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Strategy, IT and Dynamic Change in Enterprises

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Stream: Value and Supply Chain Networks

Abstract

This paper explores the importance of collaboration *between* different types of organizations within an enterprise. To achieve successful collaboration requires both endogenous and exogenous factors of each organization to be considered and a shared meta-strategy supported by shared cross-organizational processes and technology. A rolling business plan would periodically review, assess and reposition each organization within this meta-strategy according to how well they have contributed. We show that recent technological advances have made organizational structures more agile, organizational infra-structure more connected and the sharing of real-time information an operational reality; we also discuss the challenges and risks.

Keywords:

Enterprise Resource Planning, Enterprise, Organization structure, Value Networks, Supply Networks

1. Introduction

This paper presents preliminary findings and analysis from research into ERP systems and enterprise structures. It combines critical and prescriptive perspectives as a necessary means of making its contribution to the practitioner's toolkit. In addition to the methodology adopted and in recognition that action researchers are actors too, it draws on the authors own experiences as ethnographic researchers to identify parallels between their own informing practices and those of the actors studied *in situ* These parallels are intended to challenge the underlying assumptions of management practice. For this purpose a reflective and interventionist mode of representation is adopted. A summary of a research project, still in process, that tries to contribute to practitioner understanding of the issues at play when ERP systems are introduced into the context of separate organizations collaborating in an enterprise is presented.

Management literature often refers to "organization" (Galbraith, 2002), this study uses the term "enterprise" to reflect the current phenomena whereby business activity is not always carried out by a single legal entity for or by itself, this is explained further in this review. An enterprise...

".. is considered to be any entity in an economic activity, irrespective of its legal form. This includes, in particular, self-employed persons and family business engaged in craft or other activities, and partnerships or associations regularly engaged in an economic activity.".(European Commission, 2003)

The popular conception of ERP systems is that of packaged software used by business for advanced data processing, and mainly for processing financial transactions. Whilst this is broadly accurate, ERP in the current era goes far beyond that simplistic view. A practical definition of ERP is that it is a software application that takes "computer systems in finance, human resources, manufacturing and the warehouse" (Koch and Wailgum, 2007) and "combines their functionality into a single unified system, subdivided into software modules". Such systems are "comprehensive, packaged software solutions [that] seek to integrate the complete range of a business' processes and functions in order to present a holistic view of the business from a single information and IT architecture" (Gable, 1998). Both of these definitions appear to be more focussed on the achievement of a "single" technical solution. A more practitioner and user centric definition is that ERP systems "integrate organizational processes through shared information and data flows" (Seddon and Shanks, 2000). Davenport (1998) highlights the fact that the reference to "shared" is not bounded by physical location or business function; whilst Morton and Hu (2008), point to the fact that any integration is capable of being extended to business partners. From these definitions it can be seen that ERP, is, at once, a technology or system and a component of information management strategy. Some perspectives are offered on how ERP systems can be used to effect changes in enterprise structures, and these are discussed with the aid of a case study.

2. Literature Review

The year 2000 represented a watershed in the realms of ERP adoption, when many companies chose to implement ERP systems as a way of overcoming the Year 2000 (Y2K) bug; which meant many legacy systems would not be able to handle the new millennium. However, by the same token, many organizations made the conscious decision to eschew implementation of ERP systems at that time until after the millennium (Davenport, 1998).

Much research effort has been directed towards consideration of generic critical success factors of ERP implementation (Al-Mashari *et al.*, 2006; Allen *et al.*, 2002; Finney and Corbett, 2007; Hong and Kim, 2002; Peffers *et al.*, 2003; Ramayah *et al.*, 2007; Soja, 2006; Wang *et al.*, 2008), and some of the genre have directed that effort towards examining the issue of " organizational fit" (Hong and Kim, 2002; Morton and Hu, 2008; Motwani *et al.*, 2008), a focus on issues relating to enterprise structure is not central to any of these studies. Furthermore, few of these studies, Soja (2006) excluded, have addressed the area from the practitioner perspective.

The literature on ERP systems has grown steadily in recent years, this growth has meant that compilation of annotated bibliographies have become major research undertakings in their own right (Botta-Genoulaz *et al.*, 2005; Esteves and Bohorquez, 2007; Esteves and Pastor, 2001; Møller, 2006; Moon, 2007). These bibliographies served as a starting point from which to identify relevant literature for review. One notable finding in looking through these bibliographies is the realization that ERP and the literature relating to it is still very much of a practical rather than an academic nature.

Consequently the majority of articles do not appear in what may be considered journals with a high impact factor. A manual count of one bibliography shows that only 16 per cent of the 313 articles, listed by Moon (2007) appeared in what can be considered 'world leading[1]' journals, with a further 16 percent in 'internationally excellent' journals. Supplementary searches were conducted to bring these bibliographies up to date using a number of bibliographic databases including; EBSCOhost (www.ebscohost.com), Science Direct (www.sciencedirect.com, Ingenta Connect (www.ingentaconnect.com), Wiley-Interscience, incorporating Blackwell Synergy (www.interscience.wiley.com) and Google Scholar (www.scholar.google.co.uk) was particularly useful for identifying references from conference proceedings.

New Structures

A **virtual enterprise** is one created outside its parent, usually in collaboration with one or more partners, a temporary alliance of enterprises formed to exploit fast-changing opportunities, specifically to respond to an exceptional and often temporary market opportunity (Brown and Eisenhardt, 1996; Cao and Dowlatshahi, 2005; Gou *et al.*, 2003). This is an enterprise assembled based on cost-effectiveness and product uniqueness regardless of organization size or geographic location. As a result, costs, skills, and core competences are shared, thus enabling the enterprise as a whole to offer world class solutions to global markets that individually could not have been provided (Whitman *et al.*, 1999). Whitman et al, discuss how the concept of extended enterprise evolved starting with localized shop floor improvements, to improvement and

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[1] Aston Business School Journal League Tables 03 March 2008.

collaboration within supply chain management and finally to the extended enterprise, especially within more complex industries. They argue that a single enterprise can no longer provide maximum value to today's demanding customer and thus propose an extended enterprise model based on the three categories of business processes proposed by Presley et al in Whitman et al. Based on this model, the operation of a process oriented and highly flexible extended enterprise mandates that all activities, information, resources and organizational issues be carefully integrated. Extended enterprises should be perceived as transient enterprises formed and dissolved based on dynamic market opportunities (Kanter, 1999). Accordingly, Whitman et al describes the virtual enterprise as a *"temporary relationship with two or more participants which is formed, operated, and dissolved to accomplish specific short term goals and differ from existing inter-organizational models by the degree of shared accountability and responsibility of the participants and the structure by which participants contribute their competencies"*. The key nuance of this description is that the objective of the collaboration is goal specific and short term.

In their paper of 1999 , Browne and Zhang (Browne and Zhang, 1999) distinguish between extended and virtual enterprises though concede that both share many similar characteristics – for instance the formation of relationships between otherwise individual partners or companies to achieve business success in a competitive business environment, another is that such collaborations usually achieve greatly reduced time to market through quick response.

The extended enterprise (Bititci *et al.*, 2005; Krishnan *et al.*, 2007; Tam and Tsang, 2007) is viewed as focusing on long-term enterprise relationships across value chain(s)

or partners, an enterprise represented by all those organizations or parts of organizations, customers, suppliers and sub-contractors engaged collaboratively in the design, development, production and delivery of a product to the end user. This includes both inbound supply chain and outbound logistics chain.

The virtual enterprise is viewed as being a temporary consortium of independent organizations working together for a short time period to satisfy a niche market demand. This is an enterprise assembled based on cost-effectiveness and product uniqueness regardless of organization size, geographic location. As a result, costs, skills, and core competences are shared, thus enabling the enterprise as a whole to offer world class solutions to global markets that individually could not have been provided (Galbraith, 2002).

Accordingly, the success of both types of enterprise depends on intensive information sharing. Browne and Zhang further distinguish between the extended and virtual enterprise in highlighting their business focal point – with the extended enterprise focusing on product value chain while virtual enterprise is usually project based.

However, Nayak et al in a 2001 white paper (Nayak *et al.*, 2001), further describe the virtual enterprise in terms related to the types of systems required to support their activities. Production oriented virtual enterprises are intended to support an end to end supply chain, it spans multiple enterprises engaged in either discrete or continuous manufacturing. The other form is project oriented and involves activities such as construction, consulting, movie-making. In project oriented virtual enterprises delivery to the customer is either via the use of a coalition of enterprises as suppliers, often by

outsourcing the project to an integrator, or by buying in the services of different suppliers and assuming the role of integrator. Once the project is completed the 'enterprise' is disbanded, but may reform in a different guise for further projects, its composition depending on availability of participants and possibly past experience of performance.

The management and operation of the virtual enterprise will be similar to that of any project. The 'team' will be supported by both application service providers and business service providers, who can be full coalition members or another set of vendors depending on their capabilities, competencies and level of involvement. Equally dissolution of the virtual enterprise could be along project management lines, with a post completion review and other learning actions. Some of what is learnt is how to decide on future compositions of new enterprises. In some cases if the experience has been a positive one, it is not unknown for the enterprise to take on a form of permanence in the form of incorporation or the formation of limited liability partnerships. For the practitioner, implementing ERP into a virtual environment presents problems such as how to allocate responsibilities and what rules to impose on different partners in the enterprise.

Extended enterprises span company boundaries and include complex relationships between a company, its partners, customers, suppliers and market (Martinez *et al.*, 2001). The organizational aspects of an extended enterprise can be summarised as globalisation of exchanges, subcontracting and partnership. Companies in an extended enterprise must co-ordinate their internal systems (intra-organizational activities) with other systems in the supply chain and further must be flexible. These characteristics are

not easily co-ordinated in the context of ERP. This researcher takes the view that as all economic activity must be represented in the participants ERP systems, some of the problems to be resolved prior its representation in the ERP systems include:

- How to design and allocate roles and responsibilities in the enterprise structure and partner firms.

- Which set of rules to embed in the enterprise system as these may vary from one organization to another.

- What level of autonomy to afford each partner that may access the system.

- What communication protocols to adopt between partners or between the enterprise and the customer.

- Selection of an efficient control policy of the implementation phases.

Critical success factors

The challenge of successfully operating an extended enterprise involves, but not exclusively, consideration of some of the following factors;

The primary challenge of operating an extended enterprise, and or a virtual enterprise is a managerial one. There is a dynamism in operating such coalitions that calls for agile management; to set the direction for the enterprise, acquire resources, and transform those resources to produce output and result. Whitman et al, explore the development of dynamic models that can provide useful description and analysis of the managerial complexity that extended enterprises present and represent. Chief amongst these complexities is the need to model processes that are performed by other enterprises, but which the extended enterprise is responsible for delivering.

A further challenge common to both virtual and extended enterprises is the role of information and communications technology (ICT) in facilitating, enabling and supporting the coalition. The intensive sharing of information is a vital ingredient in the success of these coalitions. It's essential that the information allows for the transparency of business information which can be kept securely but can also be accessed easily and seamless by any authorised employee of a coalition member.

In the case of the virtual enterprise which Brown and Zhang view as being a more 'quick-creating and quick-dissolving organization' the ICT need is more critical, where success depends on having transactions processed rapidly and accurately. Nayak et al (2001) expand on this theme by breaking down the technology requirements into categories as follows;

- The technology layer, described as infrastructural technology such as email systems and web application servers.

- Business-to-business integration, providing applications that facilitate secured collaboration.

- E-Marketplace, where administrative and content-related functions; such as catalogues and market analysis, are supported.

- E-Commerce, ICT to support commerce and transaction-related processing functions.

- Dynamic E-Business level, where headline services are provided and supported, these centre on the coalition formation and operation, for instance, business registration information.

- Collaborative Processes level, providing ICT applications to support business processes across corporate boundaries, for instance collaborative product design, order fulfilment and project planning.

The implications of these definitions for information systems strategy formulation will be reviewed further with an analysis of the key components and issues to be addressed in the review of the literature on that area.

Still a further challenge to be overcome is related to integration of the various organizations. The concept of **organizational integration (OI)**, the extent to which distinct and interdependent organizational components constitute a unified whole, is as yet not well understood, but its significance is slowly being addressed (Barki and Pinsonneault, 2005) due to recent advances in information technologies and to heightened competition, today's firms are engaging in unprecedented levels of large scale integration endeavours that take a variety of forms (Markus, 2001). This is further explained by using the process chain of the organization as an overarching concept to identify different types of OI. A distinction can be made between the integration of the processes that are internal to an organization and those that are external. In addition, the integration of primary processes (i.e., those that directly produce an organization's outputs) can be distinguished from the integration of secondary processes (i.e., those that support the primary activities). That is, an organization's internal and external processes can be further differentiated according to whether they pertain to the primary activities or the secondary activities of the process chain. External operational processes can also be separated according to whether they are directed forward into distribution and clients, backward into supply, or laterally into partially assembled products or parts.

Internet Era Organization Structures

Anand & Daft (2007), analyze the transition of organizations over time in particular. The question this study poses is whether ERP systems have kept pace. Under normal circumstances, an ERP system is licensed for use by a single legal entity which would fit the mould of the traditional "self-contained" structure. They report on work by Duncan (1979) of the self-contained design coming in three forms. Firstly, there is the functional form where operations are grouped according to business function; accounting, human resources, marketing and so on. The second structure is a grouping along divisional lines, where a division may be seen as a company within a company housing its own set of sub-functions and being responsible for contributing to the profitability of the overall organization or enterprise. A third structure the matrix identified which "combines a vertical structure with a strong horizontal overlay". In all three cases the emphasis was on hierarchical control as well as functional specializations. Duncan's work is classed as Era 1 organization design.

The second Era of organization design, according to Anand & Daft (2007), started in the 1980s. The focus here was on removing the departmental silos within organizations and instead concentrating on the total satisfaction of customer needs. This was done either by creating self contained "project" teams or organizing along process lines, engineering processes so that all the capabilities required to satisfy a customer's needs are "linked-up". With the focus on the project or customer need the important thing in that "no internal boundaries" exist in meeting that need.

Becoming increasingly popular from the late 1990s onwards are what Anand & Daft refer to as the Era3 organizational forms. For the purposes of this review the terms pre

and post internet eras will be adopted. These include Hollow, Modular and Virtual organizations and share the common characteristics of resulting from an opening up of organizational boundaries – both internal and external. It meant identifying functions and or processes that could be better performed by other organizations, for whatever reason, usually including cost or superior competence, and "outsourcing" that activity. This could include manufacture of a component, a whole product, an entire business, such as research and development, marketing; or parts of a process such as data entry.

Binder & Clegg (Binder and Clegg, 2006) recognizing Era 3 above as representative of the new organizational structures, where the enterprise comprises more than one legal entity, present a more detailed explanation of this organizational form. Adopting the term "enterprise" as earlier defined to depict instances of structure where different parts of different companies can be brought together to make up a new operation either for a one-off project or a long-term collaboration. Using a combination of empirical research in the German automotive industry and an examination of literature, their study sought to present a conceptual framework for these enterprises. Principally, the framework advocates that enterprise management should seek to strike a balance between an exogenous and an endogenous approach to enterprise management. Referring to the practice by which some managers concentrate their energies on the operating environment in which an enterprise finds itself whilst others focus management effort on managing their internal resources. They further argue that there is no trade-off between these approaches on the basis that the priorities in a new organizational structure are constantly changing and the significance of each participant's role in an enterprise is also under constant change.

The pertinent conclusion that can be drawn from this study is that a single legal entity may find itself being a participant in an extended enterprise, a virtual enterprise or a vertically integrated enterprise and this can be the case either simultaneously or serially. On the assumption that the organization will not or cannot implement a new ERP system for each role it plays, the question is then how to implement the system in such a way that it is not forced to manage these activities outside of the ERP system.

Lucas & Baroudi (Lucas Jr and Baroudi, 1994) state that it is IT, and by extension ERP, that has made new organization structures possible. They point to how IT has made it possible to use EDI to link to a third party manufacturer such that it can supply inventory of raw materials as it is needed (virtual components); how electronic mail and video conferencing has enabled links both within and across entity boundaries thereby supporting both teleworking and transnational reporting lines and how IT can be substituted for managerial layers, eliminating some layers entirely, for example in some companies expenses up to a certain amount are approved without any direct management oversight.

ERP systems and embedded structures

There is a contrast between one view of the social sciences, wherein researchers give primacy to the power of human agents to influence social phenomena by adapting processes and the researchers that take the view that it is social structures (context) that has the most profound impact on social phenomena. Structuration theory (Giddens, 1986 ; Orlikowski, 1992), takes the view that context and structure are an interacting duality. Agents, build use and reproduce social structures through their actions, but at the same time these actions are empowered and constrained by the structures (Chu and

Smithson, 2007). Enterprises considering ERP use would then need to ensure that structural contradictions do not undermine the system, wherein a new structure is embedded in the ERP system before that structure had become normalized within the enterprise itself. Other strands of research are attempting to reverse engineer these embedded structures by making assumptions as what were the user requirements that gave rise to the standard ERP applications, (Daneva and Wieringa, 2006; Soffer *et al.*, 2003).

According to Orlikowski technology has been conceptualized as the product of human action, both during its creation by developers, and when it is subsequently appropriated and modified by users (Orlikowski, 1992, 2000), and this is also true of ERP systems which aim to automate core business processes. They are developed by vendors who draw on their existing sources of knowledge, resources and norms (Soh and Sia, 2004). The extent to which the package embedded structures differ from those of the implementing organization will depend on differences in their operational and environmental contexts. Some researchers (Dillard *et al.*, 2005) liken this embedding to inflicting "administrative evil" on ERP users. They assert that administrative evil results from an abdication of responsibility that is fostered by the absence of individual accountability for the ultimate outcome of organizational action. The abdication of responsibility begins with accepting the legitimating authority of the organization and is reinforced as individuals act and react within the legitimating context. Organizational processes and practices are embedded within, legitimated and facilitated by organizational hierarchy. Table 1 below presents a set of propositions informed by the

literature that serve to provide a platform from which to better understand ERP systems and their interplay with enterprise structures.

	Proposition	Informing authors
1	Whilst ERP systems are comfortably able to support Pre-Internet organizational designs, Post-Internet Era forms are not readily supported	Anand & Daft 2007,
2	ERP implementation needs to cater for the varying roles an entity may play in an enterprise such that management are empowered in all scenarios	Binder & Clegg 2006
3	ERP implementation must allow for the provision of management information for the explicit management of enterprise design factors and design types.	Duncan 1979, Binder & Clegg 2006
4	ERP led change initiatives, including those that involve BPR, need to extend their reach to embrace whole processes to yield ultimate benefits	Morton & Hu 2008; Wang et al. 2007; Wu, Shin & Heng 2007
5	Contingency variables are seldom explicitly factored into an ERP implementation process, but for an optimal implementation project this gap will need to be addressed.	Laukkanen, Sarpola & Hallikainen 2007; Mabert, Soni & Venkataramanan 2003
6	Enterprises that explicitly consider mapping their enterprise structure against that embedded in the ERP application will experience fewer instances where the need for customisation are required early in the implementation process	Chu & Smithson 2007; Dillard, Ruchala & Yuthas 2005.
7	ERP systems are sufficiently robust to cater for contemporary organization structures, provided they are 'designed' into the implementation at the outset	Janssen & Joha 2006; Redman et al. 2007
8	Greater effort is required to implement ERP systems to support the virtual or extended enterprise in its purest form as they are not bounded sufficiently for ERP configuration purposes.	Brown & Eisenhardt 1996; Cao & Dowlatshahi 2005; Gou et al. 2003
9	Each participant in these post- internet era organization forms will need to configure its input into the collaboration and "account" for its collaborators as arms length suppliers.	Barki & Pinsonneault 2005
10	ERP can be explicitly deployed to reinforce intended management restricting policies	Lucas Jr & Baroudi 1994; Sampler 1996

Table 1- Summary of case review propositions

3. Methodology

The primary focus of this study is the interplay between emerging enterprise structures and ERP systems, this has been investigated using case studies, and one is presented as

an example in this paper. The cases have been selected primarily so that each can provide unique focus to one or more of these issues, the objective being to contribute to praxis. The organizations chosen for examination in this study are ones for whom the researcher has participated as an action researcher in an ERP implementation and who met the researchers chosen definition of an enterprise. Extended enterprises were the preferred type in that they demand the implementation of the most modern and latest applications to their fullest extent. These organizations supported this study at a corporate level and were unbiased as to its outcome; a senior manager supervised the researcher whilst working on the action research case studies, and would where possible use non confidential material, notes and observations in any generic research findings.

In his book on the subject, Yin draws a distinction between case studies based upon a single entity and those based on multiple entities (Yin, 1984, 2002). This distinction is considered important with respect to both research design and research analysis. Yin explains further that each type of design is appropriate in specific circumstances, and argues that should circumstances change, then where possible the study should start with a new design. Based on Yin's principles Figure 1 below provides a perspective of the different possible approaches to case study design.

	Single –case designs	Multiple-case designs
Holistic (single unit of analysis	TYPE 1	TYPE 3
embedded (multiple unit of analysis	TYPE 2	TYPE 4

Figure 1 - Types of Case Study Design(Yin, 1984, 2002)

The study of ERP and Enterprise Structure contained in this article follows a Type 4 approach. Admittedly this may be deemed less than scientific, and positivist, but the approach is informed by the research objectives and the research circumstances. A common action research activity was the implementation of ERP systems in different settings. In each instance selected for this article the researcher was embedded in the research setting for varying lengths of time. Selection criteria for inclusion in the study were more as a way of demonstrating the commonality of the ERP properties across the varied settings. This approach to case selection is in keeping with what is termed the "information oriented selection" approach (Flyvbjerg, 2006), in this instance case are selected are of the "Maximum variation" type, selected "To obtain information about the significance of various circumstances for case process and outcome (e.g. , three to four cases that are very different on one dimension: size, form of organization, location, budget, and so on). As mentioned the research objective emerged in the cause of the study, as opposed to being well formulated in advance, but it does draw on Yin's suggestion that Type 3 and Type 4 studies should be replicated at each site, with the aim of observing similar or contrasting results.

The selected cases are explored using the Enterprise Matrix, a tool for mapping enterprise structures (Binder and Clegg, 2006). This serves to map the enterprise structures uniformly and aid cross case comparisons to be made. The enterprise matrix is particularly useful in mapping an enterprise structure to the internal and external forces that may impact an enterprises structure and thereby allowing the explicit analysis of the impact of ERP systems on those structures (see appendix).

To test the validity of the study and its relevance in practice, key findings will be presented to a focus group of fellow practitioners, in the form of a scaled down Delphi Study. Focus Groups are useful at any point in a research study, but are most useful for exploratory work (Berg, 2001). The wider debate of validity that is also uppermost in IS research (Pala *et al.*, 2003) is one that will be addressed in further empirical work.

4. Case Study: A European Train Operator

This assignment which was carried out over 12 months during 2003/2004 and involves the reconfiguring of an existing ERP system to cater for a possible restructuring of the business for both strategic and operational purposes.

E-star operates the high-speed passenger rail service that directly links the UK to the Europe continental mainland via the Channel Tunnel. The service was launched in November 1994 and, at the time of writing, provides up to 17 daily services between London and Paris and up to 10 daily services between London and Brussels. The enterprise targets the business and independent leisure traveller markets with its city centre to city centre services in direct competition with the major airlines and low cost carriers.

From inception the services were operated by 3 independent organizations; Euro Passenger Services Limited (EPSL) owned by British Rail, Société Nationale des Chemins de fer Français (SNCF) and Société Nationale des Chemins de fer Belges (SNCB). The last two being the national railway companies of their respective countries. In 1996 London & Continental Railways (LCR) assumed ownership of EPSL,

the British operator and renamed it E-star UK Limited (EUKL). In 1998, LCR awarded

a management contract to InterCapital and Regional Rail Ltd (ICRR) to manage EUKL.

ICRR is a consortium comprising the NExpress Group (40%), SNCF (35%) SNCB

(15%) and Brit Airways (10%). BA was a sleeping partner. In 1999 E-star Group (EGL)

was formed, jointly owned by the 3 partner enterprises, to have overall responsibility for

the strategy, marketing and commercial direction of the E-star business. EGL was run

from the UK, was staffed by EUKL personnel, and operationally was indistinguishable

from EUKL. E-star operates a fleet of 27 trains between the UK and France/Belgium. In

addition, three E-star owned trains were being used on domestic services in France, one

was in service in the UK and a fifth is based in Belgium.

In late 2001/early 2002, the partner railway companies started Project Jupiter, the

objective of which was to unify the three parts of the E-star business into one company

to be known as E-star International Limited (EIL) for the purposes of this paper. There

was also a logistics business; Esprit Europe offering timetabled parcel services between

central London, Paris and Brussels. Operationally the E-star business was very complex

with various contractual and business protocols between the partner companies. The

trains themselves were owned as assets by the individual partner companies, and these

protocols covered revenue maintenance cost sharing amongst other things. Maintenance

of the rolling stock was another highly complex part of the business. Each of the partner

companies operated their own maintenance infrastructure, and any maintenance carried

out on a train owned by another company was cross-charged according to the relevant

protocol. Through the life of the E-star partnership between EUKL, SNCF and SNCB

many of the high value repairable parts fitted to the train had been classified as "Jointly

Owned". This meant that the 3 railways bought them jointly and payment for the purchase was on the basis of the ratio of the number of sets (trains) owned.

The Appendix E-star Enterprise Matrix depicts the complexity of the E-star enterprise, showing the various stakeholders and the extent to which they are involved in its core activity of providing passenger services. Given these complexities, Project Jupiter was a complex and detailed project from the outset. In summary, this unification entailed:

- each partner railway company taking an equity stake in EIL proportional to its value (on a present value basis) in EIL;

- the transfer of each railway's existing contractual infrastructure rights (e.g. covering Eurotunnel, Channel Tunnel Rail Link project and so on) to EIL;

- the granting, by SNCF and SNCB, to EIL of access rights to the necessary French and Belgian rail and station infrastructure;

- the leasing by the partner railways of all trainsets (engines and carriages) to EIL;

- the suspension of the bi- and tri-partite protocols; and

- SNCF and SNCB becoming 'arms length' suppliers to EIL, being remunerated as per agreed 'Pricing Schedules'.

The ERP part of this exercise was to reconfigure the existing systems to better support the business both currently and in the future, and reflect the structural and operational changes that would result from the Project Jupiter as a whole. The project faced several challenges in that the exact corporate and operating structure for the new organization had not been confirmed. Also the timescales for the new organization to become operational was very fluid as it required ministerial assent, as the ultimate ownership of

the British part of the business rested with the British government. Hence, the project brief had to be fulfilled in readiness for the first possible opportunity at which that assent could be obtained, and a go ahead for the new structure to become operational. However, the current systems needed to remain operational in a 'business as usual' mode. The initial timescale for the project was eight calendar months. The project team consisted of the researcher on a full time basis, along with secondees, on a part-time basis from various parts of the business. The senior manager from the information systems department was the business project manager.

An additional complexity was the decision, to take the opportunity presented by the project, to implement a Budgeting and Forecasting system to integrate with the ERP system and effectively replace the present system based around spreadsheets. The project was sponsored by the EGL Finance Director and championed on a daily basis by the Head of Finance, with support provided by the company's Financial Controller. The assignment requirements were;

- Define and document current operating processes and procedures

- Facilitate workshops with key operational stakeholders to identify and prioritize operations that would change as a result of Project Jupiter

- Develop a new structure for the business that could be implemented immediately irrespective of a decision on Project Jupiter

- Identify system and process improvements, which could be made to current way of using the ERP system. Implement any 'quick wins'.

- Identify and select a suitable cost effective replacement for the current spreadsheet based budgeting and reporting system that would integrate as seamlessly as possible with the ERP system.

- Developed process improvement plans for each of the Top 10 quick wins, including client ownership and responsibilities, timelines, and performance targets

Work in parallel with the information systems technical team to ensure business data that goes into the corporate data warehouse supported holistic business decision making for the business 'as –is' and the proposed new company

The Existing ERP system

The researcher conducted an initial series of meetings to gain a better understanding for the rationale of the project. Owing to the complex make –up of the organization it was felt that management of the enterprise was not as good as it could be. The reporting lines were fragmented, and roles were not always filled by the best available resource. For political reasons the management of the enterprise had to be comprised of a representative number of staff from the partner railway companies. Equally management decisions had to be made with a backdrop that further approval was required from the partner company management and ultimately the respective governments. From a strategic standpoint this made the business harder and more complex to manage. In addition to the complexities mentioned earlier, there were additional issues with human resources management.

Aside from the EUKL personnel, the enterprise utilised resources that were essentially staff of other organizations. This meant that resourcing decisions had to be sensitive to the industrial relations that were outside their realms of influence or control. For

example, if SNCF staff went on strike, a *movement sociale* for instance, this always adversely affected the French side of E-star operations. Additionally, the circumstances that prompted the creation of E-star Group, to enable a unitary approach to exploiting the E-star brand commercially, still existed on the costs side of the enterprise. A single entity meant overall profitability could be under unitary management control and direction.

E-star used the following Oracle applications at Release 11i (with varying degrees of patching in some applications to add required functionality only available in later versions).

- General Ledger (GL)

- Accounts Payable (AP)

- Accounts Receivable (AR)

- Cash Management (CE)

- Purchasing (PO) including iProcurement

- Fixed Assets (FA)

- Human Resources (HRMS)

- Payroll

- Training Administration (OTA) – now known as Oracle Learning Management (OLM)

The applications were setup for multi-organization with two organizations (legal entities) set up E-star (UK) Ltd (EUKL) and E-star Group Ltd (EGL), within a single Business Group. As a limited tilt towards an e-business mode of operation E-star sent documents (Invoices, Statements, Purchase Orders etc. to its vendors or customers using

pre-printed stationery, Some Purchase Orders were being sent from the iProcurement system as e-mails, though some problems existed, in particular with e-mails being blocked as Spam (Junk mail).

Two systems that were fundamental to enterprise operations were respectively used to manage the companies scheduling of rolling stock maintenance and procuring and managing its stock of spare parts. Both these systems were integrated via customised interfaces with the ERP system. And commercially significant was the website which through which passengers could buy tickets. The enterprise also operated a data warehouse used as a business intelligence and marketing tool.

Solution Design

The ERP aspects of this project were closely ring fenced. As no decisions had been made it was essential that no explicit plans were made to show how integrated EIL could be. It was assumed for instance that the non UK operations would move to a form of charge out mechanism for any services bought in by EIL, this would include use of crew, tracks and stations. A separate project to work out the pricing schedules and so on was required to facilitate that process.

On this basis it was not difficult to map out the future state design of EIL, and draft the configuration changes to the ERP systems. Conceptually, the project sponsor and project champion had a clear idea of the shape of the new enterprise, but not of how it would be implemented. It was also clear that the ERP system had been configured in such a way that the organizational restructure would have a minimal impact on the way the enterprise functioned on a day to day basis. However, this only became apparent

after the business requirements had been established. A review of existing system documentation confirmed that few changes were required structurally. Integration testing was conducted as a matter of course to confirm that the new organization would be "recognised" by all existing legacy systems.

A further observation was the level of support received from the enterprise staff, it was very evident that people felt very secure in their roles and did not feel in anyway threatened by the project or what it stood for. Evidence of this lies in the very low rate of staff turnover generally within the company.

5. Reflections on the Literature

The researcher provided technical assistance to the company, helping the team with their activities and making suggestions as to how software configurations would need to be changed. The project itself had a very high profile within the business and the rationale behind it had been well communicated, has had the uncertainties surrounding the likelihood of a decision to go ahead with implementing the changes required.

Operationally, the main changes would be the need to "invoice" partner railway companies for services rendered to EIL. However, it was felt this also would result in little by the way of change in how the enterprise conducted its business.

One aspect of the project that was not tested, was that as part of the creation of EIL, personnel from the partner companies, could nominally become EIL employees for operational, as opposed to solely fiscal purposes.

In this case study, the ERP system was configured to allow an existing business and a restructured business to be managed using the same basic systems architecture. No additional training was required to educate users as to the system functionality. The proposed organization structure was configured on to the system, and it was demonstrated how a seamless transition could be achieved if and when the go ahead was given to make the new company operational. Because E-star was already operating two legal entities from the same system it was possible to demonstrate how a third could be added with the minimum of disruption.

The need for the project itself was subject to a complex regulatory framework and it was conducted without the certainty of ever being implemented. But it serves to demonstrate the flexibility afforded from the use of ERP systems and demonstrates that an enterprise can respond quickly to structural changes imposed on it by the environment in which it operates without the need for complex projects to re-implement or replace existing systems.

Sampler (Sampler, 1996) offers the following perspectives on the relationship between IT and Organizational Structure:

- IT leads to centralisation of organizational control (Leavitt and Whistler, 1958).

- IT leads to decentralisation of organizational control.

- IT has no uniform impact on organizational control, relationship determined by other factors.

- Organizations and IT interact in an unpredictable manner.

- IT enables new organizational arrangements such as networked or virtual organizations.

This case provided several learning opportunities for the researcher, principally that an ERP system can be used in support of making all of Sampler's perspectives a reality. With the many legal entities involved, it also demonstrated that ERP systems have a way to go before they can fully support the reality that of the current enterprise structure. The need to understand the business environment of the enterprise was very important, as was good technical understanding of the applications currently in use. After some months it became clear that a quick decision to make the new structure operational would not be forthcoming, the decision was therefore taken to complete documentation of the solution, but to leave the new configuration 'live' on a test environment. The project had been conducted with minimal disruption to the current operations and because of its profile and executive level support had been well received by those actively involved in its conduct.

6. Summary

ERP traditionally, is designed for the conventional organizational form wherein the organization is bounded. It has a legal form and employs all its own employees, and is responsible for all the premises from which it conducts its operations. The difficulty has come in catering for the new forms of enterprise, how to not only design an ERP system to cater for this, but then how to configure and implement the resultant application and its constituent modules. An additional complexity is where a company is part of multiple enterprises – how can one ERP system cater for the multiple realities that this represents.

References

AL-MASHARI, M, GHANI, S K and AL-RASHID, W (2006). A Study of the Critical Success Factors of ERP Implementation in Developing Countries. *International Journal of Internet and Enterprise Management,* **4**, 68-95.

ALLEN, D, KERN, T and HAVENHAND, M (2002). ERP Critical Success Factors: An Exploration of the Contextual Factors in Public Sector Institutions. *Proceedings of the 33rd Hawaii International Conference on System Sciences,* **IEEE** (2002).

BARKI, H and PINSONNEAULT, A (2005). A Model of Organisational Integration, Implementation Effort, and Performance. *Organization Science,* **16** (2), 165-179.

BERG, B L (2001). *Qualitative Research Methods for the Social Sciences*. 4th ed. Boston, MA, USA: Allyn and Bacon.

BINDER, M and CLEGG, B (2006). Enterprise Management: A New Frontier for Organisation. *International Journal of Production Economics,* **OSCOM** (Special Issue).

BITITCI, U S, MENDIBIL, K, MARTINEZ, V and ALBORES, P (2005). Measuring and Managing Performance in Extended Enterprises. *International Journal of Operations & Production Management,* **25** (4), 333-353.

BOTTA-GENOULAZ, V, MILLET, P-A and GRABOT, B (2005). A Survey on the Recent Research Literature on ERP Systems. *Computers in Industry,* **56** (2005), 510-522.

BROWN, S and EISENHARDT, K M (1996). When Is Virtual Virtuous? Organizing for Innovation. *Harvard Business Review,* **1996** (January-February), 65-73.

BROWNE, J and ZHANG, J (1999). Extended and Virtual Enterprises - Similarities and Differences. *Journal of Agile Management Systems,* **1** (1), 7.

CAO, Q and DOWLATSHAHI, S (2005). The Impact of Alignment between Virtual Enterprise and Information Technology on Business Performance in an Agile Manufacturing Environment *Journal of Operations Management,* **23** (5), 531-550.

CHU, C and SMITHSON, S (2007). E-Business and Organizational Change: A Structurational Approach. *Information Systems Journal,* **17**, 369-389.

DANEVA, M and WIERINGA, R J (2006). A Requirements Engineering Framework for Cross-Organizational ERP Systems. *Requirements Engineering,* **2006** (11), 194-204.

DAVENPORT, T H (1998). Think Tank: Living with ERP. *CIO Magazine,* **12** (5), 30.

DILLARD, J F, RUCHALA, L and YUTHAS, K (2005). Enterprise Resource Planning Systems: A Physical Manifestation of Administrative Evil. *International Journal of Accounting Information Systems,* **6** (2), 107-127.

ESTEVES, J and BOHORQUEZ, V (2007). An Updated ERP Systems Annotated Bibliography: 2001-2005. *Communications of Association of Information Systems,* **19** (WP 07-04), 387-446.

ESTEVES, J and PASTOR, P (2001). Enterprise Resource Planning Systems Research: An Annotated Bibliography. *Communications of the AIS,* **7** (8).

EUROPEAN COMMISSION (2003). Commission Recommendation of 6 May 2003 Concerning the Definition of Micro, Small and Medium Sized Enterprises. *Official Journal of the European Union,* **L124, 1422**, 36-41.

FINNEY, S and CORBETT, M (2007). ERP Implementations: A Compilation and Analysis of Critical Success Factors. *Business Process Management Journal,* **13** (3), 329-347.

FLYVBJERG, B (2006). Five Misunderstandings About Case-Study Research. *Qualitative Inquiry,* **12** (2), 219-245.

GABLE, G G (1998). Editorial - Large Package Software: A Neglected Technology? *Journal of Global Information Management,* **6** (3), 3-4.

GALBRAITH, J R (2002). Organizing to Deliver Solutions. *Organizational Dynamics,* **31** (2), 194-207.

GIDDENS, A (1986). *The Constitution of Society: Outline of the Theory of Structuration.* Reprint ed. California, USA: University of California Press.

GOU, H, HUANG, B, LIU, W and LI, X (2003). A Framework for Virtual Enterprise Operation Management *Computers in Industry,* **50** (3), 333-352.

HONG, K-K and KIM, Y-G (2002). The Critical Success Factors for ERP Implementation: An Organizational Fit Perspective. *Information & Management,* **40** (1), 25-40.

KANTER, R M (1999). Change Is Everyone's Job: Managing the Extended Enterprise in a Globally Connected World. *Organizational Dynamics,* **28** (1), 6-22.

KOCH, C and WAILGUM, T (2007). A B C: An Introduction to ERP. *CIO Magazine* [online]. Available from: http://www.cio.com/research/erp/edit/erpbasics.html [Accessed 20 October, 2008].

KRISHNAN, M S, RAI, A and ZMUD, R (2007). The Digitally Enabled Extended Enterprise in a Global Economy. *Information Systems Research,* **18** (3), 233-236.

LEAVITT, H and WHISTLER, T (1958). Management in the 1980's. *Harvard Business Review,* **Nov-Dec** (1958), 41–48.

LUCAS JR, H C and BAROUDI, J J (1994). The Role of Information Technology in Organization Design. *Journal of Management Information Systems,* **10** (4), 9-24.

MARKUS, M L (2001). Reflections on the System Integration Enterprise. *Business Process Management Journal,* **7** (3), 1-9.

MARTINEZ, M, FOULETIER, P, PARK, K H and FAVREL, J (2001). Virtual Enterprise - Organisation, Evolution and Control. *International Journal of Production Economics* **74** (1-3), 225 238.

MØLLER, C (2006). A Comprehensive ERP Bibliography - 2000-2005. Department of Marketing, Informatics and Statistics, Aahus School of Business.

MOON, Y B (2007). Enterprise Resource Planning ERP: A Review of the Literature. *International Journal of Management and Enterprise Development,* **4**, 235-264.

MORTON, N A and HU, Q (2008). Implications of the Fit between Organizational Structure and ERP: A Structural Contingency Theory Perspective. *Information & Management,* **28** (2008), 391-402.

MOTWANI, J, AKBULUT, A Y, MOHAMED, Z and GREENE, C (2008). Organisational Factors for Successful Implementation of ERP Systems. *International Journal of Business Information Systems,* **3** (2), 158-182`.

NAYAK, N, BHASKARAN, K and DAS, R (2001). Virtual Enterprises - Building Blocks for Dynamic E-Business. *Institute of Electrical and Electronics Engineers, Inc,* **White Paper**.

ORLIKOWSKI, W J (1992). The Duality of Technology: Rethinking the Concept of Technology in Organisations. *Organization Science,* **3** (3, August 1992), 398-427.

ORLIKOWSKI, W J (2000). Using Technology and Constituting Structures: A Practice Lens for Studying Technology in Organizations. *Organization Science,* **11** (4), 404-428.

PALA, Ã, VENNIX, J A M and VAN MULLEKOM, T (2003). Validity in Ssm: Neglected Areas. *Journal of the Operational Research Society,* **54** (7), 706.

PEFFERS, K, GENGLER, C E and TUUNANEN, T (2003). Extending Critical Success Factors Methodology to Facilitate Broadly Participative Information Systems Planning. *Journal of Management Information Systems,* **20** (1), 51-85.

RAMAYAH, T, ROY, M H, AROKIASAMY, S, ZBIB, I and AHMED, Z U (2007). Critical Success Factors for Successful Implementation of Enterprise Resource Planning Systems in Manufacturing Organisations. *International Journal of Business Information Systems,* **2**, 276-297.

SAMPLER, J L (1996). Exploring the Relationship between Information Technology and Organizational Structure. In: EARL, M J (ed.). *Information Management: The Organizational Dimension.* Oxford: Oxford University Press.

SEDDON, P and SHANKS, G (2000). Editorial to a Special Issue on ERP Systems. *Journal of Information Technology,* **15** (3), 181-182.

SOFFER, P, GOLANY, B and DORI, D (2003). ERP Modeling: A Comprehensive Approach. *Information Systems,* **28** (6), 673-690.

SOH, C and SIA, S K (2004). An Institutional Perspective on Sources of ERP Package-Organisation Misalignments. *The Journal of Strategic Information Systems,* **13** (4), 375-397.

SOJA, P (2006). Success Factors in ERP Systems Implementations: Lessons from Practice. *Journal of Enterprise Information Management,* **19** (4), 418-433.

TAM, K and TSANG, R H (2007). Timeliness and Transaction Management in Extended Enterprises. *International Journal of Business Information Systems,* **2** (4), 392-412.

WANG, E T G, SHIH, S-P, JIANG, J J and KLEIN, G (2008). The Consistency among Facilitating Factors and ERP Implementation Success: A Holistic View of Fit. *Journal of Systems and Software,* **81** (9), 1609-1621.

WHITMAN, L, KRISHNAN, K, AGARWAL, R K and BHANDARE, P (1999). Engineering the Extended Enterprise. San Antonio, Texas, USA .

YIN, R K (1984, 2002). *Case Study Research.* California, USA.: Sage Publications.

Appendix– E-star Enterprise Matrix

Company:	E-star	Valued Steps				
Product:	City to City Transfer	Process Start--Process End				
Environment:	Continuous Service					
		Ticket Sales	Station Checkin	Auxiliary Sales + On board services	Departure Processing	After Sales
high involvement	E-star Group	Sales from Call centre Website Sales Refunds Marketing (Globally)		Sale of goods Strategic management		Satisfaction surveys Legal and compliance Marketing Compensation Insurance
	E-star UK	Ticket sales	Security Immigration Baggage handling Passenger loading Scheduling	Train operations Train maintenance	Platform processing	
	SNCF (E-star FR)	Ticket sales	Security Immigration Baggage handling Passenger loading Scheduling	Train operations Train maintenance	Platform processing	
	SNCB (E-star BE)	Ticket sales	Immigration Baggage handling Passenger loading Scheduling	Train operations Train maintenance	Platform processing	
	Esprit Europe	Logistics Business not involved in passenger services				
	Caterers (Contractor Momentum)	Visibility of sales for catering planning		Host/hostess service		Satisfaction surveys
	3rd Party Rail Operators	Ticket sales Connections scheduling				Refunds Revenue distribution
	Network Rail UK (Formerly Railtrack)			Track provision Signalling Scheduling Security		
	Travel Agents / Tour Operators	Ticketing Integrated package sales Expectation setting Pick-up/ drop -off	Information provision		Transfers to final destination	Information sharing
	Fiscal & Legal Authorities	Taxation Insurance Risk management	Immigration	Security	Immigration	Statistics
	Eurotunnel	Dynamic Travel guidelines		Track provision Signalling Scheduling Security Tunnel fees & Costs		
low involvement	LCR			Track provision Signalling Scheduling Security		
	Website Host	Website design and hosting	Information provision	Expectation setting		
	Information processing companies	Ticketing and reservations transaction processing	Data and Information provision			