy [Ackoff, 1994] Organic Organisation [Beer, 1989] Viable Systems [Beer, 1989] Community Organisations [Davies, 1988] Postmodern Organisation [Hannigan 1995] Quality Management [Flood 1993] BPR [Hammer and Champy, 1993]
Debate Management	Action Learning [Mason and Mitroff, 1981] Participatory Action Research [Whyte, 1991a] Action Science [Whyte, 1991b] Strategic Assumption Surfacing [Mason and Mitroff, 1981] Soft Systems Methodology [Checkland, 1981] Postmodern debate [Bauman, 1992]
Might–Right Management	Dialogical Intervention [Holscher and Romm, 1987] Critical Systems Heuristics [Ulrich, 1983] Collaborative Inquiry [Reason, 1994] Self-Reliant Participatory Action Research [Fals-Borda and Rahman, 1991]

Table 2: Approaches at each learning loop

3. RESEARCH METHOD AND CONTEXT

This study analyses the theoretical usefulness of the concepts of triple loop learning in the context of planning inter-organisational ETS. Usefulness is operationalised as improving intelligence and responsibility [Flood and Romm, 1996]. Intelligence is defined as the capacity to acquire and apply knowledge, while responsibility is defined as the ability to act without guidance or superior authority.

Given the exploratory nature and the need to obtain rich data in complex inter-organisational contexts, a case study approach is adopted. 'A case study examines a phenomenon in its natural setting, employing multiple data collection methods to gather information from a few entities. The boundaries of the phenomenon are not clearly evident at the outset of the research and no experimental control or manipulation is used' [Benbasat *et al*., 1987]. Cases are most appropriate when the objective involves studying contemporary events, without the need to control variables or subject behavior [Yin, 1989]. Pettigrew [1992] proposes that context and action are interwoven in the study of strategy and it is important to consider the past and present when looking to the future. This further justifies the choice of a case method, as it emphasises contextual understanding and emphatic research objectives. Within the case method, a multiple case study research design was devised to facilitate the context data collection within a natural setting. Eisenhardt [1989] suggests that fewer cases are more suitable when there are mini cases within the larger ones, as here. Three inter-organisational networks were selected on the basis of type, structure of network, type of planning experience, technology and systems. The study examines the planning processes within the network. The cases illustrate diversity in the nature of networks rather than any preconceived notion of best practice.

Network 1 operates in pharmaceuticals and uses an open standard ETS, co-operatively developed by wholesalers and pharmacies to share information on product pricing and availability, and to act as an electronic market. This system was developed co-operatively so as not to allow any individual wholesaler to 'tie in' pharmacies.

Network 2 uses EDI-based ETS operating between a retail grocery chain and its suppliers, incorporating invoicing, catalogues, credit notes, and dispatch advice. While the system was originally designed by the supermarket and 'pushed' to suppliers, some of these have proactively adapted their internal operations and systems to take advantage of the ETS.

Network 3 is a group of 15 independent organisations, operating virtually providing on-line products and services. The technology differs from the other networks, as the Internet is the main infrastructure putting more emphasis on applications rather than infrastructure planning than is evident in networks 1 and 2.

Different planning environments operated within the networks. However, Network 2 can be characterised as monarchist, and Network 3 tended to club, with Network 1 operating in-between. However, technical issues in Network 3 were generally approached in a monarchist manner.

A combination of data collection methods was used. The primary methods were interviews and document analysis. Interviewees depended on willingness to co-operate, involvement in systems implementation, nature of knowledge, and seniority. Approximately ten decision makers were interviewed in each network ensuring that all key staff were interviewed. They had technical and general backgrounds, and were senior and middle managers.

4. ANALYSIS AND DISCUSSION

A review of the guidelines (Table 1) indicates that IOS planning guidelines have to enable all learning loops. All guidelines necessitate consideration of whether the network or firm is 'doing the right things' and whether 'rightness is buttressed by mightness or vice versa'. It is this consideration of rightness and mightness that is at the core of the previously discussed planning environments. In addition, guidelines 2, 5, 8 and 9 point to the need for the first loop; a consideration of whether 'we are doing things right'. However the principles of triple loop learning indicate that interventionists in systems (planners) must consider each loop as part of the overall process. The paper now considers the potential usefulness of triple loop learning for planning ETS on an inter-organisational basis given the experience of the networks studied.

4.1. Loop 1: Design Management

Design management is concerned with organisational design and process design. The guidelines identify needs for both: for individual organisations and for the network. An organisation must consider its own design in relation to the network needs and ask whether they are 'doing the right thing'. In addition network design on an inter-organisational basis must be considered.

The research demonstrates that organisational and network design is not clearly addressed as part of the planning process. There is no evidence that organisations considered their design as a consequence of their network involvement. The pharmaceutical and retail networks evolved as extensions of existing transactional relationships. Organisations in Network 3 did not have a pre-existing relationship. Yet, each network sought clarification regarding design in its efforts to understand what was happening. The bottom-up approach to design led to structural changes that were never considered as a consequence of network involvement resulting in design being considered at a stage that was too late to affect any real change to what was evolving.

In terms of affecting processes, the cases reveal that ETS begin as a technical issue that tends to spread into other organisational facets. A pattern emerges whereby IT staff champion the IS/IT, and convince senior management and functions to adopt it. When systems become stabilised, they become the responsibility of functions. Process changes occur at this level rather than as a result of top-down planning. However, some procedures are developed as part of the process.

The effects of ETS on structure are not considered by their implementers. The potential of systems to affect structure was realised, but not planned for. According to one partner (Network 3), *'as a virtual organisation, a completely new organisational structure was being created'*. However, while at a high level this structure was planned, roles and their consequential structural issues emerged as opposed to being formulated, '*The structures being created were dependent on the organisations involved. These centered on areas of expertise, and evolved more than were planned'*. When the planning process considered explicit roles and tasks in the context of delivering a commercial product, it based many decisions on roles that participants already fulfilled. While this avoided the need to explicitly consider design at this stage, some participants accept that many of the real network benefits were not realised because of the failure to consider design at an early stage.

In Network 2, network design was a secondary issue to technology implementation. According to the IS manger in a wholesaler "*electronic trade is now seen as central to the distribution nature of the organisation's activities*". However, decisions as to whether electronic trade should be adopted in such a manner were never made. Decisions to implement ETS were made at such a low level that the full design implications were never fully considered. Individual organisations were later faced with accepting structural changes that were never foreseen as a consequence of network involvement. Another IS manager in Network 2 saw how her action in relation to electronic trading had far-reaching consequences, "*electronic trade has become part of the business strategy rather than business strategy driving electronic trade*".

The issue of process and structural design was different in the pharmaceutical network. Wholesalers saw electronic ordering as key to supply chain efficiencies. Pharmacists had similar ambitions. They were "*keen to reduce time spent on administrative duties such as ordering*". While structural consideration is not a major concern at a network level here, individual players viewed process and structural changes as an important benefit of electronic trading.

Analysis indicates the networks would have benefited from a more explicit consideration of design in the context of inter-organisational activity. While the structural techniques shown examine organisation design from an intra-organisational perspective, a more formalised process within individual organisations and at a network level would have led to a more thorough consideration of the process and structural issues. A possible addition to the design techniques (Table 2) is Kumar and Van Dissel [1996]. They examine design from the perspective of inter-organisational relationships. Examination of network relationships reveals that Network 1 can best be described as pooled interdependence, Network 2 as sequential, and Network 3 as reciprocal interdependence. While no consideration was given to whether the inter-organisational networks studied were 'right' given these inter-dependencies, the issue of relationships was often central to implementing systems. Such considerations undertaken in light of existing approaches to structural and process design may result in the adoption of more appropriate processes and structures than the ad hoc approaches used, resulting in a more intelligent and responsible process. This is in line with 'goodness of fit' in that the structure must be in line with the predisposition of members. Consequently, it is necessary to consider design management in light of debate management.

4.2. Loop 2: Debate Management

Debate management is concerned with learning and understanding from the process of debate. Central is that people are informed of issues, given the opportunity to participate, and influence the outcome. The key is to arrive at a relevant decision - one that is well considered given the process of debate. Analysis indicates a need for a transparent process for establishing whether the 'right things are being done'. This is important given that many decisions were local without reference to wider implications. Debate took place, but not always involving appropriate parties.

Planning begins as a learning process where organisations attempt to find out about ETS and technologies, and their application in specific circumstances. This creates a business argument, used

to conceptualise the nature of the systems. This process is inter-woven with issues of the nature of data to be exchanged. Finally, an implementation process is planned. A dominant partner who imposes or sells these decisions to trading partners may undertake all these. Alternatively, the processes can be more co-operative. Nevertheless, knowledge or experience of the technology elsewhere proves an advantage in convincing partners to support the ideas. Even with a strong proponent, planning requires lower level decisions. Planning decisions are taken in one of two ways. First, issues are debated to reach a solution. Second, a decision is made by one organisation and then 'sold' to others. Many of these decisions concerned details of technology or process requirements. Power and influence of key players are an important element, regardless of whether the decision process is by negotiation or by decree. The hub firm and the VAN in the Network 2 made the technical decisions. Decisions in others were more co-operative. However, partners with technical expertise were influential. Nevertheless, the nominal involvement of interest parties made implementation of technical decisions easier.

In Network 2, debate about key systems was non-existent outside the hub organisation. Suppliers saw little reason for many aspects of the system they implemented at the request of the hub. This created suspicion about the intentions of the hub resulting in limited co-operation beyond that necessary to continue trading. The hub IS manager did not see a problem with this, "*while the actions of external entities may limit…ambitions, there is seldom a need to involve external organisations in a joint planning procedure*"

Debate in Network 1 was more open, as explicit inter-organisational working parties were established to agree on requirements, processes and technologies. One pharmacist acknowledged that "*individual organisations have vested interests in having specific coding systems chosen*", but that "*an agreement is more likely to be accepted if someone can support their argument with evidence from elsewhere*". However, one wholesaler IT manager bemoaned the absence of a strong controlling organisation during this debate as "*in the absence of policing, individual organisations held up the implementation because their activities were not controlled*". He believed "*planning would have been much easier if you could control both ends. Things are more difficult when it is necessary to co-ordinate independent parties*". However, efforts at discussion became easier. One pharmacist thought "*achieving co-operation is the hardest part of the process…however, once you get co-operation on one issue, you create a precedence which helps the next time*".

A similar situation was evident in Network 3. Formal meeting were held monthly involving key individuals. These were often contentious, but served to get agreement on actions. Both these networks gave greater consideration to individual needs and network options as a result of debate. However, the process of debate was difficult. One meeting was adjourned so the discussion could continue using a GroupWare product that provided an anonymous bulletin board. The idea behind was to provide "*less vocal participants with a say*", according to the chairperson. This bulletin board gave structure to the ensuing debate and a wider variety of opinions were considered.

Debate management is a key aspect of planning ETS acceptable to a broad range of participants. However, debate is difficult given their different objectives. Some techniques (Table 2) are worthy of further consideration. Revans [1982] sees action learning as important in situations where "one is facing conditions previously unknown" as managers can help each other by debating when there are no rules. Participatory action research has potential as Whyte [1991a] begins by wondering "how the intellectual contributions of underdogs could be incorporated into work process in ways that would improve the underdog's lot as well as increase organisational efficiency". Focusing more on interpersonal relationships and intrapsychic processes, action science (AS) "assumes that beginning to learn new ways of thinking and feeling should precede embarking on new courses of action…[consequently] AS calls for a detached observer to document in detail the intervention process" [Whyte, 1991b]. The systems approaches of Strategic Assumption Surfacing and Testing (SAST) [Mason and Mitroff, 1981] and Soft Systems Methodology (SSM) [Checkland, 1981] offer a more organisational basis to debate. SAST challenges accepted modes of operation by surfacing and challenging assumptions made in policy formulation. It is designed for organisational arenas where

there is conflict. However, as is evident from the cases, these approaches will have to deal with situations where the organisational or competitive power of participants affects the debate. Considerations of might – right management are made next.

4.3 Loop 3: Might – Right Management

Loop 3 is reflective and considers how design and debate management are undertaken in context of the underlying power plays. Decisions regarding design and debate management in the networks are influenced by power. It is here that the planning environments are most evident. Individual organisations often sought outcomes that preserved their status quo rather than advanced the network. Consideration of ETS planning within the context of triple loop learning may prove most beneficial as it may result in a more transparent process for less powerful organisations.

ETS are based more on the strategies of individual organisations rather than on a network strategy. These strategies led organisations to work together, and, often, the network strategy emerged from the collective strategies of participants rather than being formulated in advance. However, where one organisation had a more powerful market position, their strategy became the default network strategy. Lower level decision making and planning appears, therefore, from negotiation among participants based on their own goals. At this level key decisions are made regarding systems, data and technology.

Power emanated from two sources; (a) positional power due to competitive position and, (b) personal power due to the characteristics of representatives. Leveraging such power was central to design and debate outcomes.

Leveraging positional power was evident by the hub Network 2. Such power ensured planning was conducted in a monarchist-type environment. This organisation planned and developed the electronic trading system around its own needs, then requested suppliers to use the system. The hub IS manager believes "*suppliers will say that they invested because we pressured them to do* so". This was normal according to the retail sector manager in the VAN. She believes "*the hub sets its objectives, decides on how to move forward and then draws up a list of suppliers*".

Positional power was leveraged in a different manner in the Network 1. It came to the attention of pharmacists that some wholesalers were planning to introduce electronic ordering. Pharmacists feared that this would lead to "*a similar situation to American Hospital Supplies…and we didn't want to get tied into an individual supplier*". Through their representative body, pharmacists approached a number of wholesalers with an offer to develop a proprietary protocol used by a co-operatively developed system. This leveraging of positional power by many independent pharmacists led to competing pharmacists and wholesalers co-operating on the electronic system.

Personal power was evident in Network 3 where representatives could consistently get support due to personal characteristics rather than their organisations' influence. One individual with strong leadership skills played a dominant role despite representing a small organisation. The second example of yielding personal power was in relation to technical skills. These people were allowed a lot of input into discussions because of their technical knowledge, even when the matter was not technical. A slightly different leveraging of personal power to reverse positional power was evident in the Network 2. A determined IS manager in a wholesaler managed to convince the IS manager in retailer to request that the wholesaler introduce an electronic trading system. She managed to get her organisation to introduce the system as "*a request from a major customer is strategic enough to get the board's approval*".

Sometimes leveraging power is a necessary aspect of doing business. The issue for planning ETS is whether such leveraging has adverse effects on design and debate management. Techniques (Table 2) appear useful. The most promising is Critical Systems Heuristics which aims to highlight how planning can be guided by exclusionary rationalities so that those worse affected by plans are excluded by the manner in which plans are presented [Ulrich, 1983]. Self Reliant Participatory Action Research

may prove useful in dealing with consultants or technology professionals as it aims to treat professional opinion as an input to dialogue rather than a package of knowledge to be passed on. Reason [1994] sees Collaborative Inquiry as a way of getting individuals to question their conduct in order to encourage more effective future participation.

5. CONCLUSIONS

Our research indicates that the concept of triple loop learning is useful in explaining much of the evolutionary activity labeled 'planning' in relation to ETS. The organisational aspects of the current planning activities lead to decisions regarding design and debate management that favor more powerful players. Consequently, the principles underlying triple loop learning appear useful for effecting planning guidelines in a manner that may be more intelligent and responsible regarding inter-organisational choices.

We found that planning tends to have similar features in all networks, despite a lack of formal debate on the form it should take. Planning on an inter-organisational basis displays some characteristics of the organisational IS planning approach as proposed by Earl [1993] in that it is a continuous decision activity shared by business and IS. Planning is however a negotiation tool used by participants to establish inter-organisational arrangements and delineate systems products. It contributes to the development of ETS by helping to establish co-operation, negotiating systems and other details within the confines of inter-organisational influence and objectives. Overall, it is clear that existing processes suffer from excessive power-play in relation to design and debate management. Planners are consequently advised to customise methods and approaches to suit the inter-organisational planning conditions.

Triple loop learning enables us to unpack the inter-organisational power play of planning ETS in a manner that distinguishes the power-play from the decisions regarding systems and process changes. The constituent approaches offer opportunities for extending IS planning methods to consider electronic trading systems in a manner that recognises the inter-organisational power relationships surrounding design and debate management. However, further research is required to determine the fit between particular triple loop learning approaches and individual IS planning methods.

Overall, we have taken up the call by Galliers [1999] to rethink IS strategy in light of emerging developments in electronic business. Our study indicates that electronic business systems will challenge our perception of IS strategy in that we will have to be more conscious of organisational and behavioral aspects of inter-organisational relations in our approaches to strategy. However, we should be challenged to extend our planning approaches rather than abandon them.

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