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Focus Issue on Legacy Information Systems and Business Process Change: A Business Perspective of Legacy Information Systems

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***FOCUS ISSUE ON LEGACY INFORMATION SYSTEMS
AND BUSINESS PROCESS CHANGE:***

**A BUSINESS PERSPECTIVE OF LEGACY INFORMATION
SYSTEMS**

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ABSTRACT

Legacy information systems evolved incrementally in response to changes in business strategy and information technology. Organizations are now being forced to change much more radically and quickly than previously and this change places new demands on information systems. Legacy information systems are usually considered from a technical perspective, addressing issues such as age, complexity, maintainability, design and technology. We wish to demonstrate that the business dimension to legacy information systems, represented by the organisation structure, business processes and procedures that are bound up in the design and operation of the existing IT systems, is also significant. This paper identifies the important role of legacy information systems in the formation of new strategies. We show that the move away from a stable to an unstable business environment accelerates the rate of change. Furthermore, the gap between what the legacy information systems can deliver and the strategic vision of the organization widens when the legacy information systems are unable to adapt to meet the new requirements. An analysis of fifteen case studies provides evidence that legacy information systems include business and technical dimensions and that the systems can present problems when there is a misalignment between the strategic vision of the business, the IT legacy and the old business model embodied in the legacy.

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KEYWORDS: Legacy information systems, enterprise resource planning (ERP), business strategy, business process change, IT infrastructure.

I. INTRODUCTION

A major difficulty for organizations is the problem of overcoming legacy information systems, i.e. the information systems in place, in order to exploit novel business models and harness the power of the latest technological developments.

Many organizations are finding that legacy information systems act as a barrier to strategic innovation. The strategic importance of information systems is well documented [e.g. Henderson and Venkatraman, 1991 and Konsynski and McFarlan, 1990]. It has been recognised for some time that the work environment and information technology are inextricably linked in some way. The new infrastructure [Weill and Broadbent, 1998, p15] consists of the firm's information and communications technology linked to external industry infrastructures and is considered important for enabling business processes. Weill and Broadbent [1998] describe a typical information technology architecture in terms of

- computing (hardware and operating systems),
- communications/ telecommunications networks,
- data (data assets, use, storage, control),
- applications (their functions, the relationships between applications, and how they will be installed or developed) and
- work (standard processes, measures of success and work policies).

Legacy information systems can represent a huge investment for organizations in terms of information technology, business processes, procedures and organizational structures. Although, as Weill and Broadbent [1998] acknowledge, the work environment is a significant part of the information technology infrastructure, scant attention has been paid to the business perspective of legacy information systems even though they are well understood from a technical perspective. We propose a framework that relates legacy

systems to the business environment and strategic vision of the organization and apply it to fifteen case examples. The cases demonstrate how legacy information systems evolved and impacted the business strategies of the respective organizations. A model is proposed to aid management thinking. The implications of the results and further opportunities for investigation are outlined.

II. LEGACY INFORMATION SYSTEMS

Legacy information systems are defined as information technology (e.g. hardware, software applications and network) and the business model implicit in the application of that technology (e.g. organizational structure, work flows, procedures and processes) within the organization.

INFORMATION TECHNOLOGY LEGACY

In the 1950s organizations such as Ferranti were dependent on computers for a limited number of critical functions (e.g. wages and market research). Large centralized machines were in use in a number of organizations during the 1960s (e.g., banks and insurance companies). By the late 1970s and 1980s information architecture became far more complex, with information being distributed through telecommunication links and with the introduction of personal computing. The 1990s saw the emergence of enterprise-wide information architecture connected to suppliers and customers through the World Wide Web.

First-generation systems dating from the 1960s and 1970s were in machine language but most were developed in assembly or early versions of third-generation programming languages such as COBOL or FORTRAN [Kim, 1997]. These systems were generally batch transaction processing systems that ran on mainframes. Second-generation systems (late 1970s and throughout the 1980s) possessed some degree of modularity and many were used for online transaction processing. These systems operated on mainframes and a variety of midrange computers such as the AS400. Many of these systems were developed in COBOL but some were written in fourth-generation languages based on early database management systems. The late 1980s saw the development of third-

generation systems using rapid application development graphical user interface tools. More recently, companies adopted enterprise resource planning (ERP) packages (commercially available prewritten, precoded, sets of integrated programs which automate core corporate activities such as manufacturing, human resource, finance and supply chain management) [Holland and Light, 1999], operating in a client-server environment.

The traditional view of information technology legacy systems is that they are old [Ward, 1995]. Findings from our case study research show that it is not uncommon for organizations to be reliant on information systems created in the early 1980s. In fact, systems developed in the 1960s and 1970s are still in existence today [Kim, 1997; Adolph, 1996], although this does not necessarily mean that they are problematic. Information technology legacy systems can also be an asset to the organization, for example the American Airlines reservation system SABRE. Careful development and fine-tuning over a number of years can mean that they are relatively stable and can continue to support the strategic vision of an organization. Furthermore, they have the potential to handle thousands of clients, perform quickly and can be very secure. The real value to the organization of information technology legacy systems lies in the “accumulation of years of business rules, policies, expertise and ‘knowhow’ embedded in the system” [Kim, 1997]. Problems can arise, however, when the systems do not, for whatever reason, allow the organization to adapt rapidly in a changing business environment and/or are unable to support the organization’s new strategic vision.

BUSINESS LEGACY

Today’s business environment has been altered by three powerful world-wide changes [Laudon and Laudon, 1998]:

- first, the emergence of globalisation;
- second, the transformation of industrial societies and economies into knowledge and information-based economies leading to, for example, time-based competition and shorter product life cycles; and

- third, the transformation of the business enterprise whereby organizations are moving away from a hierarchical, centralised structure to become flattened (less hierarchical) and decentralised.

The presence of business legacy within organizations can be identified by examining how they operate in their environment. Typical components of business legacy include the way firms view their business (e.g. whether it is a national, multinational or global business), the organizational structure (e.g. whether it is centralized or decentralized), and how they perceive the market within which they operate. The business goals and strategy also form part of the business legacy, as well as the way work is organized, such as work flows and business processes. The traditional organization was a hierarchical, centralized structured collection of specialists who in most cases rely on a fixed set of standard operating procedures to deliver a mass-produced product or service, rather than a flattened, decentralized, flexible collection of generalists who depend on almost instant information to deliver mass-customised, products and services specifically designed for certain markets and customers [Laudon and Laudon, 1998]. The business legacy is embedded in the legacy IT system, and it is the inter-relatedness of business and IT legacy which makes either business or technical change a difficult process.

III. PROBLEMS CAUSED BY INEFFICIENT LEGACY INFORMATION SYSTEMS

Problems that arise from poorly developed legacy systems can have far reaching effects on the efficiency of the organization. First-generation systems often lack clarity. The structure of the systems was sometimes compromised in order to improve the speed of the program, making it difficult to maintain and test. Most of these programs were created using the best design and coding techniques of the time and the latest technology but were written when the main design considerations were memory optimization and processing speed [Bennett, 1994]. People with the necessary programming skills for example, knowledge of Assembly language and COBOL, to maintain these systems are scarce.

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Programmers with first-generation and second-generation skills often prefer to work on new systems development rather than systems maintenance.

Legacy information systems were typically modified during their life span to sustain the desired functionality in the business environment. Such modifications should not cause problems if action has been taken to prevent the structure of the systems from degrading [Lehman, 1980]. However, action has not been taken in the majority of systems and the original structure has degraded to such an extent making information systems more difficult to understand [Bennett, 1994]. Continual modification increased the size of applications considerably since they were first written. The typical business application grew by 5,400 per cent since the beginning of the 1980's [Slee and Slovin, 1997]. According to Slee and Slovin, what started within an organization as numerous separate applications often were integrated into a single system. They refer to this phenomenon as 'legacy over-integration'. It arose through integrating applications with shared databases under the assumption that the data are stable. Because they were developed in an environment with a loose concept of architecture, Slee and Slovin conclude that a generation of monolithic, tightly coupled, sometimes integrated applications were built that are difficult to maintain. Spaghetti code was replaced by spaghetti integration.

Another factor that can contribute to inefficient legacy information systems is that components of heavily modified systems often depend on other components. Interdependence can make it difficult to predict changes arising in the system as a whole as a result of minor enhancements to one component. Migrating information systems to new platforms and adjusting them to changes in machine and operating system technology probably degraded their structure further. The combination of age, incremental change, size and structural degradation means that legacy information systems are hard to maintain.

In many cases, the problem is exacerbated by the lack of formal documentation. If documentation does exist, there is often a discrepancy between the documented description of the system's function and its actual function [Adolph, 1996]. Often, the only reliable source of information about the

system is its source code. However, organizations may no longer have a listing of the program's source code. Program understanding can be the main maintenance activity and 50% of the total systems development effort is spent on attempting to comprehend the function and purpose of the code [Slee and Slovin, 1997]. Redundant code can also accumulate with changes to the system. If unrecognised, effort may be wasted understanding the redundancies and ensuring that system changes will not affect it. Testing accounts for a further 25% of effort spent on legacy maintenance [Slee and Slovin 1997]. Eventually an organization will reach the stage where it becomes almost impossible to enhance the existing systems further because they are too slow and uneconomic.

Developments in information technology add to the problem as technology moves beyond traditional transaction processing towards client/server architectures and the Internet to create new types of business solutions. Legacy information systems are often unable to exploit features of this new, more flexible computing environment because systems are often limited by their processing capability and lack of memory.

From a business perspective, inefficient legacy information systems, coupled with entrenched, outdated business models, present a serious problem. Many work processes and structures are obsolete. They came about through not keeping pace with changes in technology, demographics and business objectives [Hammer, 1990]. Often work was organised into narrowly defined manual tasks with complex mechanisms keeping track of progress. Improving the performance of these tasks was the main focus. Often these manual tasks were automated when the company became computerised, which meant that any performance deficiencies were not addressed. The hierarchical structure became entrenched within the organization. An organization's 'antiquated processes' may actually threaten business by affecting productivity, innovation, quality, customer service and ultimately the whole organization financially [Hammer, 1990]. Some tasks may be unnecessary and could be eliminated if the work was organized differently. By being able to see processes as a whole, the organization would be

better placed to react to new situations and improve their efficiency and effectiveness.

Organizations, however, are often reluctant to challenge old assumptions and reshape managerial approaches. An organization's strategies emerge from a 'cultural web' which includes organizational rituals, routines, stories and myths, symbols, power structures and organizational structures [Johnson, 1992]. The present paper extends this notion and we contend that business legacy systems comprise the existing characteristics of an organization such as its structures, processes, strategy and cultures resulting from the impact of internal and external forces. These characteristics can mean that even when new emerging technologies are introduced into organizations, employees have difficulty in adapting to new ways of working. The inclination and acceptance of change does not exist within the culture of the organization and hence employees resist change. Although managers see change as an opportunity to strengthen the business, employees may perceive change as disruptive and intrusive [Strebel 1996].

IV. WHY IS IT IMPERATIVE TO DEAL WITH LEGACY PROBLEMS TODAY?

The existence of legacy systems that hinder the implementation of new business strategies is now well established. Given the large investment in information systems, it is understandable that managers chose to evolve them incrementally over time rather than adopt more radical IT strategies. However, in the past few years, there has been an increased willingness to implement new IT infrastructures and business processes. Why has it now become imperative to deal with the issues surrounding legacy systems when many of the problems with these systems were identified in the early 1960s [Daniel 1961]?

INFORMATION TECHNOLOGY AND BUSINESS PRESSURES

From a technical perspective, organizations are increasingly aware of the substantial savings in operating costs that can be made by 'hardware

downsizing', that is, moving towards client-server architecture that support applications with a GUI interface and away from mainframe systems. In some instances, legacy systems were replaced. More recently, organizations realised that their legacy information systems are not Year 2000 compliant, in that they cannot distinguish between centuries, and therefore something has to be done to prevent a possible disaster. Another technical problem, which has not been publicised so widely, is the single European currency that will affect, in particular, organizations that deal with European customers or suppliers. The complexity of legacy information systems increases the scale of this problem.

Developments in information technology and communications also make it possible for organizations to change the way they operate and contribute to the progress of globalisation. An enterprise-wide integrated system enables an organization to be integrated globally, with benefits such as geographically shared information and a speedier process of getting products to market. Improvements in computer communications can create closer relationships between customers and suppliers, as well as between different geographic locations of an organization. Technology is an essential factor in enabling organizations to combat the environmental complexities they face and, therefore, a lack of appropriate technology can be a barrier to business innovation.

In addition to date and regulation requirements, a range of business pressures are increasingly significant today that were not present to the same extent in the 1970s and 1980s when many information systems were first developed. One factor causing business legacy is the rapidly changing and complex business environment, which is affecting the traditional way businesses operate. Globalisation, deregulation and technology are interrelated pressures that change the competitive environment for businesses. Competition is also a pressure in its own right. Globalisation enabled markets to operate without regard to national boundaries [Fraser and Oppenheim, 1997] and deregulation removed controls imposed by regulatory bodies on a particular economic activity. The liberalisation of markets, launched in the US and UK in the 1980s, is continuing to expand rapidly into other countries and industries [Wagstyl, 1997]. Industries that once

had protection due to domestic policies are now open to competition from new entrants, not only domestically, but globally as well. The ability of an organization to change its strategic vision and business model (e.g. structure, processes etc.) in response to this unstable environment, is vital to continuing success and survival.

There is also a growing recognition that information technology and business strategies need to be linked and a high degree of alignment created between them [Luftman *et.al.* 1999, Reich and Benbasat 1996; Niederman *et al.* 1991; Boynton *et al.* 1992]. Information technology should not be limited to just supporting a business strategy. Instead new technology should directly influence the strategic direction of organizations [Henderson and Venkatraman, 1991]. Information technology is now, and has for some time, been a major cost component. Most business innovations involve technology, for example electronic commerce, which create new competitive opportunities for organizations. However, organizations realize that they are being restricted by their existing technology and cannot take advantage of new ways of doing business in today's unstable environment. If the business model is redesigned then changes must be reinforced by the information systems, otherwise there is a misalignment between the business model and the IT system.

V. RESEARCH METHOD AND FRAMEWORK

To explore the problem of legacy information systems and develop general models that explain their evolution and impact on business strategy, research into a number of international companies was conducted across a range of industries. Case study research to build theory was the method used to understand the relationship between business and IT legacies, their alignment with strategic vision and the business environment within which these organizations operate. A number of companies were selected representing various industries, with the intention of being able to compare cases across industries [Eisenhardt, 1989].

We present a theoretical framework based on concepts from the academic and business literature and also from our own research in this area. This framework

(shown in Figure 1) was developed to give a well-defined focus around which semi-structured interviews could be organized. Questions were asked about the legacy information systems of the company, the company's strategic vision and the business environment within which it operates. General background information about the company was also obtained. The framework was initially considered tentative and therefore subject to change during the iterative process of case study research. Data were collected by interviews with key company personnel and also through company literature (such as annual reports and the Internet), and was analysed both within case and cross-case to generate and refine theories.

Figure 1. The Research Framework

VI. CASE DATA

A total of fifteen case studies were conducted. A summary of the results is presented in Table 1. Three of these cases are discussed in depth and are presented below. The objectives are to identify and understand the relationships among legacy information systems, business environment, and strategic vision and, based on these relationships, develop a generic model to explain the legacy information system phenomenon. For each of the detailed case studies, a brief

overview of the business change process from legacy systems to the new strategic vision is outlined to give an indication of future developments.

CASE 1: THREADS

Business Environment

Threads is part of a global group of companies with sites in various countries, comprising a large number of autonomous businesses that focus on consumer and industrial markets. The companies were acquired over a period of time and operate in a fiercely competitive global business environment. Their business centers around the manufacture and distribution of sewing thread, hand knitting and consumer craft products. The company suffered profitability problems throughout Europe due to excess and sub-scale capacity misalignments, manufacturing for fluctuating local markets and not taking advantage of economies of scale.

Strategic Vision

Thread's strategic vision aimed to maximize the benefits of international operations and ensure competitiveness through a focus on manufacturing excellence, customer service and cost effectiveness. They therefore required excellent logistics and operations management in order to support their sales and marketing functions and concluded that a common enterprise system had to be developed that would allow for the optimization of resources throughout Europe. During the development of the idea, it became apparent that the system needed to be implemented globally and the resultant strategic vision reflected this.

Legacy Information Systems

Business model. Threads comprised over 30 geographically dispersed national autonomous firms, the result of an intensive series of mergers and acquisitions throughout Europe. Its organization structure aimed to control costs, manage employee resources and serve customers on a national basis. Its IT infrastructure supported this ethos.

Table 1. Summary Overview of Case Data

<div>Construct</div> <div>Industry</div>	Business Environment	Strategic Vision	Legacy Information Systems	
			Business Model	IT Infrastructure
Textile Case 1. Threads (See below)	Fiercely competitive and dynamic global business environment due to reductions in the product life cycle.	Create a new organization structure in Europe providing a pan-European business with links between all national sales units with production and distribution sites.	Intensive merger and acquisition activity had led to a geographically dispersed, uncoordinated business. There were excess and sub-scale capacity misalignments.	Nationally focused and fragmented IT systems were impeding the integration of the various companies.
Chemical Case 2. Chemical (See below)	Global competition and wide availability of products. Cost predominant mode of competition due to de-localisation pressures throughout the market.	Compete on cost through the management of global operations and the superb execution of business processes.	Acquisition activity produced a company with diverse businesses and different cultures. Each had specific ways of working and geographical responsibilities.	Sixteen geographically focused systems were in operation between two business sites. The systems were not integrated and could not offer a global view of the business.
Retail Manufacturing Case 3. BellCo (See below)	The market had evolved from a predominantly national orientation to one which was becoming increasingly global.	Improve the global operations of the firm with a specific focus on international co-ordination quality and customer service.	A global culture had existed since it began exporting in the 1970's, however, this was not reflected in its business processes which were geographically disparate.	The information systems were not integrated, and displayed high levels of entropy. They were not capable of supporting an international co-ordination strategy.
Cinema	Intense competition in an expanding market. Film distributors also had a great deal of power due to the absence of forward planning by cinemas.	Change the cinema going experience by improving advance booking facilities and introducing innovative sales and marketing opportunities. 'Watch the film, buy the soundtrack'.	Sites had a local perspective and traditional views about the market: 'customers were interested in paying to watch films and buy popcorn'.	Systems were not integrated, had limited functionality and could not support remote or advance booking.
Information Technology	Industry highly competitive and advances in technology, such as electronic commerce are altering the way business is done.	Compete on the basis of 'best in class' customer service and the anticipation/ forecasting of market shifts.	The nature of the business had shifted from distribution to providing mid range IT solutions, contract IT staff and training.	The infrastructure was suited to a distribution business, and could not support the additional business processes in the new organization.
Healthcare	The sector was highly political and had undergone several policy changes that had resulted in a shift from a competitive to collaborative ethos.	Optimise the provision of core administrative support in order to allow resources to be redirected toward the core competence of clinical services provision.	A merger of two healthcare organizations resulted in a single entity with different business process maps for common areas and cultures which were heavily tied into these.	Relatively new, but complex information systems existed. These were specific to each organization's business process map.
Local Government	The sector was subject to significant cost pressures and there was a high degree of public accountability. Government dictated policy.	Government directive to improve the provision of public services. The aim was for a central point of contact for all services and improved information support for decision making at a local level.	Centralised decision making had borne interdependencies amongst functional departments. This made for confusion and inefficiencies for the organization and public.	Ageing functionally oriented infrastructure. Lack of integration amongst systems supporting related business processes.

<div>Construct</div> <div>Industry</div>	Business Environment	Strategic Vision	Legacy Information Systems	
			Business Model	IT Infrastructure
Paper	Consolidation activity has lowered operating costs throughout the industry. The industry generally operates on low margins and high volumes.	Limit operating costs and develop modes of differentiation to facilitate increased profit margins.	The organization is fast growing and relatively young in terms of outlook. Its business process map is relatively simple.	The existing enterprise infrastructure, only contributed to limiting operating costs. It did not generate value.
Office Supplies	A highly competitive market. American companies have established themselves in the United Kingdom and are looking to the rest of Europe.	Differentiate on the basis of customer service since there is little differentiation between products. A 'number one position' in their national markets.	A number of autonomous business units existed following acquisition activity to facilitate expansion plans. Each had different ways of work.	The historical evolution of the organization was reflected in the disparate systems and standards. The systems were not capable of supporting an integrated company.
Industrial Manufacturing	The market was historically national in nature. However, projects were being tendered for using co-ordinated global resources to improve economies of scale and geographic location.	Improve the management and co-ordination of global operations. The aim was to increase competitiveness, profitability and efficiency.	Strategy and business processes reflected the four regions which the company was organized into. Stark differences were also evident within regions and co-ordinated tendering did not exist.	Many different information systems and platforms were in existence throughout the business. There was no integration and many of the systems outdated and misaligned with the businesses at a local level.
Plastics	The market is global and competition has been largely on the basis of cost. However, it became clear the higher margins could be achieved if quality and service levels were improved.	Maintain quality and improve customer service. It wanted to strengthen its position as a global player.	The multi-site company was formed to consume a parent company's product. It was decided to convert it to a profit centre. The internal processes and overheads of the company were not geared toward this shift.	The information systems were not integrated between sites or within sites. They could not support the MIS requirements for a profit oriented business. i.e. measure profitability and monitor operating costs.
Insurance	The UK market had been subject to a major shift. Advances in technologies had led to competition from new entrants with innovative product offerings and lower overheads.	To improve the efficiency of the administrative functions and provide high levels of customer service through the use of innovative technologies.	The organization had a history of functional specialists who dealt with specific aspects of a customers relationship. There was a high level of paperwork and duplication of effort.	The IT infrastructure supported the work of the functional specialists and emulated the paper based processes in existence in the 1960/70s. The systems were complex due to the nature of the business.

<div>Construct</div> <div>Industry</div>	Business Environment	Strategic Vision	Legacy Information Systems	
			Business Model	IT Infrastructure
Retail Banking	New entrants from diverse sectors and new start-ups have entered the market place making it highly turbulent and competitive. Often, the new entrants do not have the histories of the traditional players.	To maximise the benefits of the diversification and mergers that have taken place over the past decade in order to become a leading financial services provider.	A large merger and diversification strategy has left the conglomerate with a high degree of diversity in its business processes, cultures and customer bases. There was a need to develop connections and synergies amongst these.	Many different generations of information systems and platforms were in existence throughout the conglomerate. Integration was limited and the information to exploit the synergies of the diversification could not be obtained easily.
Entertainment	Customers have become sophisticated in the ways that they manage stocks and want less more often. The lifecycle of products has also reduced and a range of niche markets have emerged.	To focus on global operations management strategy aimed at developing international coordination in order to improve efficiency and management information.	There was no integration between the globally dispersed operations functions. Each resembled the historical preferences of the management which was common place and each was heavily cost rather than customer focused.	Many information systems existed reflecting the functional silos of the organisation. Although these generally met the needs of each function/site there was no way of obtaining a global perspective of the business.
Convenience Retailing	The market is under threat from a variety of sources includes, the large supermarket chains, petrol stations and other chains of convenience retailers.	To improve the efficiency of its operations and overheads and develop a more strategic approach to the market it operates which is no longer a 'cash cow' as it was in the past.	The organization is comprised of several hundred different businesses which form a strategic alliance although the only benefit to date has been purchasing power for branded and unbranded goods. Each business is entirely autonomous and is very protective of its business information and ways of work.	The alliance has a common IT infrastructure which has not seen much investment as it is viewed very much as an expense rather than an strategic opportunity. The system contained inaccurate data and was functionally oriented and did not add value to the business.

IT Infrastructure. Sixty-five different systems were in operation most of which were nearing the end of their useful lives because they were bespoke or heavily modified packages that were no longer supported by the vendors. These systems were supposed to facilitate the management of the enterprise but did so haphazardly. It was not possible to obtain a global view of operations data and the national marketing units could only see information about their own country. Information technology spend was also very low reflecting the penny pinching attitude throughout the industry due to the pressures upon it and the fragmented and low level nature of the IT structure which caused it to be viewed as an expense rather than a strategic opportunity.

Discussion

Threads needed to manage its fragmented operations that were preventing the exploitation of its international dispersion. Its legacy information systems were as fragmented as the firms which comprised the Threads business and were in no way capable of providing the integrated business support that the new strategic vision demanded. The company decided to reengineer the organization including implementation of a process-oriented ERP solution. This enabled Threads to rationalise its manufacturing and administrative processes whilst improving its customer interface. The scale of the change was a significant step shift for the organization as, generally, the autonomous firms were not process-oriented. In addition, the pace was radical despite the history of merger and acquisitions, the turbulent business environment and difficult legacy information systems. The scale and pace of the change was facilitated by the realisation that Threads had to act or face immense problems as a result of the obsolete and misaligned nature of its legacy information systems.

CASE 2: CHEMICAL

Business Environment

The conglomerate of which Chemical is a part is divided into three groups; performance chemicals, industrial chemicals, and machinery and equipment. Chemical produces process additives which fall under performance chemicals. The business operates over a wide geographic area, has offices world-wide and sells to a large global customer base.

Chemical was facing business pressures as a result of globalisation, deregulation and competitive forces. Competitive advantage differentiation throughout the industry was fairly difficult as Chemical traded a raw material of standard quality which tended to be sold first on the basis of cost and then availability irrespective of supplier. The business was pressured by exchange rates and needed to maintain low operating costs. In addition, Chemical needed to ensure optimum availability of its products to satisfy a global customer base.

Strategic Vision

Chemical's strategic vision was based upon the notion of superb execution and growth into new product areas. Part of this vision meant that it had to be able to manage global operations both efficiently and effectively. This required a common global information system.

Legacy Information Systems

Business model. The conglomerate acquired the business in 1992, which resulted in skill loss in the form of redundancies. Chemical was process-oriented as prior to the acquisition it had been preparing to implement an MRPII solution. This did not go ahead due to other pressures associated with the acquisition. Raw materials were sourced via backward integration into another area of the conglomerate and there was no perceived need for forward integration with customers as this was not typical of the industry.

IT infrastructure. A bespoke enterprise system developed in-house in the 1980s was in operation. It ran on an AS400 that was becoming overloaded. There was no integration within the business and modifications had not been made since 1990. As a result it was not possible to obtain a global view of the business.

Discussion

Chemical was operating in a highly competitive global market and had recently been acquired by another company. The company needed to improve efficiency and cut cost. There was no integration across the business units and the information technology systems could not support the strategic plan of realising a common global information system. Chemical decided to move towards a process-oriented approach facilitated by an ERP solution, in an attempt to realise its aims.

CASE 3: BELLCO

Business Environment

BellCo is one of five companies within a large Group of companies that is divided into five main divisions, BellCo is in the electrical division and is one of the smallest companies in the group. Their main competitors are sited in Germany, France and Spain. There are no US-based manufacturers. Continual investment in new machinery, plant and support services enables BellCo to provide customers with superior products and service.

The company has been owned by three different groups since 1985. In the late 1980s, the company opened overseas sales and distribution offices, thereby bypassing distributors and enabling its products to be sold globally. New product development work is still carried out in the U.K and seventy five to eighty per cent of the products are made in the U.K. The balance is sourced in South East Asia. Technological advances are providing new, more efficient ways for BellCo to do business with its customers. The main routes to market are via electrical wholesalers or retailers (e.g. WalMart in the U.S. and B&Q in the U.K.).

Strategic Vision

The over-all goal of the Group is to develop the businesses so that they achieve leadership in their markets, with the ability to benefit from economies of scale and from international best practice. The Group's emphasis is on investment in training and development of its employees and in research and development. They are committed to innovation. They realise the need to continuously add value to the Group's products and services. Continuous improvement programmes are targeted at achieving further cost reductions – all the companies in the Group are committed to increasing productivity through process improvement designed to reduce manufacturing costs. The industry is competitive and BellCo therefore adopted the strategy of focussing on original product development, quality and customer service. The retailers, relative newcomers to the marketplace, are pushing for changes in the use of information

technology, such as electronic data interchange (EDI), to alter the traditional way business has been done.

Legacy Information Systems

Business model. The consequences of the company having been owned by three different groups since 1985, and the opening of fifteen overseas offices in the late 1980's, meant that it was impossible to obtain a total world view of the business. BellCo's functional processes were automated when their system was first developed in the 1970's. Apart from modifications, it appears that these processes were largely unchanged since then. Furthermore, all the various offices operated independently. In the first stage of a search for a new IT system in 1993, BellCo undertook some business process improvement (BPI) in engineering. It was the first time that processes had been properly looked at since designing the first system.

IT infrastructure. BellCo's information technology system dates back to the 1970s with the original bespoke software, although heavily modified, still in existence today and not Year 2000 compliant. This IT system copied the manual processes that were in existence at the time. Modifications and further developments were made to the system throughout the 1970s and 1980s, making the system difficult to maintain and understand. Staff who may have been able to understand the system . left the company. Some departments started using PCs to do reports. Since the PCs and mainframe did not link, data entry had to be duplicated. The IT systems in these offices are independent and incompatible with other sites making it impossible to obtain a total worldview of the business.

Discussion

BellCo operates in a competitive industry. it decided to focus on original product development, quality and customer service. Retailers are pushing for changes in the use of it to alter the traditional way business is done. Now operating on a global basis the IT infrastructure dates back to the 1970s, is not year 2000 compliant and does not support the new global business environment.

In 1993 the decision was taken to implement an ERP system and business process improvement project was carried out. this project was the first time that processes had been properly looked at since designing the first system in the late 1960s. It is hoped that the business process improvement project will aid BellCo's operations as a global company and allow it to achieve its strategic vision of market and technological superiority.

VII. CONCLUSION

The cases demonstrate that legacy information systems contain an information technology component and an implicit business model. In a stable business environment, it is possible to evolve the information technology infrastructure and business model in response to relatively small rates of change. However, in an unstable business environment where the rate of change is much higher, it is more difficult to adapt the legacy information technology system and business model fast enough to support the strategic vision. The relation between the legacy information systems and the strategic vision is shown in Figure 2.

Figure 2 Misalignment and Legacy Problems Created over Time

The case study companies are attempting to eliminate their current legacy problems by implementing new IT systems and support their strategic vision. To do so, they used new technology combined with, in many cases, business process change, to realign both business and information technology functions with their strategic vision.

Eliminating today's legacy problems does not protect the organization from legacy problems occurring in the future. However, the magnitude of the problem can be lessened. Factors that are causing today's information system legacy problems will continue in the future. The business environment will continue to change requiring a new strategic vision and consequent business changes. The potential of emerging technology should be an integral factor in the strategic direction of the business. Both incremental and radical changes in strategic vision need to be reflected in both information technology and business processes to maintain alignment. Modifications to information systems must avoid degrading the structure of the system and thereby reaching the stage where the system is no longer maintainable. Maintainability of information systems must be a key feature in their design. If this goal is achieved, then the system can evolve as the business changes and help the information technology and business strategy to remain integrated.

Legacy information systems cannot be defined solely as a technical problem. There is a business dimension to the problem because the information system is integral to the running of the business.

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