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Editorial:

E-Business and Information Systems Research - Towards a common research agenda

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Abstract

This special issue was born from a Workshop organized by the e-Business & e-Government Special Interest Group of the British Academy of Management (BAM), held on the 3rd-4th May at Brunel University Business School in London. The central theme of the workshop was on the relationship between e-Business and Information Systems (IS) research.

Keywords: e-business, information systems, research agenda

EDITORIAL

This special issue was born from a Workshop organized by the e-Business & e-Government Special Interest Group of the British Academy of Management (BAM), held on the 3rd-4th May at Brunel University Business School in London. The central theme of the workshop was on the relationship between e-Business and Information Systems (IS) research. Over 40 participants from all over the UK gathered at the event to present, discuss and debate relevant issues concerning the common research agenda between these two overlapping but increasingly distinctive fields of inquiries.

Over the last 10 years or so, e-Business and e-Government research has evolved and expanded considerably, and it has now become firmly established as a field of inquiry with growing academic, practical and policy interests. This raises serious issues with regard to its relationships with IS research, especially in terms of their focuses, boundaries, target audiences, as well as key research questions, as rapidly evolving disciplines.

Back in the 1990s, there were intense debates about the nature and scope of IS as a discipline. The UKAIS defined information systems as the means by which 'people and organisations, utilising technologies, gather, process, store, use and disseminate information'. The domain involves 'the study of theories and practices related to the social and technological phenomena, which determine the development, use and effects of information systems in organisations and society'. Such a broad perspective was echoed by international IS organizations, such as the International Federation for Information Processing (IFIP), especially its working group 8.2, which focuses on the interactions between information systems and organization. The debate generated rapid theoretical and methodological developments in the 1990s with increased the profile of the researchers involved. However, by the late-1990s, the IS community was so concerned with the nature of the discipline and the various conceptual and methodological issues involved that many other important aspects of the IS domain were increasingly side-lined. The shift was clearly reflected in the focus of IS conferences and journals, which somehow helped to alienate many IS researchers who were primarily concerned with the applications and business impacts of information systems, as well as the practice communities that IS was supposed to serve and inform.

Also during this period, the Internet was opened up for commercial exploitation, and e-Commerce and e-Business increasingly captured the attention of people from many different domains. Different from IS research which focuses on the means by which 'people and organisations, utilising technologies, gather, process, store, use and disseminate information', E-Business and e-Commerce research focuses on using electronic means to facilitate new ways of buying and selling, servicing customers, collaborating with business partners, and conducting transactions within an organisation. In particular, research and applications were extended rapidly from the initial focus on dot.coms and Internet only companies and buying and selling via electronic channels, to wider issues including transforming existing businesses through the Internet and related technologies; integration within and between organisations and breaking down organisational barriers and boundaries; and enabling new ways of doing things that were not possible in the past via Internet and related technologies. The interest was so strong that even the dot.com crash of 2001 failed to dampen enthusiasm for very long, and by 2005 there were already talks of a 'Second Internet Boom', characterised by the rapid developments of social networking, SOA, Web2.0, Skype, Youtube, iTune, mobile devices, RFID, and MMORPGs, to name but a few. New technologies, applications, ideas and new companies are constantly emerging which helped to sustain the enthusiasm.

Today, both e-Business and information systems research are doing well, but perhaps for different reasons, and in subtly different ways. Despite the apparent common ground between them, the divergence – and the gap between them - is also growing rapidly. It is important for us to reflect on the nature and scope of our work and coordinate our efforts more effectively. At the Brunel workshop, all the participants agreed that there were many mutually beneficial opportunities for collaborations in research and publications and in influencing practice, policy and public perceptions. The presentations and debates at the workshop highlighted some of the key issues, explored common interests and identified a number of ways forward. In particular, new opportunities for collaboration between e-Business and e-Government researchers and IS specialists have been identified, as well as the need for stronger links between the e-Business and e-Government SIG with various IS communities, such as the UK academy for Information Systems (UKAIS).

This special issue of the International Journal of Business Science and Applied Management is dedicated to continuing and sustaining our discussions and debate of the relationship between e-Business & e-Government and information systems research. We hope it will help contribute to the development of a common agenda. After the Brunel workshop, all participants were encouraged to submit their papers to this special issue and an open call for papers was also released. Many papers

were received, and each of them was double blind reviewed. This special issue will only publish three papers that have successfully gone through the review process in time. Several further promising papers are currently being revised by the authors and some of them will appear in future regular issues of this journal. We hope this special issue will serve to stimulate further debates, and your ideas, comments, suggestions and criticisms are most welcome. I can be reached by email at Feng.li@ncl.ac.uk

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Deferred Action: Theoretical model of process architecture design for emergent business processes

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Abstract

E-Business modelling and ebusiness systems development assumes fixed company resources, structures, and business processes. Empirical and theoretical evidence suggests that company resources and structures are emergent rather than fixed. Planning business activity in emergent contexts requires flexible ebusiness models based on better management theories and models. This paper builds and proposes a theoretical model of ebusiness systems capable of catering for emergent factors that affect business processes. Drawing on development of theories of the 'action and design' class the Theory of Deferred Action is invoked as the base theory for the theoretical model. A theoretical model of flexible process architecture is presented by identifying its core components and their relationships, and then illustrated with exemplar flexible process architectures capable of responding to emergent factors. Managerial implications of the model are considered and the model's generic applicability is discussed.

Keywords: service science, Theory of Deferred Action, theoretical model, business process, process architecture, emergence

1 INTRODUCTION

The term *process architecture* describes artefactual objects resulting from designing and implementing business processes and the supporting IT systems. This is *planned* architecture. Process architecture and business organization should be in reciprocal relation to each other to improve business performance. The reciprocity is between organization and its IT systems. Research into process architecture has focused on practical aspects resulting in a body of literature on business process modelling (Miers D 1994; Elizinga D, Horak T et al. 1995; Georgakopoulos D, M et al. 1995; Reijswoud V, Mulder H et al. 1999). Less research is evident on building models based on theory, see for example Shaw et al. (2006) The question considered theoretically in this paper is how business process designers can model changing processes involving uncertainties, unpredictable futures, and non-standardisable business processes. This type of business process is termed emergent business processes (EBP) and it is not amenable to planned architecture design.

A search of leading business and management journals revealed that there is little research into the *theory* of process design. The journals consulted were Harvard Business Review, Academy of Management Journal and Academy of Management Review for the period 1999-2006. Slack (2005) proposes a model and Larger and Horte (2005) a taxonomy indicative of emerging theoretical perspective on process architecture design. This is in contrast to editorial support for theoretical work in management in general (Kilduff M 2007).

Editors of leading management journals and information systems journals value theory building and theory publishing (Weber R 2003). Researchers in information systems have proposed theoretical models to explain IT systems design for organizational knowledge management (Markus M L, Majchrzak A et al. 2002) and executive information systems (Walls J G, R et al. 1992). In business and management, there is little similar theory proposed for process architecture design. Shaw et al., (2007) propose a theory-based process architecture capable of evolving with business process change. They state that: 'there is no theoretical basis for any assembly of business process model constructs that we have seen.' (p.95). Kettinger and Grover (1995) propose a theory of business process management. A theoretical model of process architecture design is proposed in this paper to improve theoretical process knowledge and to address the general gap in theory building for process architecture design. The theoretical basis of process architecture design in general is weak.

Theoretical understanding provides a sound basis for designing process architecture. The central question addressed here concerns the kind of process architecture design required for emergent business processes. A theoretical understanding of process architecture design should enable appropriate responses to emergent organization – its processes and the associated process information and process knowledge. This paper addresses three related problems in process architecture design: emergent organization, planned business change, and emergent business processes (also termed non-standardisable processes). The crucial interrelationship among these problems is not addressed in the research literature.

Theoretical models can draw on two types of theory: variance theory or process theory (Soh C and Markus M L 1995). Variance theories explain the variations in the magnitude of a certain outcome and are better at explaining 'why' something happens. Variance theories are also called linear models because of the use of linear equations to model phenomena. Variance theories do not explain well situations where the outcome is uncertain – sometimes occurring, sometimes not. Such situations indicate that the necessary conditions are not sufficient to produce the outcome. Process theories better explain situations where the causal agent is not sufficient to produce the outcome. Process theories explain 'how' something happens. They are better suited to explain process architecture design for emergent organization, as the outcome is uncertain in emergent organization and the causal agent alone is insufficient to produce the outcome.

Drawing on process theory, this paper presents a theoretical model of process architecture design for emergent business processes and emergent organization in general. Its focus is on emergent business processes. It explains process architecture design and suggests design strategies for process architecture in emergent organisation. The theoretical model is based on the postulate of emergent organization, which is evidenced in the next section. Definition of business process in the context of emergent organization is then discussed. These preliminaries aside, the theoretical framework for the theoretical model is outlined in the following two sections. First, the Theory of Deferred Action, a process theory of action and design, is outlined as the base theory for developing the theoretical model. Then the 'non-trivial machine' cybernetic concept and the active model modelling concept are presented. The theoretical model draws on these concepts to improve EBP design. This sets the background for elaborating the theoretical model of process architecture design for EBP. The theoretical model is illustrated in the penultimate section with exemplar process-oriented IT systems.

The concluding section is a summary and description of further ongoing theoretical and design research in process architecture design.

2 EMERGENT ORGANISATION

A business model and its internal logic can be specified to form the basis for process architecture design. Many entities composing business processes can be predicted. In a supply chain the supplier, materials, quantities, locations, and times when required can be predicted. In the main, business rules, organizational processes, procedures, and policies can be determined, predicted, and specified. Business activities engendered by implementing business rules can be used to design the activities of business processes.

However, emergent organization differs from organization that can be so specified. By definition, emergent organization cannot be determined, predicted, and specified. The term 'emergent organization' is used to describe three related process architecture design problems: emergent organization, business change and associated change management, and emergent business processes (non-standardizable processes).

Emergent organization posses a problem for process architecture design. Emergence is a characteristic of organization affecting routines, structure, and process information needs. Feldman's (2000) study of organizational routines shows how even routines are a source of continuous emergent change. A later study shows organizational structures to be emergent, affecting organizational resources planning (Feldman 2004). In organizational knowledge management research, emergence effects organizational knowledge processes (Clarke and Patel 1995; Truex D P, Baskerville R et al. 1999). Markus et al. (2002) identify organization design knowledge processes as emergent having implications for designing supporting IT systems.

Frameworks and theories are proposed to explain the effect of emergent organization on IS development (Clarke and Patel 1995; Truex D P, Baskerville R et al. 1999; Markus M L, Majchrzak A et al. 2002; Warboys B, Snowdon B et al. 2005). Patel (2006) makes emergence a central postulate for designing artefacts that are connected to human (organised) action. 'Emergence is an unpredictable affect of the interrelatedness of multifarious purposes and the means to achieve them that is characteristic of social action. By implication, emergence is the nonspecifiable constraint on rational design because it cannot be determined as design objects, it is off-design.' (Patel, 2006:12). Emergence is sudden and unexpected change indicative of complexity in social systems. It requires process architecture responses in context.

Allied to emergent organization is the second problem of how expected or planned business change can be factored into process architecture design. Research in this area focuses on strategic organizational change. Such change management differs from emergence because change management is amenable to planning and can be predicted. Among those who have proposed change management models are Gordon et. al's (2000) integrated model of change forces focusing on strategic change and Boddy et al.'s (2000) model of supply chain partnering. The third problem of EBP (non-standardisable processes) is discussed in the next section.

3 BUSINESS PROCESS

Business processes are of two types standardisable and non-standardisable. The attributes of standardisable processes can be known in advance making the input-process-output relationship invariant and more amenable to design. A business process has specific inputs that are converted into predetermined outputs by a series of value-added tasks for the benefit of customers and resulting in a revenue stream for the business. Such a definition of business process assumes that inputs and outputs are invariant, implying also that the process by which the inputs are converted into outputs is invariant too. Standardisable business processes contain predictable routines and structure. A production process would have certain plant and equipment, human resources, energy and material inputs that are converted into products/services and revenue. Invariant process can be well-defined processes with high volumes, low variation in order and delivery, and short lead-times, where complexity is less and experiential learning is useful.

In contrast, attributes of non-standardisable processes (emergent business processes) only become cognizant in context, making the input-process-output relationship variant and less amenable to specification and predetermined design. Non-standardisable business processes are non-routine and contain many emergent properties that cannot be known in advance. Project management business processes and jobbing process are examples of non-standardisable business processes. Routines and

structure are not possible to determine for non-standardisable processes. Non-standardisable processes are highly affected by emergence. As evidenced above, emergence affects even organizational routines and structure.

Research into manufacturing processes shows the uniqueness quality of non-standardisable business processes. Hayes and Wheelwright's (1979) product-process matrix is a tool for analyzing the strategic relationship between the product life cycle and the technological life cycle. It characterises the production process as evolving and staged, moving from highly flexible, high-cost process towards increasing standardization. The stages themselves are characteristic of different process structures found in other business activity such as projects, jobbing, and one-off processes. These are non-standardisable processes whose input-process-outputs vary. Such processes are evident in organizational work involving innovation, knowledge management, project management and other knowledge-intensive business processes. Marjanovic (2005) concludes that knowledge-intensive processes cannot be 'fully pre-defined' and, for this reason, 'automation of this process is neither desirable nor possible.' Here we argue that it is possible to apply IT to non-standardisable or emergent processes.

Theoretically, the key to information management is process architecture design. Data and information is the reciprocal of business process and organisational structure. Ould (2003) classifies process into: core processes, management processes, and support processes. As a support process, sales order process generates data and information on customers, products, delivery and other support activities. Such processes are data intensive. As a management process, process management is highly information-intensive supporting management decision-making. IT is central to process architecture design because it can capture process data and process it to deliver process information for management. IT enables processes and is the basis for designing process management systems.

The term emergent business process (EBP) describes non-standardisable processes that are dynamic, evolving, knowledge-intensive business processes (Marjanovic O 2005). Markus et al. (2002), define EBP as:

- an emergent process of 'deliberations' with no best structure or sequence;
- highly unpredictable potential users and work contexts; and
- information requirements that include general, specific and tacit knowledge distributed across experts and non-experts.

Markus et al (2002) cite strategic business planning, new product development, and organisation design as examples of EBP. To design process architecture for emergent organization, there are four significant aspects of EBP to be considered:

Predictable business change

Process architecture should be designed for ease of change to facilitate predictable or planned business change. Such business change can be predicted and planned, and it requires process flexibility. Shaw et al. (2007) define flexibity as 'the ability to change organizational capabilities repeatably, economically and in a timely way.' (p.92) Predictable business change occurs because organizations want to improve their performance, efficiency and effectiveness to counter competition and to respond to market change. The elements of the change programme are known. Current process management, modelling, and design techniques assume predictability.

Emergence

Emergence differs from predictable business change or planned change because it is unpredictable and sudden. Process and information requirements emerge. Emergent process has no best structure or sequence. It is not specifiable for the purpose of deliberate design. However, EBP do coexist with standardisable processes.

Process actors

Emergence suggests a greater role for organizational actors involved in process enactment. Ould (2003) calls them 'process actors'. They are the process owners who are responsible for the performance and continuous improvement of processes. They are prerequisite of process design and Ould proposes that they should be enabled to design processes. Process actors capable of designing are necessary for EBP, which is a key concept of the Theory of Deferred Action discussed in the next section.

Reciprocity

Organizational process design and IT systems design should be consistent. Snowdon and Kawalek (2003) observe that the design of IT systems affects organization and the design of organization affects IT systems. There is a reciprocal relation between them. The emergence that affects organization also has an impact on the supporting process architecture.

These four issues are integral to process architecture design. What is an appropriate conceptual basis for process architecture design in this context? How should process support IT systems be conceptualised? A potential action and design theory capable of addressing these issues is outlined next. It forms the basis for the proposed theoretical model.

4 THE THEORY OF DEFERRED ACTION

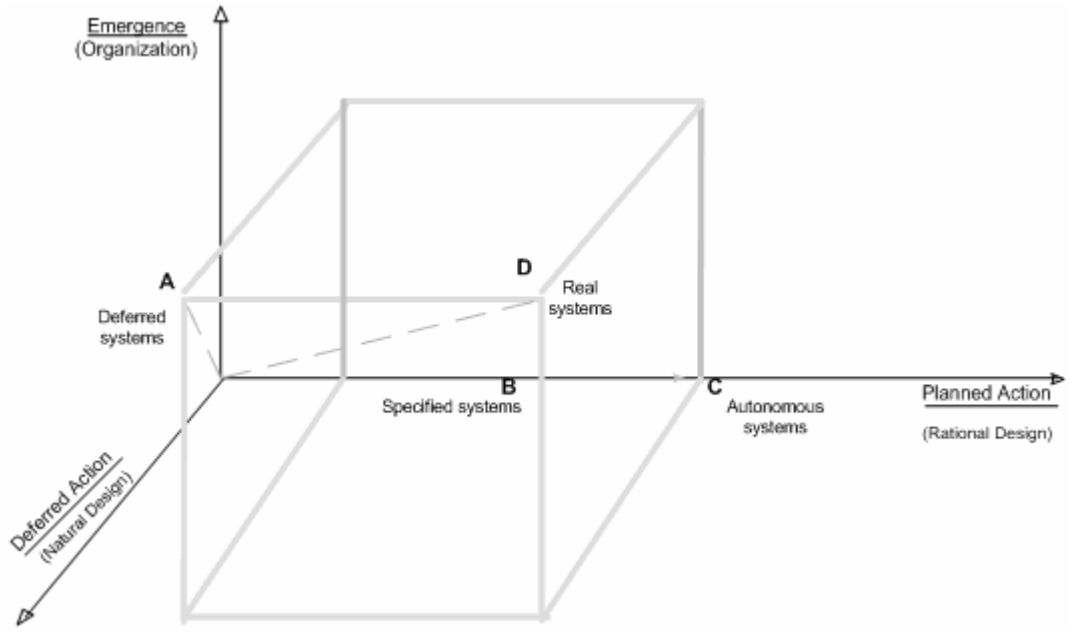
Gregor (2006) elaborates the nature of theory in information systems by demarcating five interrelated types: (1) theory for analysing, (2) theory for explaining, (3) theory for predicting, (4) theory for predicting and explaining, and (5) theory for action and design. The theoretical model presented in the next section draws on the Theory of Deferred Action, which is a 'theory for action and design'. It is a 'process theory' in terms of Sol's (1995) classification discussed in the introduction.

Rather than explain a phenomenon, action and design theories seek to develop 'usable knowledge' that can be applied to design. Walls et al. (1992) propose the IS design theory; Bell (1993) proposes a database design theory from the perspective of organization; Markus et al. (2002) propose a theory to design IT systems to support the work of organizational design; and Arnott (2006), one for the design of decision support systems. These theories aim to inform the design of IT artifacts. Shaw et al., (2007) propose the business process management system pyramid architecture to design process architecture that evolves with business change.

The Theory of Deferred Action proposes three design dimensions: planned action, emergence, and deferred action. The correlation of the planned action and emergence dimensions determines types of organization and systems design possible, as illustrated in Figure 1. The planned action dimension is typical of the ontological assumptions made in existing approaches to process architecture design. It assumes that design objects can be predetermined and specified. It results in the specified systems type indicated at point B. Existing process modelling techniques seek such specifiable design objects. Only those design objects not affected by emergence can be specified.

By introducing the emergence design dimension, the specifiability of design objects becomes less. Since the object of design will emerge in the future they cannot be specified. How a particular design will be used in emergent conditions cannot be specified. To cope with this type of design the theory proposes the notion of 'deferred action', the third design dimension. Deferred action assumes that actual action is superior to any formal design in particular contexts and facilitates such action in the designed artefact. Catering for deferred action results in the 'deferred systems' type depicted at point A. Deferred systems are a 'a way of achieving formal objectives that combines knowable rules and procedures with actuality' and they are 'inherently future-oriented…' (Patel 2006). Mathematically, a deferred system is a continuous system with much randomness. This facilitates design objects that become necessary because of emergence.

Figure 1: Types of Organization and Systems Design



Critically, the theory introduces the deferred action dimension as a synthesised element to design for emergent organization. The deferred action construct accounts for human action and organizational behaviour, or emergent organization, evidenced by the literature earlier. It thus synthesises planned action and deferred action necessary because of emergent organization. The deferred systems type is consequently a synthesis of planned action and action necessary because of emergent organization, deferred action. This is emergent action that cannot be predetermined as design objects.

The theory renders process architecture design for EBP, and emergent organization generally. This is done as the deferred systems type. EBP can be designed as deferred systems. Elliman and Eatock (2005) have applied the 'deferred design decisions' design principle, stemming from the theory, to develop IT systems to support non-standard legal arbitration processes. Sotiropoulou and Theotokis (2005) have applied the theory to develop egovernment systems using service-oriented process architecture (service-oriented architecture is cited later as an example of the proposed theoretical model). The theory has been applied to develop tailorable information systems (Theotokis, Gyftodimes et al. 1996; Stamoulis D, Kanellis P et al. 2001) and e-learning systems (Dron, Boyne et al. 2003), where learning itself is characterised as a deferred system because of the temporal and cognitive distance required for learning to happen. These applications of the theory in diverse fields establish its generality.

5 CYBERNETICS AND ACTIVE MODELS

Formal design needs to cater for variant behaviour required in actual organizational situations. The deferred action construct enables such variant behaviour in formal design. Modelling this type of organizational behaviour is discussed in this section. Deferred action can be operationalised with the cybernetic concept of 'non-trivial machine' and the 'active model' modelling type. Emergence requires designed process architecture to cater for variance, conceptualised as the non-trivial machine, and maintain a link with ongoing organisation, conceptualised as an active model.

Since deferred action cannot be predicted because of emergence, it is necessary to design systems whose input-process-output structure is variant. Foerster (2003) defines a 'non-trivial machine' as having a variant input-process-output structure. Such a system is unpredictable - the quality we seek for EBP design and emergent organization design generally, because its outputs would vary even if the inputs remain the same. The key is processes taking shape in particular situations. The non-trivial machine concept characterises well non-standardisable process whose complexity is greater – involving functional groups, strategic business units and even different companies. Such processes can be one-off and/or take long time to complete, for example in aerospace, capital goods, pharmaceutical and industrial engineering.

Modelling process architecture as an 'active model' links it well actual organization. The relevance of active models is more general. Groth (1999) conceptualises organization as active model.

An active model maintains a synchronized link with the subject that it models (Snowdon B and Kawalek P 2003), in this case business processes. Warboys et al., (2000) used active models to develop process-oriented IT support systems. However, active models do not realise the non-trivial machine because the input-process-output is invariant in active models. But active models are important in the proposed theoretical model because they maintain a synchronization link with the subject – in this case EBP.

How should the design/designer be conceptualised in the context of emergence? With a variant input-process-output, the question of who designs it arises. Since emergence precludes complete predetermined designed, process actors should be enabled to design EBP. Additionally, both the non-trivial machine and active models imply an active role for process actors in designing systems. In this context, process actors are termed 'active designers'.

This has theoretical implications for process modelling techniques. There are few theoretical views on business process modelling. Melão and Pidd (2000) note a conceptual framework for process modelling, the role activity diagram approach. Melão and Pidd's own conceptual framework is a taxonomy of extant approaches to process modelling. They classify the approaches into: deterministic machines, complex dynamic systems, interacting feedback loops, and social constructs. None of this theoretical work however addresses emergent organization and EBP as characterized in this paper. The modelling techniques intrinsically result in static models, as opposed to active models type required for emergent organization. The implications of emergence for processes modelling are considered after next presenting the theoretical model for process architecture design.

6 THEORETICAL MODEL OF PROCESS ARCHITECTURE DESIGN FOR EMERGENT ORGANIZATION

Shaw et al. (2007) define a model as a 'planned abstraction of reality represented in a form that is usable by a human.' (p.95). A theoretical model for designing is a planned abstraction based on some theory. Here the theoretical model is based on the Theory of Deferred Action. Its purpose is to support humans' design activity.

Akin to design models, a theoretical model can perform three functions: it can be explanatory, it can contain reasoning facility, and it can be basis for designing. An example of a theoretical model that explains a phenomenon is Currie and Parikh's (2006) integrative model of value creation from web services. Theoretical mathematical models are most powerful for reasoning. No reasoning models exist for process architecture design. Snowdon and Kawalek's (2003) active meta-process model is a conceptual model for designing process architecture. The theoretical model developed in this paper is for designing. It is an 'action and design' theoretical model, rather than simply an explanatory model, but does not contain reasoning power. It draws on and is deduced from the Theory of Deferred Action, the non-trivial machine concept, and active models discussed above.

The theoretical model is for improving EBP design but it can be used for standardisable business process design too, as standardisable processes are affected by emergence in the long run. It is capable of addressing predictable business change and unpredictable EBP requirements. Change management is relatively non-problematical because the associated process architecture can be predicted and specified. EBP cannot be similarly specified because they emerge in unpredictable and sudden ways. The unpredictable class of business processes cannot be pre-defined and pre-specified for design purposes. The cause of this unpredictability is emergent factors. The theoretical model helps improve our understanding of how to design EBP by understanding the effect of emergence on the design of systems in general.

7 THEORETICAL CONSTRUCTS

Designing for emergent organization is problematical and complex. The design has to cope with endogenous and exogenous business factors, some predictable and others emergent. There are prominent established research streams relevant for understanding these factors, which also form the basis for proposing the theoretical model. The theoretical model contains five constructs, shown in Table 1, drawn from the information systems development (specified design), organization studies (emergent organization), deferred action, deferred design, and ebusiness model research streams.

Table 1: Construct Definition

Construct	Definition	Evidence Base
Specified design	Design that requires complete specification of requirements. Specification is central to designing process architecture or 'infrastructure software' and information systems. Design is a rational process.	(NATO 1968; Demarco 1978; Mumford, Hirschheim et al. 1985)
Emergence	Sudden and unpredictable occurrence of events that make rational design by specification alone impossible.	(Feldman, 2000; Feldman, 2004; Patel 2006)
Deferred action	Consequence of relating specified design with emergent organization is deferred action. Design that cannot be predicted because of emergence is deferred to organizational actors or 'process actors.'	(Elliman T and Eatock J 2005; Patel 2006)
Deferred design	Deferred design is design by 'action designers' (organizational actors) within formal design to cope with unknowable emergence or 'equivocal reality'.	(Purao S, Truex D et al. 2003; Dron J 2005; Elliman T and Eatock J 2005; Patel 2006)
Process architecture	Process architecture is composed of artifacts that are a combination of business process design and supporting IT systems design. The process architecture is a socio-technical system.	(Beeson I, Green S et al. 2002) Marjanovic O 2005; Snowdon B, Warboys B et al. 2006)
ebusiness model	eBusiness model is composed of business processes and supporting IT systems designed to generate and sustain revenue streams. It is based on the concept of 'business model' for producing, delivering and selling product or services of value to customers and capable of creating wealth.	(Timmers 1999; Margretta J 2002)

Specified design

The term specified design is used to describe design that requires complete specification of requirements based on construing design as a rational process. Specification is central to rationally designing process architecture or 'infrastructure software' and information systems. Information systems development approaches (Demarco 1978; Yourdon and Constantine 1978; Gane and Sarson 1979) and IS development methodologies (Martin J and Finkelstein C 1981) make specification a prerequisite for designing rationally. The resultant systems models are static as they contain no link with the subject domain modelled.

Dearden (1972) commented early on the limitations of rational or specified design. He stated that it is impossible to pre-design all the information requirements for a company. Attempts to cope with business change within this paradigm result in system evolution (Snowdon B, Warboys B et al. 2006) as a software engineering solution to business change. Business change has engendered proposals for dynamic modelling (Giaglis 1999) and suggestion for 'postmodern software development' (Robinson, Hall et al. 1998). Swartout and Balzer (1982) sought to break form the rational design paradigm by proposing that 'requirements' and 'implementation' are not discrete but 'intertwined.'

Emergent organization

Emergence is the efficient cause of the difficulties with specified design. Specifically, for information systems design, Truex et al. (1999) propose the explicit recognition of emergence in IS development approaches. Baskerville et al., (1992) are more radical in proposing 'amethodological' approaches, in which phased development or rational design is underplayed for a continuous development approach akin to deferred systems.

Wieck (2004), the organization theorist, argues for design by 'underspecification' as a solution to business change. The basic idea is to gather a specification that forms the 'skeleton' for the design and enabling organizational actors to fill in the 'flesh' in actual organizational contexts. The proposal is a general solution to the problem of emergent organization too. It is key to the proposed theoretical model, as it underpins the deferred action, deferred design, and process architecture constructs of the model.

Process architecture design has moved away from individual 'applications' to organisation-oriented design, centrally recognising organizational change and complexity. McDermid (1994) calls approaches to requirements engineering that focus solely on applications functionality 'orthodox'. He

calls for an *organizational focus* to address requirements comprehensively for changing organization. This organizational focus is addressed by process-oriented IT systems development and research funded by UK government agencies (Henderson 2000).

Deferred action

The consequence of relating specified design with emergent organization is deferred action (Patel 2006). Design that cannot be predicted because of emergent factors is deferred to organizational actors or 'process actors.' Deferred action not only explicitly recognises the limitation of specified design by adhering to the notion of underspecification but, critically, provides a way forward to design systems for emergent contexts. Since design by complete specification of requirements is precluded by emergence the design of the 'skeleton', to use Wieck's (2004) term, should include the capability to do deferred design. The notion of tailoring information, based on deferred action, for specific contextual needs was recognised earlier by Macmillan (1997).

Deferred design

As the design of a complete artefact is not possible, deferred design is necessary. Michl (2002) regards all design as 'redesign', meaning that all design is incomplete. In this paper it is termed deferred design, which recognises the incompleteness of design and enabling continuous design. The need for deferred design is acknowledged by IS and software researchers (Theotokis, Gyftodimos et al. 1997; Truex D P, Baskerville R et al. 1999; (Carey J E and Carlson B A 2000). Deferred design is made possible within a formally designed framework, distinguishing it from instrumentalism.

Design for changing and emerging processes is deferrable as deferred design to process actors in actual contexts. (Dron J 2005; Elliman T and Eatock J 2005; Sotiropoulou A and Theotokis D 2005). Researchers affiliated to the International Federation of Information Processing (IFIP) recognise the importance of deferred design (Purao S, Truex D et al. 2003).

Process architecture

Process architecture is composed of artifacts that are a combination of business process design and supporting IT systems design. An example is customised XML scripting. The process architecture is thus a socio-technical system (Mumford 2000). The technical system element of the process architecture is also called 'infrastructure software.'

Process architecture may be classified using Keen and Scott-Morton's (1978) classification. They classify decision processes into highly-structured, semi-structured and unstructured, which is useful for business process design. Process architecture that supports emergent business processes is unstructured.

Ebusiness model

An ebusiness model is a model of the future. It is a model of something that will be realised. Such models are also termed 'to-be models', as opposed to 'as-is models' that model the current system of interest. Weill and Vitale (2001) discuss the transition that firms need to make from business models to e-business models. The centrality of business model is recognized in the literature. To-be business models improve understanding of enterprise success and are designed to produce, deliver and sell products or services that add value for customers and create wealth (Margretta J 2002). An objectified business model improves a company's knowledge of its purpose and operations, resulting in explicit organizational knowledge and explicit business value creation knowledge.

Process architecture design is effective when based on sound business model. Business models and e-business models explain how a business organization should organise its activities to create value for customers. However, the body of literature on e-business models lacks the necessary commensurate conceptualisation of the requisite process architecture design to support processes to achieve goals. Few ebusiness models recognize emergent organization. For instance, Patel (1995) proposed emergent form of IT governance to support global ebusiness models.

The constructs detailed above are related and their interrelationships result in an ebusiness model capable of emergent behaviour. The relationships are defined in Table 2. An ebusiness model is an expression of these constructs and their interrelationships. Emergence is the independent variable that effects specified design, process architecture and ebusiness model. Specified design and deferred design co-exist in the process architecture design. Deferred action is necessary when specified design is correlated with emergent organization.

Table 2: Defining construct relationships

Construct	Relationships
Specified design	Specified design is the basis for designing an ebusiness model whose process architecture is emergent.
Emergence	Emergence is the independent variable that effects specified design, process architecture and ebusiness model.
Deferred action	Deferred action is the consequence of relating specified design to emergence. Deferred action is necessary in emergent organization.
Deferred design	Catering for emergent organization is enabled by deferred design and the deferred design decisions principle.
Process architecture	Process architecture is the enabling mechanism for emergent organization and its consequence.
ebusiness model	ebusiness model is an expression of the constructs and their interrelationships. It is designed by specified design and contains deferred design capability in order to respond to emergence. The process architecture is emergent.

The model has generic applicability. Company resources and structures are organised as business processes. Since no competitive business is free of business change, the theoretical model has generic applicability to manufacturing and service sectors. Growth and innovation are important for all businesses, and they are affected by markets and competitors' actions. Central for achieving growth and generating innovation is the design of ebusiness models and business process. Innovation in particular is subject to emergence.

The central element affected by business change and emergence is business process. The ability of businesses to meet business change and emergence depends on appropriate process architecture being in place. Both growth and innovation can be facilitated on agile process architecture.

8 RELIABILITY, VALIDITY AND PROPOSITIONS

The theoretical model is checked in this section for reliability and validity. Reliability and validity are of interest to improve the strength of the knowledge claim. Reliability is concerned with repeatability and corroboration. Validity is concerned with the appropriateness or meaningfulness of the knowledge claim (Rosenthal R and Rosnow R L 2008). The theoretical model can be assessed for reliability and validity by checking its internal and external consistency. Internal consistency is discussed in this section and external consistency in the next section.

The internal consistency of the theoretical model depends on the veracity of the Theory of Deferred Action on which it is based. The theory is a 'far-reaching' theory (Kaplan A 1964), as it addresses the design of socio-technical systems (Mumford and Beekman 1994; Mumford 2000). The veracity of the theory is attested to by its application. Researchers have drawn on its deferred design decisions principle (Patel, 2005) to design IT systems capable of coping with organizational change and emergence (Fitzgerald, 1999; Elliman T, 2005). It is the subject of joint research proposal with the UK Ministry of Defences' Defence Science and Technology Laboratory (dstl). The theory's construct of deferred system is proposed to be realised as an IT system using technology developed by the Informatics Process Group at Manchester University's Computer Science Department.

Is it possible to design an enterprise architecture that is able to cope with both predictable outcomes and unpredictable outcomes? This depends on the veracity of the propositions deduced from the theoretical model that inform process architecture design. The explanatory capability of the theoretical model is deepened because it combines relevant constructs from cybernetics and modelling. Consequently, the value of business propositions derived from the model is improved. Research propositions are useful because they direct further research and clarify the logic of the theoretical argument. As propositions involve concepts (Whetten D A 1989), the validity and interrelations of the concepts is clarified when stated in propositional form. Propositions 'should be limited to specifying the logically deduced implications for researchers of a theoretical argument.' (Whetten D A 1989) p.492.

Three propositions are derived from the theoretical model:

Proposition 1. Process architecture design is effective when based on a sound e-business model.

Proposition 2. Organizational emergence affects process architecture design.

Proposition 3. The model of EBP (non-standardisable) process evolves.

The three propositions are logically connected. An e-business model seeks to deliver business performance based on process efficiency supported by IT systems. However, organizational emergence determines what is required from the process-oriented IT systems. Therefore, as the non-standardisable processes evolve in response to emergence, so does the supporting IT systems. These propositions are illustrated in the exemplar systems discussed next.

Process-oriented IT systems

Contribution to improving our understanding and capability of explaining the phenomena of interest constitutes the external validity of the theoretical model. The theoretical model can be used to explain process support IT systems design and methodologies. Conceptualisation of IT systems can be improved based on the theoretical model.

There are implications of the theoretical model for models of EBP and business process modelling techniques. How does the theoretical model inform the methods used to design process architecture? What kind of IT systems design is required to support non-standard business processes and business processes requiring change? A key question is how the theoretical model can contribute to process architecture *design problem-solving*. The explanatory capability of the theoretical model can be demonstrated by considering exemplar systems. The kinds of design problems it has to be capable of addressing include emergent organization, business change, and competitors' moves. In this section, the theoretical model is exemplified.

Models inform process-centered IT systems design. In turn, planning and problem-solving with models require clear design and development methodology. Shaw (2007) defines a model as: 'A model is a planned abstraction of reality represented in a form that is usable by a human.' (p.95). Slack (Slack N and Lewis M 2005) proposes a model of business process technology. Larger and Horte (T Larger and Horte 2005) have developed a classification system for process technology. The two exemplar systems discussed in this section are similarly model-based systems.

Process-oriented approach to IT systems development is adopted in the research literature. This research is at the enterprise level. The UK Government's grant-awarding research body Engineering and Physical Sciences Research Council (EPSRC) supported research into enterprise process-oriented systems architecture. It focused on how organizational change affects the development of IT systems. The result of this research is process-oriented systems architecture as reported in Henderson (2000).

In terms of cybernetics, process-oriented approach can be categorized as trivial machine and non-trivial machine, explained above. Much research can be categorised as trivial machine conceptualization of process-oriented IT systems, as reported in Ould (2003) and (Henderson, 2000). Larger and Horte (2005) provide a classification of success factors for developing process technology. Alongside this research is research that can be categorized as non-trivial machine conceptualisation of process-oriented IT systems. A particular strand of interest is on active models (Warboys B, Greenwood R M et al. 2000). Active models address the problematical issue of change in business processes and the necessary commensurate change in IT systems.

Exemplar 1 process ProcessWeb

The ProcessWeb is an IT system developed by the Informatics Process Group at the Computer Science Department of Manchester University, UK. ProcessWeb adopts a process-oriented perspective to conceptualise and design systems architecture suitable for evolution, which is necessary to cope with organizational change (and emergence). Theoretically, ProcessWeb adopts a systems approach, particularly Viable Systems Model (Beer 1979) and active model perspective on business process (Greenwood R M, Robertson I et al. 1995; Warboys B 1995; Snowdon B and Kawalek P 2003; Warboys B, Snowdon B et al. 2005).

The active model provides the synchronisation link between business process change and supporting IT systems. This achieved by maintaining a synchronisation link, through the coordination layer, with the subject of the system – in this case business processes. In active models the meta-process is the process of changing a process (Warboys B, Greenwood R M et al. 2000). An active

model is contrasted with a 'passive model' which is static rather than dynamic, representing the position at the point of observation and lacking an updating mechanism (Beeson I, Green S et al. 2002). Integral to the active model of business process is the process 'coordination layer'.(Warboys B, 2000). The coordination layer enables the co-evolution of business process and IT systems.

In terms of cybernetics, ProcessWeb can be categorised as a non-trivial machine conceptualization of business processes with one critical qualification. In ProcessWeb, the input-process-output relationship is non-variant, whereas in non-trivial machines it is variant. Whilst the active model provides a link with the actual business processes modelled, the system architecture of ProcessWeb does not enable variable input-process-output.

ProcessWeb illustrates four of the five constructs, and their interrelationships, of the deferred action theoretical model. The theoretical model directs modelling attention to emergent factors. In ProcessWeb, specified design is based on the active model. As the active model keeps a synchronised link with the business domain, it accounts for emergent factors. There is no direct enablement of deferred action. However, the synchronisation link in the active model is the mechanism that enables organizational actors to keep the IT system relevant to business needs. It indirectly caters for deferred action. The conceptual model of the ProcessWeb is based on business process and so its system architecture is process-oriented. As ProcessWeb is an experimental system it has no e-business model.

The three propositions deduced from the theoretical model are accounted for in ProcessWeb. Concerning proposition 1, ProcessWeb is capable of supporting any process-based business model since its architecture is process-oriented. It seeks to be effective by catering for business processes. Proposition 2 is met because organizational change, an aspect of organizational emergence, is catered for by the synchronisation link in the active model. Since ProcessWeb is predicated on software evolution, it meets Proposition 3 of non-standardisable processes evolving with the same magnitude of IT systems evolution.

Exemplar 2 service oriented architecture (SOA)

The underlying design principle of Service Oriented Architecture (SOA) is the provision of software services to business on demand. The services are loosely coupled or configured to meet specific business process needs (Jones S 2005). IT system architecture, including computer networks, is accessed without constraints to deliver required services.

SOA illustrates five of the constructs and their interrelationships of the deferred action theoretical model. Specified design is based on software (and hardware) components. A software component is a system element offering a predefined service and able to communicate with other components. Since software components are 'non-context-specific', they enable emergence through composition to be represented in IT systems. Software componentry, indirectly, makes deferred action at the level of systems designers possible (as opposed to organizational actors). Concerning the process architecture, as components are non-context-specific, they can be mapped onto existing or newly designed business processes. The technical system architecture is distributed computing based on application servers. SOA, within which software componentry is embedded, is suited to support emergent e-business models. Business processes and the needs of organizational actors underpin SOA. It recognises the interconnectedness of organization, data and applications. The architecture is designed to deliver computational resources on demand as required by business users, thereby serving any e-business model.

The three propositions deduced from the theoretical model are accounted for in SOA. Concerning proposition 1, since the concept of service underpins SOA, any underlying e-business model is supported. IT systems are configured to support specific, and unique, business processes. Proposition 2 is met because organizational change (and emergence) is catered for by re-configuring services. Similarly, Proposition 3 is met as non-standardisable processes are directly catered by re-configuring services as required.

Generally, the exemplar systems are indicative of a trend towards a new conceptualization of IT systems. In terms of cybernetics, the emerging conceptualisation is tending towards IT systems as non-trivial machines whose input-process-output structure is variant. This conceptualisation mirrors the deferred action theoretical model developed above and the derived propositions. It is evident in systems like ProcessWeb and emerging technologies like software componentry, SOA, and the Semantic Web.

The theoretical model has wider implications for process management. Process management involves approaches to process improvement. It encompasses interest in business process modelling languages and theory of process management change. Process management encompasses methodologies, techniques and tools to support the re(design) of business processes. Business process design is informed by business process modelling languages. Practitioners particularly are interested in modelling languages. Kettinger et al (1997) surveyed 25 methodologies, 72 techniques and 102 tools.

In terms of the theoretical model, the current class of modelling languages focus only on explicit knowledge of the organization and the things that can be specified.

Of the four perspectives on business processes elaborated by Melão and Pidd (2000), business processes as interacting feedback loops and business process as social contracts reveal that the possibility of the exact specification of business processes is limited. Business processes as deterministic machines and business process as complex dynamic systems, the other two perspectives, require exact specification of processes. But the perspective and modelling languages used to model processes from these perspectives assume objectivity and fixed ontology. Objectivity is not assumed in the social contract perspective. In terms of cybernetics, they all assume the possibility of business processes as trivial machine. Given emergence, it is necessary to acknowledge emergent ontology. For instance, when business partnerships form a new business vocabulary and artifacts are also likely.

9 MANAGERIAL IMPLICATIONS

The theoretical model has implications for business managers and IT managers. Managers need to reconsider the extent to which IT architecture (process architecture) and methods for developing it can be specified. The distinction between a definitive and static business and similar IT architecture becomes blurred in emergent organization. Companies procuring IT solutions from vendors who supply fixed architecture need to reconsider their IT strategy.

Management have to think about IT centrally in emergent organization. IT cannot simply be *supporting function*. Managers have to revise their concept of managing in an emergent organization. Since fixed ontology becomes inappropriate in emergent contexts, management constructs need to be revised to cope with emergence.

Management have to think of ebusiness models as composing two elements, the specified element and the deferred element. The specified element should be based on sound determinable business strategy and objectives. The deferred element should operate within the boundaries of the specified element. However, it is conceivable for the ebusiness model to change marginally or radically to generate new revenue streams. Existing on-line businesses have added new revenue streams by providing services or selling products that were not in the original business model. The ebusiness model needs to be specified such that its evolution is deferred.

The implication of emergence for enterprise resource planning is that such planning activities have to be redefined as continuous. Manager's ideas of plans per se need to be changed. Rather than a discrete event planning needs to be continuous activity. Resource allocations and work design would change to meet emerging market conditions and competitors actions. There is also an implication for integrated systems. Such change would also affect cost accounting, which needs to be reported to provide integrated strategic knowledge.

10 CONCLUSION

The flexibility of process architecture is important for emergent organization. A theoretical model based on the Theory of Deferred Action was elaborated. The purpose of the model is to understand better how organizational change and emergence can be catered for in IT systems supporting business processes. The model's five constructs were detailed and their interrelationships explained. Three propositions were derived from the model. The theoretical model and the propositions were exemplified in two IT systems.

The proposed model has implications for models of business processes, particularly non-standardisable or emergent business processes. It also has implications for business process modelling methodologies and techniques. The latter in turn has implications for practice, which are beyond the scope of this paper's consideration but nonetheless important.

The theoretical model has business implications that require further research. The model's deficiencies include consideration of market leadership, strategic differentiation, and revenue generation, as a minimum basis for designing business processes and process architecture. Further empirical research, particularly cases studies of IT systems purporting to cater for organizational change and emergence, are needed. The Theory of Deferred Action is the subject of proposed research collaboration with the UK government's Defence Sciences and Technology Laboratory and the Informatics Process Group (IPG) at Manchester University. The IPG collaboration will seek to technologically realise some of the theoretical constructs presented in the theoretical model.

The theoretical model suggests a research agenda directed to improving process architecture flexibility. The paper has applied the Theory of Deferred Action to business process flexibility and

improved our understanding of the robustness of process architecture and limitations of specification-based design. The implications of the theoretical analysis with regard to process architecture design require further research. The important issues that have been identified theoretically as promising areas of further research include: scope of process specification, relationship between EBP and deferred action, and development of techniques to model EBP. An important question is raised. What is the right magnitude of deferred action for particular EBP? This question is synergistically related to the impact that emergence has on organizational design. Levels of emergence determine levels of deferred action required. This relationship is a central focus of further deep research at the Brunel Organization and Systems Design Center [BOSdc].

In particular, further research will focus on the problem of demarcating specifiable and deferrable business objects in ebusiness systems design. This requires clear definition of specification and deferment in terms of the business services enabled by IT systems. Understanding ebusiness modelling and ebusiness systems designing as an emergent or continuous activity is an allied further research theme. Understanding the distinction between specifiable objects and deferrable objects and emergent design can be improved as services science. A service is an interaction between a provider and a client that produces and captures value for the client. Developments in Service Oriented Architecture and web services are important but they are predicated on specified design. We seek to understand the scope of deferrable design within service science.

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The potential for using information systems to enhance information flows and relationships in the intellectual property sector: The case of Kennedys Patent

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Abstract

This paper investigates the potential use of information systems (IS) for enhancing the supply chains of organisations positioned in the intellectual property (IP) sector. Exploratory research has been conducted through the lens of a patent and trade mark agent who is involved in advising on a range of IP issues. The research highlights the opportunities offered by IS (including online technologies) for generally improving the provision of business services e.g. automating supply chain processes. More specifically, though, it investigates the potential IS have for integrating information flows and providing timely, in-depth and better presented information and the options for online filing. It also explores the capabilities for improving interactions with clients and enhancing relationships with key stakeholders in the supply chain e.g. government agencies, overseas patent agents and lawyers. The paper additionally outlines key challenges that are at the forefront and need to be addressed when using IS within the IP sector such as identity management, security and authentication. The key findings of the research will be of value to researchers and practitioners in the IP field but many of the issues and challenges faced will also be applicable to other sectors.

Keywords: information systems, intellectual property, supply chain, information flows, relationships; e-business; e-government

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1 INTRODUCTION

Current developments in information systems (IS) have focused heavily on the Internet and the World Wide Web (www). Furthermore, the proliferation of the Internet in the 1990s has given rise to E-Commerce and E-Business. E-Commerce relates more to the online buying and selling of goods and services. E-business includes e-commerce but covers a wider application of online technologies to an organisation's front end and back end processes (Kalakota & Robinson, 2000). E-business exploits many technologies such as the Internet, intranets, extranets, e-mail, electronic data interchange (EDI), Enterprise Resource Planning (ERP), document management systems and portals: and so on. A further application area which has grown significantly in recent years has been E-Government which relates to the government's use of online technologies for transforming services, exchanging information and interacting with citizens and businesses. Generally, IS and in particular online applications, are playing an increasingly prominent role in the management of organisational supply chains. Supply chains are networks of organisations and the related business processes involved in the production and delivery of goods and services (Laudon & Laudon, 2006). IS are being used for enhancing the management of these supply chains in terms of streamlining key business processes, improving information flows and enhancing relationships with key stakeholders.

In tandem with the rise of the Internet and the so-called 'knowledge economy', another societal trend has been a growing awareness that intellectual property (IP) can be, and should be, managed strategically for creating and sustaining competitive advantage (Davis & Harrison, 2001; Hemphill, 2004; Thumm, 2004). The term 'intellectual property' refers to rights which relate to, most commonly, "patents, copyright, designs and trade marks" (Gowers, 2006, p13). The effective management of IP requires an awareness of the legal and regulatory framework(s) across a number of jurisdictions and may necessitate the specialist expertise and experience of IP specialists such as patent agents. Patent agents are a form of professional service firm, and a subset of the legal services sector. The technical, commercial and legal nature of IP (and specifically patents; Bently and Sherman, 2004) requires significant skills to undertake the process of creating and managing such intellectual property rights (Gordon et al, 2006). This context provides firms in the sector with the opportunity to adopt IS/e-business for increased effectiveness and competitive advantage, and also the prospect of enhancing the relationships with government agencies through e-government related initiatives.

The purpose of this paper is to explore the potential for using IS for strategically managing organisational supply chains, information flows and relationships in the IP sector. In particular, the paper is based around a case study of a patent and trademark agents - Kennedys Patent (shortened to 'Kennedys'). Registering a patent is complex, and involves the exchange of information between a number of stakeholders. The patent supply chain involves a range of different processes, different organisations such as clients, patent agents and patent offices and many internal and external information flows. Traditionally, the process has been principally paper-based. However, many jurisdictions across a number of areas of law have become aware of the opportunities offered by the advent of e-business technologies to instigate electronic online filing (eOLF) of documents (see for example UK Patent Office, 2006; European Patent Office, 2005). The patent supply chain is expanded upon in Section 2. The insights provided by Kennedys have arisen from the authors' collaboration in a DTI funded Knowledge Transfer Partnership (KTP) Project between Kennedys Patent and Glasgow Caledonian University. Kennedys Patent was founded in 1997 and now has offices in Glasgow, Newcastle and Aberdeen, employing a total of 18 fee-earning staff and 9 support staff. Although the main focus of Kennedys' work is patent and trademark advice and applications, they offer advice across the field of IP law, as well as on the strategic use of IP within organisations. As the firm has grown in size, the need to manage its information flows and relationships internally and externally has increased substantially.

The structure of the paper is as follows. The next section examines the work of patents agents such as Kennedys Patent in more detail, describing the overall supply chain, the patent process (focusing on registering patents and related processes, as an example of the processes which are central to much of Kennedys' work), the relationships with key players and the key information flows. Section 3 discusses the single case study research design. This will be followed by an evaluation of current issues across Kennedys Patent and the potential role of IS, E-Business and E-Government for addressing some of these issues. Consideration will be given to opportunities enabled but also the challenges. The paper will close with a discussion of the conclusions and implications of the work and areas for future research will be identified.

2 PATENT PROCESS, INFORMATION FLOWS AND RELATIONSHIPS

As noted in Section 1 above, supply chains are networks of organisations and the related business processes. The management of information flows constitutes an "important aspect of managing the supply chain" (Combe, 2006, p196). This section describes a simplified version of the process of registering a patent, highlighting the principal relationships in and information flows in the supply chain. The discussion is based on Gordon et al (2006) where a more extended treatment, with greater emphasis on the legal aspects, is given.

A patent is:

> "an intellectual property right, granted by a country's government as a territorial right for a limited period. Patent rights make it illegal for anyone except the owner or someone with the owner's permission to make, use, import or sell the invention in the country where the patent was granted. As long as renewal fees are paid every year, a UK patent has a life of 20 years and provides protection throughout the UK, but no further" (UK Intellectual Property Office, 2007, p6.)

This definition introduces several concepts which are explored further below. Firstly, *invention* – what can be protected by a patent. Secondly, a patent is *granted* by a government and has to be applied for. Related to this is the concept of *territorial rights* – there is no single patent that covers the whole world so multiple patents covering a number of different jurisdictions may be required. Finally, *renewal* – the registration must be kept 'current' or it will lapse; allowing others to use the invention.

Supply Chain/Principal Relationships

The Oxford English Dictionary defines a relationship as "the way in which two or more people or things are connected" or "the way in which two or more people or groups behave towards each other". Supply chains incorporate relationships between people involved in supply chain processes and activities across the same organisation and between different organisations. Relationships between organisations can range from arm's length relationships (consisting of one-off exchanges between two organisations) to vertical integration of the two organisations. In the United Kingdom (UK), the supply chain of patent agents comprises of three principal relationships: Client ↔ Patent Agents; Patent Agents ↔ Patent Offices (UK or European); *Patent Agents ↔ Overseas Patent and Trademark Agents*[1]. These are discussed in greater detail below.

Client « Patent Agents

Dawson emphasises the importance of client relationships as being "central to the ability of professional service firms to differentiate themselves from their competitors" (Dawson, 2000, p 19). A (prospective) client may approach a firm of patent agents seeking advice on what they hope is a patentable invention. To be eligible for patent protection the invention must be novel, involve an inventive step, be capable of industrial application and not be 'excluded' (eg a mathematical method) (Gowers, 2006, pp13-14). The patent agents may advise on the legal and commercial alternatives available. If appropriate, the patent agents may then act on behalf of the client in registering the patent. As noted above, patents are territorial in scope and a key decision may be in which jurisdictions to register. In the case of UK based patent agents, the firm would normally interact directly with the relevant UK[2] or European patent office.

[1] For brevity, the term 'foreign associates' will be used in this paper as a synonym for 'Overseas Patent and Trademark Agents'.

[2] The UK Patent Office (UKPO) became the *UK Intellectual Property Office* (UKIPO) on 2 April 2007. Where more than one patent office may be relevant (eg UK, European or US) then the term 'patent office(s)' is used. To simplify the terminology, the acronym UKIPO is used when referring specifically to the UK office whether or not it is, strictly speaking, the UKPO (pre-April 2007) or UKIPO (April 2007 onwards) that is relevant. References have been left as referring to the UKPO or UKIPO depending on the date of publication of the source material.

Patent Agents « Patent Offices

Taking registering a patent in the UK as an example (see Gordon et al, 2006 for greater detail), the process is as follows (see Table 1):

Table 1: Simplified process of registering a patent in the United Kingdom

Stage	Activity	Comment
1	Filing an Application for Registration with the UK Intellectual Property Office (UKIPO).	Starts the process and gives the extremely important 'filing date'.
2	Preliminary Examination, Search and Search Report	The application will be examined to ensure if meets all formal requirements. A search of the UKIPO's database for published material upon which to assess whether the invention is 'new' and 'inventive'.
3	Initial, or 'A' Publication	The application and search report are published and made available for public inspection. The purpose of this is to allow third parties to comment on whether the patent should be granted.
4	Substantive Examination	Examines the validity of the invention in relation to the requirements of novelty and inventive step and industrial application. This may require a dialogue between the examiner and the applicant (client; via the patent agents) concerning, for example, objections raised regarding the granting of the patent and the applicant's responses. This iterative process, if required, will continue until agreement is reached.
5	Grant of Patent	If the application is not rejected following substantive examination, the patent will be Granted.
6	'B' Publication of Granted Patent	The details of the patent are 'published' and are in the public domain.

Source: Adapted from Gordon et al, 2006, Section 4.2

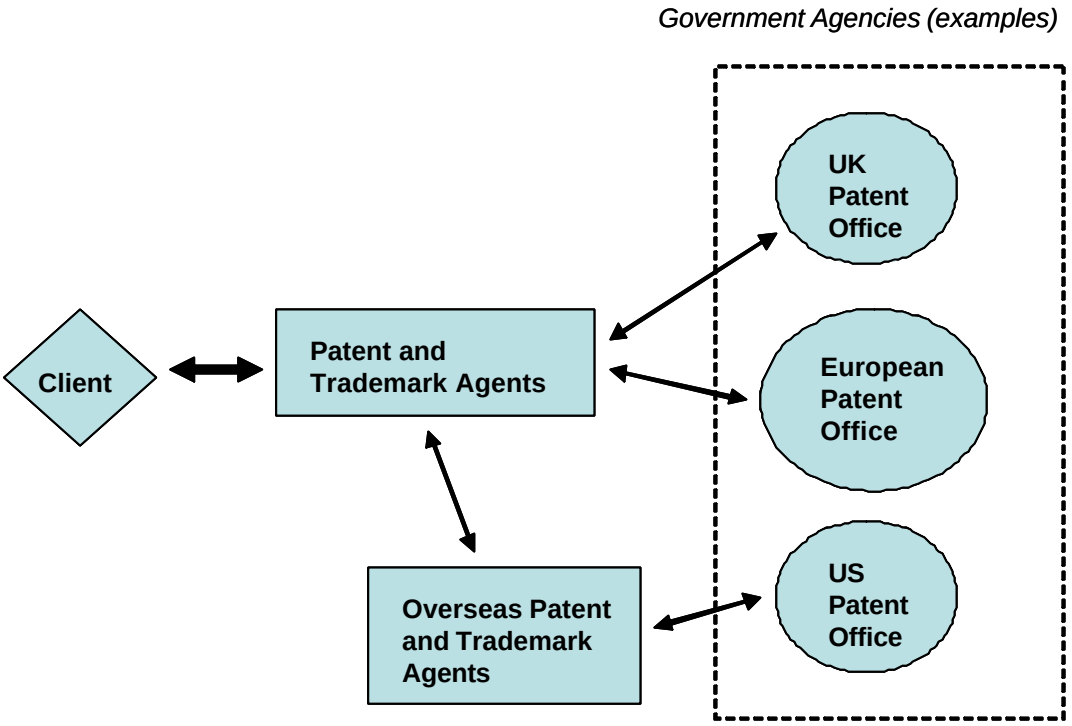
Once granted, the protection offered by the patent is initially for four years, with renewal (and related fees) required every subsequent year up to a maximum of twenty years.

Patent Agents « Overseas Patent and Trademark Agents

As noted above, patents are territorial in nature. So for non UK and European jurisdictions (such as the United States) a UK based firm of patent agents may liaise with a firm of patent agents ('foreign associate') in that country. This requires the timely and appropriate transfer of information between the UK based agent and the foreign associate.

The relationships between client(s), government agency(ies) and overseas associate(s) can be considered to form the patent agents' supply chain (see Figure 1). Where appropriate, such as to secure the enforcement of IP rights, relationships with lawyers may also be involved. However for the purposes of this paper, the lawyer-patent agents' relationship is not seen as being a 'principal relationship'. Communication and the exchange of appropriate, accurate and timely information are crucial to the process – in particular to ensure strict adherence to deadlines.

Figure 1: Patent and Trademark Agents: principal relationships



Information Flows

Based on the discussion above, the process of registering a patent can be seen to be complex, time consuming ("usually [taking] between three and four years"; UK Intellectual Property Office (UKIPO), 2007, p9) and, perhaps in consequence, expensive. Fees for the UKIPO and the professional services of the patent agents may run to several thousand pounds for a UK patent, or tens of thousands where an international application is made in several countries (UK Intellectual Property Office, 2007, p9).

The information flows relating to the work of patent agents can be regarded as being externally and internally driven. The flows within these two broad categories are two-way rather than unidirectional and there is, of course, interplay between the two broad categories themselves. Some examples of these information flows and the nature of the information required are given below.

External Flows

Between the client and the patent agents:

- Information from the client regarding the nature of the invention to enable the patent agents to the draft the application.
- Information/communication with the client regarding any subsequent clarification required, for example relating to the substantive examination if objections are made.
- Ongoing communication with the client regarding the progress of the application, and the amount (and payment) of any fees due such as outgoings (eg fees due to the relevant patent office(s)) and/or payment to the patent agents for the work undertaken on the client's behalf.

Between the patent agents and the patent office(s):

- Filing an application and subsequent monitoring of its progress. Awareness of the law and process required including the form and content of the documentation as well as the timescales involved.
- The patent agents will act as 'conduit' for communication between the patent office(s) and the agents' client.
- Where the patent agents are also managing the renewals process – knowledge of that process and in particular the date renewal is due.

Between the patent agents and foreign associate(s):

- Information concerning the location and availability of foreign associates, their specialisms, and in which jurisdictions they operate.
- Communication and information exchange between the patent agents and the foreign associate(s) to *inter alia*, ensure the associate(s) are managing the client's work in an appropriate and timely manner.
- Information regarding the fees charged by the foreign associate, as well as the current and predicted amount to be billed.

Between the patent agents and the legal system(s):

- Patent attorneys require access to the relevant statue and case law relating to jurisdictions within which they are registering the patent; as well as practice guidelines issued by the patent office(s).

Internal Flows

- There is a need for efficient and effective case management to provide *firstly*, a clear indication of what task has to be done, and *secondly* internal monitoring of the progress of the application, renewals and communication with the client, patent office(s) and foreign associates - including a clear intimation when tasks have been completed.
- An awareness of the time spent by a fee-earner on a particular matter for a particular client is crucial to the management decision-making of professional services firms (Mayson, 1997). From an external-facing perspective, these 'billable hours' form the basis for calculating the fee charged to the client. From an internal perspective the firm's management will attempt to maximise the time fee-earners spend on 'billable' rather than 'non-billable' hours – a precursor of this is knowing who has done what, and when.
- Related to time recording, as a for-profit business the patent agents must manage the information flows relating to invoicing clients for fees owed, and dealing with the payment/non-payment as required.

In summary, the whole process is data and 'date driven' with the filing date being of crucial importance in establishing the 'priority date' (and time) for the client's invention. The priority date being, effectively, the date upon which you would obtain protection from any patent – and any very similar 'invention' from after this date may have to yield to your priority/prior invention. A range of information in various forms (eg paper, electronic or speech-based) is required in order for patent agents to discharge their work effectively in such a date-driven environment. Effective workflow/case management is vital.

This section outlined, in general terms, the work of patent agents (focusing on patents in particular), as well as the principal relationships and information flows involved. The next section discusses the case study strategy adopted to analyse the potential impact of IS on these aspects of the patent supply chain.

3 CASE STUDY STRATEGY: KENNEDYS PATENT

A single case study based on Kennedys Patent has been conducted for the purposes of this research. Benbasat, Goldstein and Mead (1987, p 370) argue that case studies can examine:

> "a phenomenon in its natural setting, employing multiple methods of data collection to gather information from one or a few entities (people, groups, or organizations). The boundaries of the phenomenon are not clearly evident at the outset of the research and no experimental control or manipulation is used."

Case studies consist of detailed investigations and allow research to be conducted in natural settings. The phenomenon is not isolated from its context (as in, say, laboratory research) and is of interest precisely because of its relation to its context (Hartley, 1994). This research explored the potential use of IS for enhancing information flows and relationships within the intellectual property sector and in particular a patents and trademark agent. A case study was necessary for exploring why,

how and what information systems could potentially be used. The research needed to essentially be contextualised, evolving and gather the subjective opinions of key actors in the patent supply chain.

Case study strategies can involve single or multiple cases. Yin (2003) states that single case studies are appropriate if: it represents a critical case in testing a well-formulated theory; it is an extreme or unique case; it is a representative or typical case; it is a revelatory case; it is being used as a longitudinal case. There are of course other situations that single case studies may be used. For example, a researcher may use it for exploratory purposes, before they conduct a multiple case study (Benbasat, Goldstein & Mead, 1987). In this particular research a single case study was being used which was longitudinal for the purposes of exploratory research and as a stepping stone for further research.

Case studies are also appropriate for studying areas of research that few studies have been carried out. The nature of IS, is such that many areas are new and emerging and consequently research and theory are at there early, formative stages (Benbasat, Goldstein & Mead, 1987; Eisenhardt, 1989). In particular, research on IS in the supply of services and specifically legal/patent services, is still in its infancy and case studies are therefore useful for exploring this emerging area of research. A range of data collection methods were used including participant observation, interviewing, questionnaires, document analysis and process mapping.

4 CURRENT ISSUES

Firstly, the research explored issues and problems that needed to be addressed in Kennedys Patents' current supply chain, key processes, information flows and relationships. These are summarised under the following categories: Case Management; Integration; Security. The state of the current IS within Kennedys has contributed to many of these issues. Currently, there is a client and case management system, an invoicing/billing system, a range of bespoke databases e.g. new enquiries, renewals, foreign associates, a range of documents and a poorly configured virtual private network (VPN) with limited access from remote offices. The different IS are not well integrated and consequently there is little coordination between (and with) the internal and external information flows. This raises a number of key shortcomings that are outlined below. It should be noted that many of these issues are not unique to Kennedys and are likely to be common across many professional services firms.

Case Management: The first category of issues is related to the management of different cases. Kennedys does not have a common file naming convention and central repository for all electronic client and case documents. Problems are apparent when a new member of staff is introduced or a current member of staff is absent. Each secretary has implemented their own naming and saving process thus finding a particular document becomes a time consuming and tedious task. The invoicing process for cases handled for clients is also flawed. Certain aspects of the process are a major cause for concern including the manual generation of invoice numbers. For example, when generating a new invoice, the secretary needs to take the next available invoice number from the table and mark the client/case details next to it. This 'manual' (rather than automated) system proved efficient enough when the firm operated from one central office but is not easily supported by Kennedys' current multiple office structure. Moreover, the current system is proving inadequate for ensuring the correct account of time spent on each case is accurately recorded. Invoicing a client for the correct amount of money is obviously of great interest to both parties involved, as clients do not wish to be overcharged, just as firms would rather not sell themselves short. In line with many other firms in the legal services sector (Mayson, 1997), recording the time spent on a client's work provides the 'billable hours' that form the foundation for calculating the amount to be invoiced to the client.

Integration: Many of the above problems are exacerbated by the fact that Kennedys have outgrown their current IS as their business has seen significant growth in recent years, expanding from one office to three offices across the UK. Kennedys currently use a number of different systems and the limited integration has led to many dispersed documents (named inconsistently) across systems with no solid links between them e.g. certain documents in the document management systems should be linked to cases within the case management system. This currently means switching from one system to another to try and establish linkages between documents which is a very time consuming and error prone process.

The lack of integrated systems and processes leads to unnecessary human intervention (with consequent cost increases in terms of time and the risk of errors). Lack of integration also limits the

reporting options offered by the systems or at the least requires the difficult task of data reconciliation/mining across systems to generate relevant reports. The manual generation of invoice numbers is also symptomatic of the wider integration issue. For example, there is currently limited visibility of 'bad payers' (clients who are slow to pay or who do not pay). The only way of recognising/identifying bad payers is to manually check the accounts package. As few users have access to the accounts system or the time to investigate the issue, there is an increased chance of work being conducted which the firm may never get paid for.

The potential integration of case, time, invoicing and document management systems would provide a number of potential solutions to current problems. For example it would alleviate the time spent through human intervention and also streamlines the whole process and ensure each client is charged the correct amount. It would also offer opportunities not only for the firm but additionally for the client (Hinde, 2006). Providing clients with access to integrated personal portfolios would cut down on client/attorney interaction time e.g. a client would no longer need to be charged for the breakdown/status report of a particular case.

Security: The final category of issues is mainly related to security. This is a vastly important issue due to the sensitivity of the data with which patent agents such as Kennedys have to process. Ensuring client data is kept as secure and private is one of the most important aspects of any patent agents' IS. Kennedys have recently changed the way they conduct certain matters across their offices. They introduced a Citrix enabled network has meant that there is now no need to transfer a copy of the client and case database to each of their other remote offices. The security, authentication and permissions have also been enhanced during this change of network architecture, leading to a more stable and efficient VPN.

However there is a tension between the requirements for security, and being able to provide the appropriate access to staff (in office(s) or teleworking) or clients(for example), as required by the current business context facing the firm (Bunke, 2005; Hinde, 2006). Currently, clients have no access to the Kennedys system and must contact staff directly to be furnished with their desired IP report/portfolio. The way forward is to build upon the current architecture and introduce some kind of integrated practice management system that would allow client access. Due to Kennedys' view on information security, extra layers of security and authentication will be required to ensure those, and only those, permitted will be capable of accessing the new system. One possibility is to introduce a requirement for biometric authentication before access is granted.

Overall, the current systems are contributing to many of the issues or problems that are evident with Kennedys Patent. They are also providing limited business value and most certainly are only being used for operational purposes. The firm and its clients could potentially benefit from more careful application and greater exploitation of IS for maximising strategic opportunities.

5 THE POTENTIAL ROLE OF INFORMATION SYSTEMS, E-BUSINESS AND E-GOVERNMENT

From one perspective, IS can play a role in making information available, enabling communication and informing decision making. Many of Kennedys processes and information needs can be supported through the use case management tools such as electronic diaries, document assembly techniques, databases and automatic accounting and billing of clients to automate as much of the process as possible (saving fee-earner time and reducing costs), while ensuring quality standards are met (Leith and Hoey, 1998; Susskind, 2000).

More innovative application of specific types of IS may even lead to aligning organisational activities, creating value, exploiting benefits and maximising strategic opportunities. Susskind predicted that most major law firms would be using IS and information and communication technologies (ICTs) to provide clients with a wide variety of services online by 2005 (Susskind, 2000). Unfortunately, this has not been fully met by providers of legal services (and indeed patent and trademark agents) despite clear benefits to firms and clients. The principal drivers for any changes which have taken place to date have been the internal dynamics of the firm which have, in turn, been influenced by the need to acquire competitive edge, through improving the service to the client (Barton et al, 2000; Bernstein et al, 2001; Thomson et al, 2000a; Thomson et al, 2000b). Historically at least, the interface of the law office with other, external bodies, most notably government, agencies has been limited, suggesting that there was not much pressure for change beyond that internal dynamic, whether from clients or the agencies themselves. Recent developments in IS and ICT, particularly those focusing on the Internet and the www, offer patent agents potential opportunities from two perspectives

in particular. Firstly, there are general *e-business* opportunities relating to the electronic interactions between the patent agent and their clients, overseas patent agents ('foreign associates'), and lawyers. Secondly, and in particular, there are *e-government* opportunities relating to electronic interactions with government agencies such as the UKIPO.

The growth of e-business has presented significant opportunities. Amongst these is the potential for adopting online technologies within the field of supply chain management (SCM). Online technologies have been seen to impact major supply chain processes, supply chain coordination and supply chain relationships. The use of e-business for enhancing the efficiency and effectiveness of supply chains has provided many benefits. Croom (2005) suggests a collection of primary objectives of e-business implementation including supply chain integration, cost reduction, knowledge development and learning, IP and information flow control, supporting speed of change, managing global customers and suppliers, developing e-procurement practices and improving lead time management. Online technologies could potentially be used within supply chains of legal service firms (see for example Holmes, 2006; Susskind, 2000), and more specifically patent agents (see for example Hinde, 2006), for providing services and enhancing the management of supply chain and client relationships. Application areas could revolve around key business processes such as case management, time recording, invoicing and billing and online filing of patent applications and be used for communicating and sharing information with clients.

E-government has also grown significantly, with important implications for the provision of legal services (Mitrakas, 2005). This has been made possible by the convergence of technical infrastructure, the uptake of broadband to make the transmission of complex documentation in lengthy procedures possible, the development of appropriate authoring languages and software, and the provision of secure networks. One particular area which is having an impact in the field of IP is electronic online filing (eOLF). More particularly, IPR Registries like the United Kingdom Intellectual Property Office (UKIPO) and the European Patent Office (EPO) have recognised the benefits of online filing of applications (see UK Patent Office, 2006; European Patent Office, 2005) and a standard filing format has been agreed (World Intellectual Property Organization (WIPO), undated; Berwin and Ankyn, 2002). This, it is suggested, is a powerful driver for change and provides a spur for Patent and Trademark Agents to develop and/or enhance their use of online technologies, leading to competitive advantage in what Bunke (2005, p1) describes as "an increasingly competitive environment, where there is a necessity to develop … business in new ways". It is also an environment circumscribed by a constantly evolving legal and procedural framework within which identity, security and authentication are of paramount importance due to the commercial sensitivity of the matters being dealt with.

6 OPPORTUNITIES

Focusing on the patent agents' supply chain (Section 2) and the current problems identified in Section 3, this section of the paper highlights the main areas of patent services that can be developed through the use of IS, e-business and e-government. It will also outline the key drivers and opportunities for using them including streamlining information flows and for enhancing relationships with clients, government agencies, overseas agents and lawyers.

Patent agents specialise in IP which, given the data and date-driven nature of their product/service, has a particular potential to be strategically managed through the use of IS, e-business and e-government. There are many different classifications of IS depending on their role e.g. Transaction Processing Systems, Management Information Systems, Decision Support Systems and in particular there are specific types of IS available e.g. Enterprise Resource Planning (ERP) systems, Documents Management Systems, Electronic Data Interchange (EDI) and Practice Management Systems. In particular, IS such as integrated practice management systems will offer opportunities for automating a range of functions and services provided by patent agents. For example, it can applied to many different processes involved in case management e.g. registration of patents and renewals. It can also be used for monitoring the amount of time that is spent on different cases, billing and invoicing, online filing, effective date and deadline monitoring as well as searching for files or previous patent applications. On top of this, e-business technologies such as intranets, extranets, EDI and so on can be used to not only transform patent agent's processes but also integrate back end and front end supply chain processes. E-business and online practice management system can enhance the efficiency and effectiveness of patent agents and offer a range of benefits including access to all case materials, improved efficiency and workflow, time and resource savings, improved reports and structures, audit and history trail and a user friendly interface. Online access also provides agents with easy access to relevant information and the opportunity to telework (working from home or at another location remote

from the firm's offices). Moreover, online access to a greater depth of information can enhance knowledge sharing and encourage dissemination of best practice.

These kinds of benefits can have an impact on the level of customer service provided to clients and the types of relationships that can be developed. In addition clients can have the benefits of easier access to information, transparency and feedback, detailed reports (for example detailing the current status of work-in-progress (WIP)) which are automatically generated by the system and an improved invoicing service (for example adjusted automatically to display different currencies as required). Portals may be developed for aggregating and customising information and facilities that are appropriate for the needs of different clients.

As patent and trademark agents spend much of their time interacting with government agencies on behalf of their clients, online technology now presents agents with the ability to increase efficiency and profitability in the management of those relationships. In particular, Epoline (the EPO and UKIPO online filing platform) (Epoline, 2006) offers an application building function that validates patent applications electronically. This effectively automates the preliminary formalities examination (part of Stage 2 in Table 1), thus minimising errors, inconsistencies or omissions. The system imposes a standard file format, ensuring there is much less paper going backwards and forwards; aspects such as 'filing dates' can be issued immediately upon applying online, therefore saving time. There is much more transparency and the chances of applications being lost or stolen during transit are nullified by the use of this service. All information passed to the patent offices is encrypted using state-of-the-art smart card technology and users have the reassurance that the application the patent office receives is identical to the copy retained on the applicant's PC. Patent agents are automatically sent a filing receipt and another, perhaps the most important, benefit of online registration is that it attracts significant fee reductions, or discounts (UK Patent Office, 2005).

Relationships with overseas agents can also be enhanced as overseas agents can be provided with more information via secure portals which include cases related to them, and may on occasion allow agents to make updates. In particular, the amount of work that has been given to overseas agents can be monitored by the patent agents, and vice versa.

Overall, IS, e-business and e-government provide a range of opportunities for improving both the internal and external information flow and the management of external relationships with clients, government agencies and other overseas agents. They offer greater transparency, access to more information and a higher level of efficiency and more importantly the opportunity for patent agents to reap competitive advantage. Finally, they also present the organisation with more chances for expanding their existing offices and moving into different locations ('scalability'). In the future there may even be the opportunity for developing online IP services offering "premium advice and know how" to corporate clients (Holmes, 2006, p2; Susskind, 2000; Terrett, 2000).

7 CHALLENGES

Although there are various opportunities offered by IS, e-business and e-government across patent agents' supply chains and in particular for improved information flow and relationship management, there are also a number of key challenges faced by firms such as Kennedys. Patent agents operate within a challenging and evolving legal and procedural framework within which identity, security and authentication are of paramount importance. Therefore, IS solutions need to incorporate technologies that will address these issues. In some respects current developments in IS offer the opportunity for patent agents and government agencies to articulate issues such as identity management, security and authentication, but on the other hand they also pose greater challenges. These challenges include issues such as establishing permissions, whether on a per-user basis or on a per-group basis, ensuring the correct level of security is in place to allow authorised persons home access to certain electronic documents or reports, and ensuring any of these changes do not compromise the functionality of the current system being used.

As highlighted above, security is of paramount importance when opening a door/portal to a back office system, for reasons such as confidentiality and privacy. This is especially important when dealing with information as sensitive as that of new inventions. Needless to say, a simple username and password may not be enough security to protect such highly sensitive information. Identity management is required to ensure sensitive/private information can only be accessed by those authorised to do so. There are a number of technologies currently available that can identify/verify authorised users of a system and can be incorporated into an online environment. These range from simple 'username and password' to digital certificates and digital signatures, to more advanced technologies such as biometric solutions. Biometric solutions offer greater security over their predecessors due to the incorporation of 'something you are' (Smart Card Alliance, 2002) as opposed

to 'something you know'. Furthermore, authentication of users is significantly enhanced as passwords can be guessed, conveyed to, or stolen by unauthorised users of a system, whereas biometrics cannot be stolen or forgotten, and are extremely difficult to forge (Smart Card Alliance, 2002).

Once the decision has been made as to which level of security is required, the next challenge faced is ensuring the correct permissions are in place. Visibility and access to certain levels of the system should be sub-divided into a per-user and per-group hierarchy. Staff members at Kennedys should be divided into groups (for example senior management, fee-earners and support staff) as they must have access to most case details anywhere and anytime. However, efforts must be taken to ensure that some fee-earners cannot access any documents where there may be a conflict of interest. This may prove to be challenging and will depend greatly on the practice management system being implemented. Permissions for client access should be based on a per-user basis, thus only allowing a view or read-only permission when accessing the system. The main challenge here is ensuring that clients that have access to the system cannot access any other documentation or reports not related to them.

For Kennedys in particular, due to the architecture of their current systems, providing streamlined interaction with online filing would be a considerable task. The possibility of encountering problems when generating the forms required for online filing is exacerbated due to the proliferation of systems, especially when working across multiple sites. These issues of integration and streamlining must be addressed by Kennedys in the near future to allow them to benefit, in turn, from the technological advances made with respect to the online filing of patent applications.

In summary, using IS and related e-business/e-government applications for enhancing information flows and relationship management is by no means a straightforward task, especially when dealing with highly sensitive material. Ensuring the correct security measures are in place will go some way to make clients feel secure when using organisational systems.

8 CONCLUSIONS AND IMPLICATIONS

This paper examined the potential role of IS, e-business, e-government for enhancing the supply chains of organisations in the IP sector. There is a growing awareness that the strategic management of intellectual capital, which includes IP, is a key aspect of business success. Exploratory research was undertaken through a single case study of Kennedys Patent (a patent agent offering IP services) who are responsible for handling information regarding patent and trademark advice and applications and acting on behalf of clients with overseas agents, government agencies and lawyers. The key conclusions are as follows:

The development and adoption of IS, e-business and e-government within this sector is driven by the interplay of both internal and external factors. From the internal perspective, the research identified a number of areas where current systems and supply chain processes could be enhanced and streamlined through automation e.g. document management, invoicing and time recording. Moreover, a significant issue was the integration of a range of existing and emerging systems and online filing to allow maximised internal efficiencies and information flows across a range of staff, departments and offices. This internal focus was seen as a precursor to benefiting from the opportunities offered by online technologies (including e-business and e-government) for developing external relationships and interactions with clients, government agencies, overseas agents and lawyers and providing facilities such as portals allowing clients access to data such as customised reports.

The multi-jurisdictional framework within which patents agents operate, rather than being a barrier to the emergence of standards may actually be a driver for change. From an e-government perspective, it is clear that government agencies such as the UKIPO and EPO are committed to online filing (see for example the UKIPO's vision for an 'Electronic Patent Office' (UK Patent Office, 2004)), and both standards (Berwin and Ankyn, 2002) and software such as Epoline (Epoline, 2006) are emerging. Software houses will inceasingly model their case management solutions with electronic online filing functionality in mind. The associated benefits of online filing in terms of time, and perhaps cost, may be passed on by the firm to clients and overseas agencies. There may be the opportunity to deprofessionalise ('leverage' in Mayson's (1997) terms) some of the administrative aspects of the patent agents' work, freeing the fee earner to concentrate on high value tasks requiring more of their professional competence.

Online technologies enables the clear benefits of 24/7 access to appropriate elements of the firm's systems from anywhere in the world to staff (in terms of teleworking) and to external bodies such as clients (e.g. portals). However, given the nature of the work carried out by patent agents, firms must strike an optimal balance between providing the appropriate access to the firm's systems, and the potentially devastating consequences of the misappropriation of sensitive information due to weak security and authentication systems. One way forward may lie with biometric authentication.

The issues and challenges faced by Kennedys are not unique to the firm: they reflect and reinforce many commentators' views on the opportunities offered by IS and in particular online technologies for streamlining information flows and enhancing relationships within the broader legal services sector and beyond (for example Bunke, 2005; Croxton et al, 2001; Hinde, 2006; Susskind, 2000; Terrett, 2000).

9 FUTURE RESEARCH

The firm, around which this research is centred, is still undergoing substantial development and implementation of the IS and online technologies. The practice management systems and the e-business related systems are likely to be developed further to embrace other areas of internal and external functionality, and provide greater opportunities for competitive advantage. This area of research would benefit from conducting a more in-depth longitudinal case study research to monitor and evaluate the organisational impact of these developments. Secondly, from an e-government perspective future research should include observing further developments in the online filing systems offered by agencies such as the UKPO and EPO, and the requirements which such bodies may make on patent agents to embrace online filing.

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An evaluation of inter-organisational information systems development on business partnership relations

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Abstract

Inter-organisational information systems (IOS) are being used within SCM to improve businesses processes and to facilitate closer working relations with business partners. However, the technologies themselves impact on this relationship as they allow various levels of information flows, communications, function integration and partner integration.

The aim of this paper is to evaluate IOS development influencing partnership integration within Supply Chain Management (SCM) by investigating thirteen businesses that use a variety of IOS. IOS are classified into Elementary IOS, Intermediate IOS and Advanced IOS. Organisational variables such as information flows, partner co-ordination and integration, partner trust and confidence are measured against the level of IOS development. Variables such as management commitment, financial costs, system standards and partner resistance are investigated as forces or barriers, and related to different levels of IOS development.

This research concludes that IOS development results in increased information flows and coordination which supports the development of trust and confidence in business partners. However, the customer position in the supply chain, whether it be retailer, distributor or manufacturer can influence the use of IOS of its business partners. Also, although IOS allows businesses to source and contact a larger range of business partners, the tendency is for businesses to use a smaller number of partners. This work also shows that IOS development changes a business's relationship with its partners and moves it towards partnership integration.

However, a number of organisational factors impact on this integration. These factors vary with the level of IOS development. Management commitment and showing the requirement for IOS development can act as a positive force in developing IOS or as a barrier against IOS development. Other barriers include resistance from business partners, financial costs, lack of system standards and technical maturity of the companies. The effect of these barriers also is affected by the level of IOS development.

Keywords: inter-organisational information systems, supply chain management, business partnership relations

1 INTRODUCTION

An inter-organisational information system (IOS) is a collection of IT resources, including communications networks, hardware, IT applications, standards for data transmission, and human skills and experiences. It provides a framework for electronic cooperation between businesses by allowing the processing, sharing and communication of information (Haiwook, 2001). IOS are also known as extranets and allow electronic processing of business transactions and documents, as well as the transfer of information with minimal effort and makes it quickly available. The growth of IOS in SCM has allowed the flow of information throughout the supply chain by the integration of business processes (Stephens, Gustin & Ayers, in Ayers, 2002).

IOS can be used at both ends of the supply chain. They can be used with customers, to give visibility of data and interaction with company employees and with business partners, such as suppliers and logistic companies. Benefits are the same at both ends and include visibility of data and reduced purchasing costs (Ayers, 2002).

IOS can be categorised into four phases, in terms of historical IS development (Shore, 2001):
Phase One - Manual systems
Phase Two - EDI systems
Phase Three - ERP systems
Phase Four - Internet-enabled systems

Phase One: Manual Systems

This phase includes paper copies of documents such as purchase orders, bills and invoices. The information is processed manually and therefore information technology and telecommunications do not contribute to this system. The disadvantages of this phase are obvious – laborious procedures, inaccurate data, insufficient information and expensive maintenance of the system. This initial phase is still in use in some companies either on a wide scale across the company or in particular departments and in many Small to Medium sized Enterprises (SMEs), as shown in the empirical case studies. This IOS development may be curtailed due to a lack of expertise, financial resources or other organisational or environmental pressures (Papazoglou & Ribbers, 2006).

Phase Two: Electronic Data Interchange Systems

The next phase involved the development of EDI technology in the 1980's and this had a dramatic effect on the automation of heavy data flows and the elimination of many labour intensive key business processes. Paper documents such as purchase orders, invoices, bills of lading and shipping slips were replaced by electronic transmission of the information between computers (McKeown, 2003). EDI was the main technology used in electronic trading in many sectors, such as retail, manufacturing and financial services and has only been widely used since the early 1990's (Williams & Frolick in Ayers, 2002).

Early EDI systems used value added networks (VAN), which are special services on public networks available by subscription, and provide companies with data communication facilities. The company operating the VAN is totally responsible for managing the network, including providing any data conversion between different systems (McKeown, 2003). Therefore VANs were expensive to implement and therefore limited EDI use to the larger companies.

However, as there is no single agreed national or international standard, an EDI link tends to be set up for a specific supplier and buyer. Therefore it is difficult to switch the connection to another partner and a second EDI system may have to be created. Golden and Powell (1999) research showed that EDI limits flexibility of suppliers who are connected to more than one customer since they are required to support specific technologies for each. This resulted in an explosion of EDI software, VAN and EDI standards which made it difficult to integrate the technologies. Also, the full benefits of EDI can only be realized when EDI is fully integrated with other transaction processing systems, such as accounting and sales systems. The information sent via EDI is ordered as a transaction set and this transaction set has a fixed structure. These transaction sets for new products or services also have to be firstly agreed before they can be implemented. These data constraints also hamper EDI growth and implementation.

A second generation of EDI technology, Internet EDI, overcomes some of the disadvantages of the early EDI systems. Companies are able to use existing EDI systems and processes by installing Extensible Mark-up Language (XML) EDI translators on web-servers. Internet EDI lowers entry costs for businesses as data is transmitted over the Internet rather than using subscription to a VAN, and therefore telecommunication costs are minimized. It is also more useful in the global marketplace. Cost savings can be as much as 90% (EDI Data, 2003) and therefore can be implemented by smaller

companies. It uses the same EDI standards for documents. Data transaction sets are also more flexible within Internet EDI and allows easier and quicker development of applications (Papazoglou & Ribbers, 2006). Data is processed in real-time when using Internet EDI, as opposed to overnight batch data flows/processing and this is also an operational advantage. Therefore, due to these benefits over the older system, the volume of Internet EDI is increasing.

Phase Three: Enterprise Resource Planning Systems

This phase describes a more integrated information systems approach. This approach is being taken by companies who view the integration of systems and information flows as being essential in providing improved customer satisfaction and cut operational costs in an increasingly competitive market-place (Jenson & Johnson in Ayers, 2002).

Enterprise-wide systems and databases integrate and coordinate IT operations across the company. These systems, characterized by Enterprise Resource Planning (ERP) systems, have developed from Manufacturing Resource Planning (MRP II) applications. They generally include manufacturing, logistics, distribution, inventory, shipping, invoicing and accounting (Ayers, 2002). The integration of information from all departments in the company in the ERP system means that output or consequences from one system can be fed into other systems, so that there is total information coordination. An ERP system can also assist in controlling business activities such as sales, delivery, billing, production, inventory management and human resource management. Therefore it can cover all primary and support activities within the Value Chain. The implementation of ERP systems also results in organisational efficiencies as they automate processes, integrate functions and improve the quality of information flows (Papazoglou & Ribbers, 2006). The reach of ERP systems can be extended to include partners with the supply chain by the use of SCM software transferred onto the new integrated system. ERP systems, such as SAP's R/3, have been implemented across the globe. Worldwide sales of ERP packages, combined with implementation support, exceeded $15billion in 1999 with annual growth rates of over 30% (Akkerman et al, 2003).

Phase Four: Internet-enabled Systems

The Internet is a worldwide web of computer networks. The development of the protocol, Transmission Control Protocol/Internet Protocol (TCP/IP), allows separate networks of different architectures to work together through open network architecture. The integration of information resources has therefore been enabled by the use of web development technologies such as Extensible Mark-up Language (XML) and Java, which have allowed business partners to integrate their information resources. These systems also provide platforms for fast and reliable communications between trading partners, regardless of physical barriers (Bandyo-padhyay, 2002).

The use of the Internet requires integration of computer systems by examining existing legacy systems and software and developing integrated solutions. However, changing corporate information systems brings about a number of challenges for the business which need to be managed successfully (Krizner, 2001):

1. businesses have invested thousands if not millions of pounds in legacy systems which they will be keen to keep in place
2. the financial and time resources required to carry out systems integration
3. security and risk aspects of opening up internal systems to external parties
4. legacy systems require to be integrated to allow information flow between disparate systems and were not designed to 'talk' to other systems
5. businesses may define processes and data differently from their supply chain partners
6. legacy systems of partners may use different platforms
7. partners will belong to many different supply chains

There are a variety of information mechanisms available for use by managers in SCM, such as auctions, purchasing groups and electronic agents which provide this linkage. Recent developments also include trading exchanges or market places. These are online supply chains which allow the sharing of real-time synchronized information by using XML on features such as prices and delivery information. Examples include NonstopRX.com for the pharmaceutical industry and Retail.com for apparel manufacturers and buyers (Messmer, 2000). These mechanisms may be used to conduct a business transaction, to purchase something at a given price or to share information to coordinate the flow of the item after the purchase has taken place. These collaborative mechanisms come under the Collaborative Planning, Forecasting and Replenishment (CPFR) heading and aim to closely integrate business partners. In order to help companies come together within this system, the Voluntary Inter-

industry Commerce Standards Association (VICS) publishes guidelines to assist companies to achieve their objectives when using CPFR systems. However, the technology may require some business process change and also CPFR should be integrated into the e-business strategy. (Grossman, 2004). Managers are also required to choose the appropriate level of integration for particular relations in the supply chain and the appropriate degree of information sharing (Garcia-Dastugue & Lambert, 2002).

Therefore the Internet is now being used as one of the main networking platform in the upstream, downstream and internal supply chain by both large and relatively small companies.

Current IOS Development within Business

However, companies may be involved in ad-hoc development and use various operational and management information systems. For example, a company may use a legacy system for processing orders and stock control. Legacy systems may also be 'best of breed', bespoke, point or developed internally ERP systems. It may access a customer's web-enabled production system to calculate order quantities and it may implement a new invoicing and accounting system as required by head office which may be a SAP system. These systems may also be totally disjointed, totally integrated, using a web-enabled ERP integrated technology or use a few information systems with some integration of processes, some of which are web-enabled. Such companies may have the objective of full integration in the future. For example, a substantial proportion (82%) of companies surveyed during 2003 expect to be using the web for purchasing in the course of the next few years, while 75% plan to use online technology for order management and 71% for order status, with supplier management (69%) and selling (65%) proving equally popular. (Sweet, 2003). Therefore the actual configuration of IOS used by a company usually consists of a number of IOS, which may be partially or fully integrated internally or externally with business partners. This scenario is evident in the empirical case studies.

2 INTER-ORGANISATIONAL INFORMATION SYSTEMS DEVELOPMENT AFFECTING PARTNERSHIP RELATIONS

Previous research has focused on the how the use of information systems themselves have changed the business structure and influenced partner relationships (Venkatramen, 1991, 1994). Christopher & Juttner (1998) found that the quality of a relationship is strongly influenced by its interface structure. Premkumar in Ayers (2002) states that the nature of the IOS technology and partner linkages, including common partner objectives is important to IOS development and implementation.

Electronic Data Interchange Systems and Partnership Relations

Electronic Data Interchange (EDI) and point of sale (POS) systems have been used generally within SCM to facilitate information flows and therefore communication between businesses and their partners. Research carried out by Hill and Scudder (2002) on the use of EDI systems in the food industry found that the implementation of EDI facilitated inter-company coordination and that EDI users have more coordination with their suppliers than do non-users of EDI. These IOS bring about electronic cooperation by integrating stock holding, distribution, purchasing and other functions to improve customer responsiveness (Mische, 1992). POS systems have been a major influence in increasing information sharing among, for example, logistic managers and show that information exchanges can be beneficial to all parties involved (Lancioni, Smith & Oliva, 2000).

Haiwook (2001) found that EDI provides a better means of inter-organisational coordination than earlier applications of IT, but it is limited in its influence. Similarly, Santema (2003) found that although EDI improve communication between business partners, it doesn't 'add value' to the relationship. This supported previous findings by Clemons & Row (1993), who found that EDI-based checkout scanners significantly affect efficiency and information flow in distribution channels, but that automating the processes in this way, doesn't increase electronic cooperation. He concluded that only by sharing company information, such as in a two-way information flow, is a true partnership developed. EDI has also been accused of depersonalizing inter-organisational relationships due to its restricted information format (Morris, Tasliyan & Wood, 2003).

Crook & Kumar (1998) found that a number of organisational variables, including the partners' experience of EDI influenced the expansion of its use. Vlosky et al (1997) found that buyers, such as manufactures, initiate EDI and expect to and actual gain more benefits that their suppliers – their main objective is to improve customer satisfaction and cut costs. Significant disruption to the business relationship can occur if the implementation is not handled properly. Over time, relationship strength and satisfaction increases.

Internet Inter-organisational Information Systems and Partner Relations

The Internet can be used to provide a platform for partnerships in all areas of the supply chain, whether it is procurement, purchasing, negotiation, coordination or just information exchange. The Internet allows two-way communications, unlike EDI technology, and therefore has much more impact on partner relations and partnerships. Research by Lancioni, Smith & Oliva (2000) concluded that the use of Internet IOS, can improve supplier relations by improving communications and data flows between suppliers and businesses. Support for these conclusions is given by a number of researchers. Barua et al (2001) suggested that the Internet provides opportunities for companies to develop relations with all business partners, suppliers as well as customers. This research was further developed by Zank and Vokurka (2003) who surveyed manufacturers, distributors and industrial customers and found that overall, members of the supply chain believed that e-commerce had a slightly positive impact on their relations with other supply chain partners. Hayes (2002) has shown that the use of the latest IT systems can aid supplier relations. For example, commitment, trust and communications can be enhanced and solidified by allowing the supplier/s access to real-time data which can also be manipulated, as required.

The Internet better supports the business relationship by offering better information with little investment expense. (Papazoglou & Ribbers, 2006). Therefore is it the case that advances in technology are changing this relationship scenario and now it is not so much about the type of transaction but the technical development within companies and level of information interaction between companies.

Li & Williams (2001) concluded that implementing IOS could assist in strengthening partnerships and improving cooperation as

- it requires close working between companies which, in turn, helps them to build a closer relationship and encourage the sharing of information
- it removes many errors associated with manual systems
- changing partners can be costly and time consuming

However, some Japanese car manufacturers see e-procurement, in particular, as preventing the development of closer partnership-type relations, which is what they prefer, by automating partner relations and therefore limit e-purchases to nuts and bolts and basic office supplies (Harney, 2000).

3 RESEARCH

This paper further develops the above findings by investigating the influence of IOS development on business relationships with suppliers and customers. It also analysed forces for and against IOS development.

The research critically evaluates 13 case studies to provide rich, in depth information to develop a theoretical model, thereby extending existing theories and models. The case study approach was also chosen as an all-embracing method that allows a detailed investigation and understanding of situations within particular organisational settings (Walsham, 1995). Nineteen in-depth interviews were carried out with senior employees of these 13 companies to enable cross-case analysis. Companies in product supply chains were the focus of the research as the products, and supply chains would be clearly identifiable. Most of the companies were large multinational companies with locations in Scotland, although three were small Scottish Companies. Items produced by all companies included electronics, clothing, food and drink, packaging and fixing solutions. The companies were positioned at various points in the supply chains - suppliers, packaging distributors and manufacturers. Retailers were also included in the research in order to give an analysis of the full supply chains.

Initially, employees interviewed were managers responsible for part of the supply chain, such as purchasing managers and sales managers. Thereafter, the manager was usually asked to suggest partners, either suppliers or customers, as appropriate, who could be used for the development of dyadic case studies. Managers in these companies were interviewed by using the same structured questionnaire. Interview responses were confirmed and corroborated by managers within the same companies, partner companies and other companies using the same type of technologies. It was also substantiated by additional information from a number of secondary sources, such as company publications, company websites, published company case studies and the WWW. Data collected was made more robust by the supply chain network associations. For example, third-party systems, such as GXS TradeWeb, an Internet EDI global marketplace used by several companies included in the research.

As this research investigated the relationship between a company and its partner, partners of the companies chosen were also investigated where possible. Wilson, Stone & Woodcock (1996) suggested that researchers exploring buyer-supplier relationships in business-to-business markets should collect data from both ends of the dyad. They argued that the collected data would be richer and therefore would compensate for the smaller sample size involved. In fact, although some linkages between case studies were not known, during the research and analysis, it was clear that most companies had linkages with most of the others. These gave very strong basis for conclusions. The case studies can therefore be seen as a network of companies.

Data analysis was undertaken during and after the data collection. The analysis was conducted using principles of hermeneutics (Klien & Myers, 1999) as methods for identifying and extracting key themes from multiple case studies (Eisenhardt, 1989). Data analysis used coding, developing trends, summarizing, clustering and graphs.

After an initial analysis of data, IOS used by the companies were categorised into three types, Elementary IOS, Intermediate IOS and Advanced IOS, according to the level of internal information systems integration and external information systems integration with partners in their supply chain. This classification was subsequently used to determine the objectives of the research and is further explained in Figure 1.

Figure 1: Inter-organisational Information System Categories and Level of Information System Integration

Inter-organisational Information System	Level of Information System Integration
Elementary	Many different internal IS with manual data input between systems. No systems integration with external partners
Intermediate	More than one internal IS may be used but automatic data input between systems. No systems integration with external partners
Advanced	More than one internal IS may be used but automatic data input between systems. More than one external-facing IS may be used with partners but automatic data input between internal and external systems.

4 FINDINGS

The empirical study gave interesting findings on how IOS development affects not only the company itself, but also its relationship with its business partners, whether suppliers and customers. This is due to the fact that IOS cannot be deemed as a closed system on its own, but must be taken as a component of the organisation (Leavitt, 1965: Boddy, Boonstra & Kennedy, 2002).

Company Restructuring, IOS Development and Position in the Supply Chain

Findings here showed that companies restructure when developing IOS, to improve relationships with both suppliers and customers. All companies using Advanced IOS had restructured to some extent, while around 66% of companies using Intermediate IOS and only 33% of companies using Elementary IOS had undergone any restructuring. Therefore, companies with Advanced IOS are more likely to have restructured than companies using Intermediate or Elementary IOS. This supports previous findings that relationships within SCM are now increasingly being seen as partnerships and businesses within the supply chain generally consider themselves as partners, rather than taking on a more adversarial and segregated role (Grieco, 1989: Kanter, 1994: Bowersox, 1996: Heikkila, 2002).

Similarly, Venkatramen (1994) in Papazoglou & Ribbers (2006) determined that integration of advanced information systems require business transformation, which involve changing business structure and processes and establishing inter-organisational business processes. His work is supported by other writers such as Ayers (2002), Clark & Stoddard (1996) and Benjamin et al (1990) who propose that benefits from IOS can only be gained when basic organisational structures and work processes are redesigned.

This research also showed that companies are more likely to reorganise to improve relations with customers due to the position power of the customer in the supply chain. Research supports these findings (Ayers, 2002) in that where previously power resided with vendors/suppliers and they pushed technology onto their customers, the retailers, now the balance of power is with the retailer. This power balance was also shown here. For example, a retailer in this study was pushing the food manufacturer

to used newer advanced technologies, such as RFID. Another manufacturer was 'invited' to use the third party GlobalNetXchange marketplace by their retailing business partner.

Development of Trust and Confidence in Partners

The research found that the level of IOS development has a beneficial impact on communication/information flows. Of companies using Elementary IOS, 63% of respondents found no change on communications/information flows/interaction, with only 37% experiencing a Positive Effect. With regard to companies using Intermediate IOS, 82% replies experienced at least a Positive Effect with 28% experiencing a Significant Positive effect. All companies using Advanced IOS found that they had a positive effect (55%), or a significant positive effect (45%) on communications.

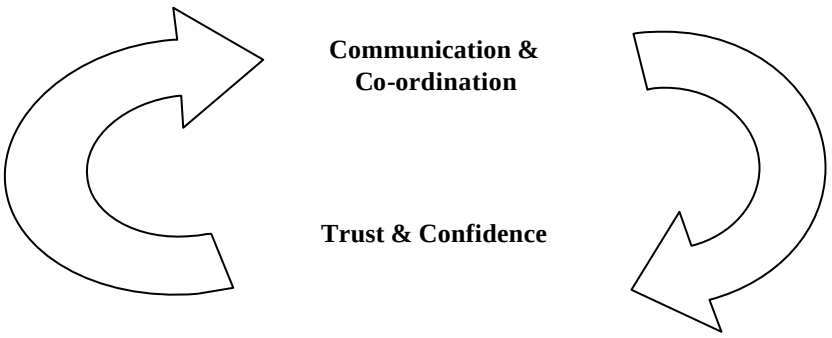
To illustrate, one manager commented that their legacy IOS brought about improvements in communications in purchasing, logistics and customer service and warehousing when they were implemented. Similarly, another employee commented that IOS development has not changed the number of meetings with suppliers, but has allowed more interaction with partners and therefore more important matters can be discussed at face to face meetings. A retail manager illustrated the beneficial impact of IOS on communications/ information flows to his role. Weekly information from Head Office is fed back to himself to give information on store targets such as revenue, stock levels and shelf space usage.

Information sharing and communication is necessary to build trust (Ballou, Gilbert & Mukherjee, 2000). Therefore given the previous findings that IOS development can improve information sharing and communication, it was of interest to determine if trust between partners was also developed when IOS development has taken place.

Findings showed that Elementary IOS can have a detrimental effect on trust levels between partners. For example, one manager regarded the lack of technology as hindering trust levels between partners as he felt that, as his company's IOS were not up web-based and in real-time, they hindered communication between business partners. Where companies used only Intermediate IOS then a positive effect on trust levels was reported by 54% respondents. For example, a Purchasing Manager reported that their web-enabled link with suppliers such as has enabled them to share more information and has led to an increase in trust between the companies. Most, 82%, of the replies from the companies with Advanced IOS reported a positive effect on the trust levels with partners. Therefore IOS development assists in development of trust levels between partners.

These findings can be shown as in Figure 2, as a virtuous partnership circle, supporting the partnership.

Figure 2: Virtuous Partnership Circle



Choi (1999) also found that there is a positive relationship between information volumes, amount of sales and joint decision-making, leading to better electronic cooperation. Grieco, (1989), Kanter (1994) and Kwon & Suh (2004) pointed to trust and communications/interaction as improving or even are necessary for effective working relationships with suppliers.

Barriers to and Forces for IOS development

Findings showed that other organizational factors also impact on the rate of this development. Some of these factors can encourage IOS development, whilst others act as barriers against it.

Seven organisational factors were shown to be barriers - benefits not demonstrated, financial costs, lack of system standards, resistance from other business partners, resistance from customers, technical maturity of the company, and technical maturity of the trading partner. These barriers were found to have different levels of impact, depending on the level of IOS development. The barriers had least effect in companies using Elementary IOS and most impact in companies with Advanced IOS. This is supported by Soliman & Janz (2003) who found that EDI and Internet-based IOS encountered a range of barriers which varied with the level of IOS development.

'Benefits not demonstrated' and 'Financial Costs' were not significant barriers for Advanced IOS but tended to be significant barriers for Intermediate and Elementary Systems. The remaining five factors were shown to be barriers, but at different levels and for different levels of IOS development:

'Business requirement' and 'Management commitment' can act as positive forces and encourage IOS development at all levels, thereby also enhancing partnership relations. In fact, management commitment can act as both a barrier, if it does not exist and have positive impact if it does exist.

A manager within one of the electronic companies endorsed this finding with his comment that the implementation of sophisticated IOS allows both their business and their customer to benefit, thereby keeping them in a leading position in the electronic market.

Significant Barriers for Advanced IOS

- Lack of System Standards
- Resistance from other business partner
- Resistance from customer

Small Barriers for Advanced IOS

- Technical maturity of company
- Technical maturity of trading partner

Small Barriers for Elementary and Intermediate IOS

- Financial Costs
- Lack of System Standards
- Resistance from other business partner
- Resistance from customer
- Technical maturity of company
- Technical maturity of trading partner

Therefore, in relating the strength of barriers to the type of IOS, then problems were generally regarded as 'Small Barrier' with Elementary and Intermediate IOS and more as 'Significant Barriers' with regard to Advanced IOS.

The above analysis also shows that partner resistance is more important to companies with Advanced IOS. This supports other findings in that variables within both partners can influence partner integration and that partner variables are more important in companies deploying Advanced IOS.

Therefore, it may be that due to the sophisticated nature of the systems and the integrative nature of their deployment in bringing companies together, a stronger, 'leader' or champion for technological change is required in order to push through the Advanced IOS, and to overcome technical and partner barriers.

5 MODEL DEVELOPMENT

In order to further progress the empirical and literature findings, a model has been developed from the above analysis. Firstly, this research has allowed the definitions of Elementary IOS, Intermediate IOS and Advanced IOS to be extended, to include other variables, such as Use of IOS, Partner Factors and Organisational Factors. Thereafter, the influence of organisational and technological factors at the three levels of IOS development on the organisation and its partners is compared. These are shown in the following Figures 3, 4, and 5.

Figure 3: Characteristics of Elementary Inter-organisational Information Systems

Characteristics of Elementary IOS			
Technology	**Use**	**Partner Factors**	**Organisational Factors**
Many different IS used, including EDI and third party networks. No/little internal systems integration. Technology seen as an operational tool, rather than as a key strategic component. Automation of processes gives effectiveness gains.	Transactions only. Partners enter information into their own systems. Limited information communication and co-ordination. Limited benefits from use of technology. Collaboration at operational level.	Companies may be working towards their own agenda and for their own benefit. Trust exists between partners but is limited by the nature of the IOS used. Partner collaboration is weak. Customers exert position power in the chain	*Significant barriers*: Benefits not demonstrated *Small barriers*: Financial costs Lack of system standards Resistance from other business partners Resistance from customers

Figure 3 shows that within Elementary IOS development, there is a low level of systems integration, information co-ordination, and partner collaboration and of benefits gained. Significant barriers are management commitment, benefits not demonstrated and resistance from customers. Smaller barriers include financial costs and resistance from other partners.

Figure 4: Characteristics of Intermediate Inter-organisational Information Systems

Characteristics of Intermediate IOS			
Technology	**Use**	**Partner Factors**	**Organisational Factors**
More that one IOS are used, but internal integration between information systems, gives integrated data flows. Role of technology is changing, from an operational tool to being a more strategic component. Technology is used for a larger range of tasks within all functions. Automation of processes gives effectiveness and efficiency gains. Information also used for business planning	Functional transactions and management reporting. Some integration of information systems to form links with parent company. Improved level of communications between functions. IOS replacing some face-to-face communications. IS supports communications with partners. Collaboration at operational and tactical levels	Companies may be working towards their own agenda and for their own benefit. However, some improvement in partner confidence due to increased communications and collaboration. Trust between partners is being enhanced. Integration of partnerships increasing Customers exert position power in the chain	*Significant barriers*: Benefits not demonstrated *Small barriers*: Financial costs Lack of system standards Resistance from other business partners Resistance from customers

Figure 4 shows that there is some systems integration, information co-ordination, partner collaboration and benefits gained within Intermediate IOS development. Significant barriers and insignificant barriers seem to be similar to those in the Elementary IOS.

Figure 5 shows the characteristics of Advanced IOS.

Figure 5: Characteristics of Advanced Inter-organisational Information Systems

Characteristics of Advanced IOS			
Technology	**Use**	**Partner Factors**	**Organisational Factors**
Technology viewed as a key strategic component with information as a key resource. Internal and external integration between information systems, using one of more Internet systems and portals Automation of processes gives efficiency and effectiveness gains.	IOS are used at all levels within the org, from strategic through to operational. Technology is used for an extensive range of tasks within all functions. Integration of communications, functions and processes is carried out by sophisticated technologies	Advanced IOS allow partners controlled access to extensive company information Company may review the status and number of partners. They may use tiered partners according to 'value' of partnership. Customers exert position power in the chain	*Significant barriers*: Business Requirement Management Commitment Lack of System Standards Resistance from other business partner Resistance from customer *Small barriers*: Financial costs Technical maturity of company Technical maturity of trading partners

At this level of IOS development, there is a high level of systems integration, information co-ordination, partner collaboration and benefits gained. Organisational barriers become different at this level of IOS development, with resistance from other business partners becoming more influential.

Combining these results into one graph, Figure 6 shows the influence of these organisational factors is the three levels of IOS development. The figure shows that IOS development impacts business partner relationship in a number of ways:

- Communication and coordination with the business partner increases
- Partner integration increases
- Confidence and trust in partners increase

However, this development also brings with it an increase in implementation barriers, such as lack of IOS standards and resistance from business partners. Management commitment and business requirement for IOS development can both as act as barriers against or drivers for IOS implementation.

Figure 6: The Impact of Organisational Factors at varying levels of Inter-organisational Information Systems Development

Factor	Elementary IOS	Intermediate IOS	Advanced IOS	Factor Impact
Partner Communication co-ordination, integration				IOS development increases communication and co-ordination between partners, as well as developing partner integration
Partner confidence and trust				IOS development, enhances confidence and trust in partners and therefore partnership integration
System Standards				Impact of lack of information system standards increase in effect with IOS development
Resistance from Business Partners and Customers				Impact of resistance from other business partners and customers increase in effect with IOS development
Management Commitment				Top management beliefs can act as a barrier or driver for IS development at all levels of IOS development. Strong management commitment is required for significant IOS development
Business Requirement/ Benefits not demonstrated				Business requirement can act as a driver towards IS integration at all levels of IOS development. If the benefits of IOS implementation cannot be demonstrated, then this may cause a significant barrier

Sherer (1995) developed a framework to describe three types of risk that affect IOS; technical risk such as security breaches, organisational risk which may arise due to restructuring of staff and their roles and environmental risk where partner and competitive forces exert influence over the company. Li & Williams (2001) also developed a similar three level model of barriers to the use of IOS, namely technical barriers or problems, organisational attitude to sharing information with business partners and suppliers and at the third level, an overall organisational cultural attitude towards inter-firm collaboration. However, this model relates such barriers to different levels of IOS development.

This model is supported by findings from Bensaou & Venkatramen (1995) who found that Inter-organisational Relationships varied with IOS development and that new IOS development will result in new business models and relationships. The pressure for these developments will come from the highly competitive marketplace.

6 CONCLUSION

This study is a comparative study on levels of IOS development within 13 case studies. It provides a better understanding of the impact of IOS across organizational boundaries. The findings show that the level of IOS development influences partner co-ordination and integration. IOS capabilities also assist in building trust and confidence in partners. However, a number of organisational factors influence IOS development and these factors such as management commitment, financial costs, resistance from other business partners can act as forces for or barriers to IOS development. The strength of these variables also varies with IOS capabilities.

The study has important implications for business. Organisations are increasing their use of IOS within SCM functions and therefore identification of the influencing factors is required and critical for emerging electronic business environments. Since partnership arrangements can be difficult and resource intensive and important to success in SCM, it would be valuable to businesses to evaluate the impact of technology, in particular, Internet IOS, on the required levels of partnership integration in

particular SCM functions. This will assist in improving SCM performance, enhancing business performance and ultimately leading to competitive advantage.

Ongoing work includes investigating and evaluating the impact of IOS on the supply chain of virtual products and services, as well as the impact of new technologies such as wireless applications.

The companies involved in this study were international or Scottish based companies and therefore the international cultural dimension was not investigated or noted. This research could be expanded to investigate any cultural aspects of the power aspect within business relationships, furthering the work of Hofstede (1983) who recognised cultural differences in the power variable.

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Book Review:

What Is E-Business? How the Internet transforms Organizations

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BOOK REVIEW

In this book Feng Li provides a timely review of the "state of e-business" at the beginning of the 21st Century. At a time when we are still coming to grips with the reality of what e-business means not only to organizations but also individuals, communities and services Feng Li's contribution creates a comprehensive starting point for both academics and scholars of e-business. By providing a clear grounding of the reality of e-business transactions within both the organisational environment and the community at large, we can begin to understand how internet technologies are influencing business processes.

What is an ever-changing and turbulent world of information technology requires a firm grip and understanding of what this means to the many stakeholders involved in the e-business transaction. Feng Li's definition of e-business (which he regards as a wide and encompassing entity) is both intriguing and thought-provoking and sets the scene for the ensuing discussions, scenarios and cases throughout the remainder of the book. Both the use of real-world examples and relevant and timely newspaper and magazine references makes the material accessible to both the novice and experienced scholar in many cognisant fields from e-business and information systems to management and commerce.

Part I provides a clear overview of the background within which e-business operates, applying the concept to three distinct but interrelated areas. First, the information economy in which we operate and the underlying themes within this, helping the reader to understand the interactions and connections between increased network connectivity, the rapid pace of technological change and investment, and our increasing reliance on information. The adage "Information is Power" grows continually in its relevance. Following this the ten rules of the network economy open our eyes to the myths and realities of the environment in which we operate. This section is consolidated by recognising what this means to the business world – how e-business actually takes place and the implications therein. I particularly liked the range of assignment options which were given throughout this section, which will enable any scholar to select and review an enticing topic.

Part II reflects upon the important role of strategy in the workplace, and recognises that business strategy has had to adapt and change to embrace the technological culture. Herein lays the paradox: although web-based systems require a strategic plan, the emergent result is often disruptive to the environment in which they operate. This section identifies many of the key disrupters of modern business practices, and recontextualises strategy as a process. It finishes by evaluating key models of e-business. These reflect the latest thinking in the field, by authors such as Timmers, Rappa, Afuah, Tucci and Osterwalder, and with the help of Feng Li's critical review the reader can use these models to interpret and understand the complexity of e-business.

The book finishes, in part III, by focussing on the growing field of Information and Communication Technologies (ICTs), the infrastructure within which e-business has been able to operate and grow. The first three chapters focus upon internal processes which enable organisations to use e-business systems to make an impact upon efficiency, while the final chapter extends this to the external environment. The role of ICTs in organizational change is explored through the use of positive examples of ICT's influence on the change process, for example, brining functional information closer together, while being aware of the political and cultural changes necessary to facilitate these efficiencies. ICT's role in innovation, and specifically Business Process Reengineering, is reviewed. Finally, internal processes relating to the role of teleworkers and virtual teams are explored, demonstrating not only the business benefits but also the advantages to the employee, while simultaneously being aware of such issues as alienation. From a communications background, I would like to have seen further review of the "soft" skills needed to complement the alienation potential within e-business processes, but this should not take away from the comprehensive nature of the book.

The assignments and discussions points contained throughout are consolidated by the appendices which provide three comprehensive examples of assignments which could be set for students. These draw upon many aspects of the work covered in the book and, in my opinion, would enable scholars to demonstrate their knowledge and understanding of e-business. These obviously come from a dedicated educator.

From the reader point of view I found this book straight-forward to understand and felt that a wide range of issues relating to the impact of internet technologies on business were scoped out and made relevant to many business-related fields. This book would be ideal for the post-graduate market, as well as academics and practitioners, providing a high level of academic and business relevance. From the clearly identified wide-ranging impact of technology, facets of the book would also be relevant on communications, strategy, change and other business modules, as well as engineering and sociology.

To summarise I would highly recommend this book with its clear academic justification, its beautifully outlined examples and its creative and relevant assignments which could easily be adapted and implemented in many different fields. The book is well presented, and the layout and structure easy to follow. It enables readers to "dip" in and out of relevant sections and apply these to the field in which they are interested. In What is E-Business?: How the Internet Transforms Organizations, Feng Li has produced a book which will be a wonderful resource for anyone trying to understand this growing field, and should be a required text in any e-business or e-commerce course.