E-business and process change: two case studies (towards an assessment framework)

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Abstract

Purpose – The purpose of this research paper is to explore the impacts of e-business technology adoption at process level in SMEs.

Design/methodology/approach – The paper reviews a range of literature and mainstream models relating to e-business impacts in SMEs and then focuses on two in-depth case studies. The cases draw their empirical material from the involvement of the authors in e-business project management in these two companies.

Findings – The two case studies show significant impacts of e-business technology at process level. They also illustrate how contrasting information systems strategies can successfully embrace e-business process change, and suggest the importance of organisational issues in determining the degree of benefits delivery.

Research limitations/implications – The paper suggests a framework for analysing the impact of e-business at process level that can be used with other SME case studies.

Practical implications – The suggested assessment framework can be used for comparison with e-business implementations in other SMEs.

Originality/value – The value of the case studies lies in their originality and the paper highlights the potential impacts and benefits of e-business at process level. The suggested assessment framework builds on existing models and concepts but provides an update and customisation relevant to today's e-business technologies and business environment.

Keywords Information systems, SMEs, E-business, Assessment framework, Legacy systems, Process change, Process models

Paper type Case study

Introduction

There is still considerable debate about the practicality and value of adopting e-business technologies and processes in the SME sector in the UK. Whilst Zhu *et al.*

(2003) note that "firms are migrating toward the internet-based digital platform that holds the promise of substantial productivity gains", Basu and Muylle (2011) have recently concluded that "many entrepreneurial ventures and established firms are still having difficulty in harnessing the power of digital technologies in e-business". This article examines how two SMEs in different industry sectors have adopted e-business in recent years, and assesses the impact of e-business on core business processes.

The two companies adopted e-business for different business reasons and also implemented distinct technical solutions. TPG DisableAids, a provider of equipment for the elderly and diasabled, were driven by the demands of large public sector customers to have the capability to trade electronically, which the company achieved through bespoke portal and middleware systems development. Conversely, it was the need for multi-site communication and document exchange that led Optimum Consultancy, a provider of project management services, to instal a web-based collaboration management system. Both companies have experienced varying impacts and benefits of the adoption of e-business technologies and associated process change.

Theoretical framework

The term e-business has a number of definitions ranging from the "conduct of any type of business via the internet" (Carter, 2001) to a broader concept embracing "all electronically mediated information exchanges" (Chaffey, 2009). Some authors also stress the impact e-business can have on process redesign. For example, Sawhney and Zabin (2001) define e-business as "the use of electronic networks and associated technologies to enable, improve, enhance, transform or invent a business process or business system to create superior value for current or potential customers". In similar vein, Zhu *et al.* (2003) assert that "e-business facilitates major business processes along the value chain, which leads to the common constituents of e-business – web marketing, online selling, online procurement and service and support".

The broader definition noted by Chaffey and others reflects the convergence of technologies used for an internet presence and web based communications with those used for in-house systems and software package development. Many business software packages now have a web "front-end" and are accessible over the internet either by field based staff, business partners or in-house staff via the intranet. They are, as the jargon goes, "web-enabled". It can thus be argued that an e-business analysis is more or less the same thing as an information systems analysis. For the purposes of this article, we take the view that e-business is the deployment of internet or web technologies to enhance core business processes; this then includes the use of mainstream business systems if they are accessible via the internet or intranet. So, for example, on-line expense claims processed by in-house staff would be included as "e-business" as much as the classic customer order capture via a company web site. This definition thus encompasses the use of in-house systems via a web front end, not only by customers or suppliers, but also by employees. The B2E (business to employee) impacts of e-business are now arguably as significant as B2B and B2C. This broader understanding of e-business is supported by Li (2007), who suggests that "e-business is about using information and communications technologies to enable organisations in private and public sectors to do things differently, in more superior ways".

Over the past decade, a number of concepts and models have been developed and applied to companies and organisations in an attempt to assess the impacts of

e-business. Porter suggests that internet technologies can reconfigure or improve activities in an organisation's value chain – "the set of activities through which a product or service is created and delivered to customers" (Porter, 2001). Porter concludes that internet technologies can link value activities and enable information sharing between activities and with outside suppliers, at lower costs than traditional methods such as private networks. Furthermore, according to Porter, internet technologies impact business processes by moving physical activities on-line or making physical activities more cost effective; examples include "cross-activity integration such as the linking of sales activities with order processing" and the integration of an organisation's value chain with suppliers and customers to create an integrated value system (Porter, 2001).

Porter's conclusions are consistent with the early research findings of Wen (1998), Rodgers *et al.* (2002) and Baldwin *et al.* (2001) who maintain that internet technologies can transform and enhance business operations within the organisation and with customers, suppliers and business partners. Sawhney and Zabin (2001) sum-up the impacts of e-business on organisational value chains by concluding that e-business can transform organisational supply chains and value creation processes by helping to build and manage relationships with customers, suppliers, employees, and partners.

The extent to which SMEs engage with e-business varies from one SME to another (Taylor and Murphy, 2004), and a number of stage models have been developed to determine how advanced a company is in its adoption of e-business (Chaffey, 2009).

The DTI Adoption Ladder (Department of Trade and Industry, 2003) breaks down e-business elements into five separate entities, in relation to the business benefits and increasing organisational change and sophistication that they bring. Although adoption ladders highlight the stages of e-business adoption, they are sequential, progressive, and imply that business benefits can be derived directly from increased e-business adoption (Taylor and Murphy, 2004). Linear models also stipulate one route for e-business adoption, with failure to reach the top of the ladder implying failure to adopt e-business successfully, whereas arguably this is not the case.

In terms of where and how e-business impacts at process level, Feeney (2001) asserted that "web-based technology is creating opportunities to rethink business models, processes and relationships along the whole length of the supply chain in pursuit of unprecedented levels of productivity, improved customer propositions and new streams of business". Feeney identified three main process areas where e-business had major impacts: e-operations, e-marketing and e-services (see Figure 1).

The concept of analysing the impact of e-business at process level was taken a step further in the DTI's Connect, Publish, Interact, Transform (CPIT) model (Department of Trade and Industry, 2003). Taylor and Murphy (2004) suggest that the CPIT model is a more pragmatic way to view and interpret patterns of e-business adoption among SMEs than the DTI Adoption Ladder model. The model (see Figure 2) better accommodates the diversity of implementation and adoption of e-business approaches among SMEs, and allows analysis at process level. The model is a two dimensional matrix which examines how e-business technologies impact on six main business process activities. Within these process areas, e-business technologies can be used to "Connect", "Publish", "Interact" and "Transform" business activities. "Connect" refers to implementing and using basic internet technologies "such as e-mail for messaging [...] or the internet for information gathering". "Publish" refers to "publishing
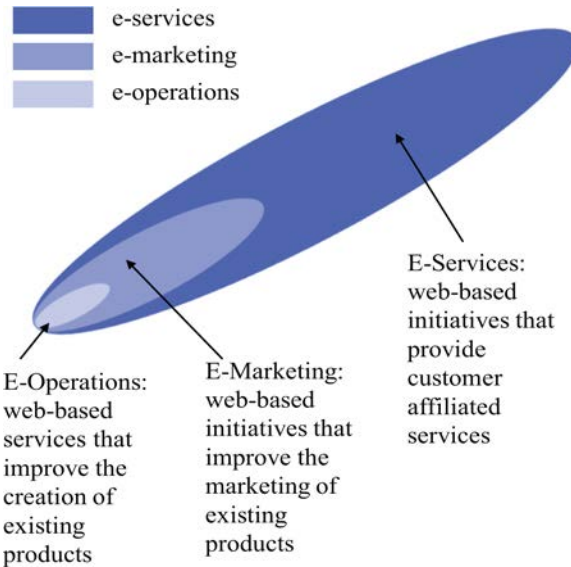
Figure 1.
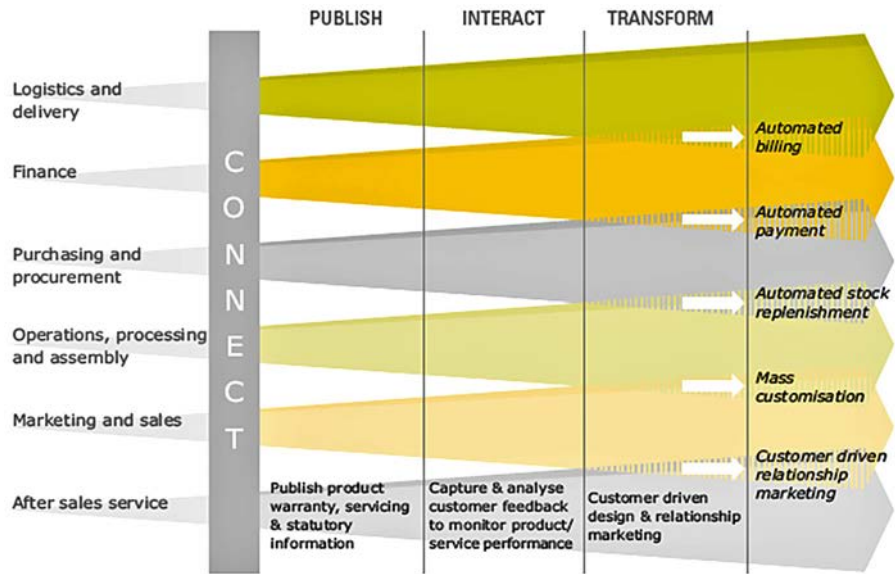The three process domains
of e-opportunity

Figure 2.
The Connect-Publish-
Interact-Transform (CPIT)
model

information using online technologies". It is noted that publishing is a one way process and involves no interaction between the organisation and the viewer, for example, a static web site used solely for marketing purposes. 'Interact', on the other hand is a two way process, "whereby a business allows its customers, suppliers or employees to interact with them online". An example of such interaction is a web site that allows customers to submit an order online, or a procurement system that allows suppliers to

interact with the organisation. Finally, Transform is when "a business has used online technologies to fully transform its business processes". This could potentially mean "the redesigning of business processes around online technologies or the complete reinvention of the business model" (Department of Trade and Industry, 2003).

The CPIT model does not view the introduction of e-business technologies into different business processes as isolated events, but rather it emphasises how activities interact and overlap. This was an attribute of e-business identified by Taylor and Murphy (2004), who suggest that, as e-business adoption increases, e-business activities in different areas of the organisation begin to overlap, and synergies begin to appear which have the potential to create major changes within the organisation. Figure 2 provides an example of how increased e-business adoption can impact business processes within the after sales service function of an organisation. The model shows how synergistic changes result in increased automation, customisation and customer driven marketing.

The advantage of the CPIT model compared to traditional "e-adoption ladders" is that it accommodates the differential pace of e-business adoption in different business processes, and it does not assume that businesses are striving to introduce e-business technologies into all their activities simultaneously. A model that accommodates these factors should satisfy commentators such as Wu *et al.* (2003), who argue that all aspects of e-business adoption may not necessarily proceed in tandem.

The model developed by Willcocks and Sauer (2000) also depicts the increasing business value an organisation will gain as it increases its use of e-business, but highlights the skills and capabilities gaps that need to be bridged for SMEs to advance their deployment of e-business. At stage 1, firms use basic internet tools like web pages to establish a web presence before progressing to stage 2. Levy *et al.* (2001) suggest that many businesses do not extend past stage 1, as they can see no benefits in so doing (see Figure 3).

(1) Stage 1. Web presence:
   - Develop presence.
   - Develop technology capability.

(2) Stage 2. Access information and transact business:
   - Re-orientate business/technology thinking skills.
   - Build integrated approach with the web and business systems.
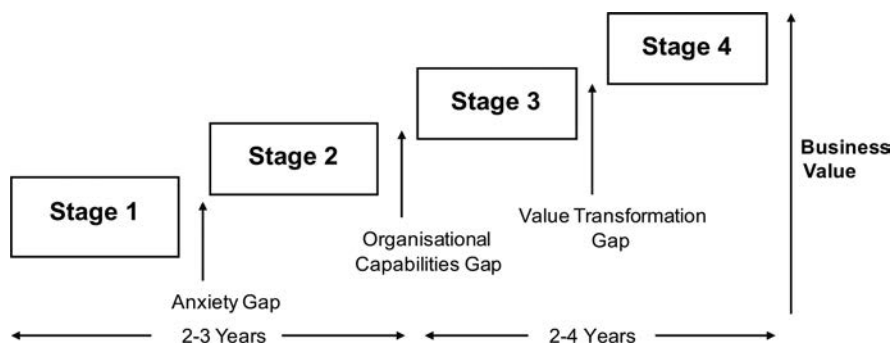

Figure 3.
E-business stage model

(3) Stage 3. Further integration of skills, processes, technologies:
  • Reorganise people/structures.
  • Reengineer processes.
  • Remodel technology infrastructure.
(4) Stage 4. Capability, leveraging, experience and know-how to maximise value:
  • Customer-focused organisation.

SMEs may have difficulties in reaching stage 2 (the transaction business stage), due to the financial and human resource constraints. At stage 3 firms recognise that changes to processes, structures and skills are necessary to utilise the technology. To reach stage 4 the firm must recognise that the business can surpass its current line of products and use e-business technologies to develop new markets and products. Zhu *et al.* (2006) also stress the importance of capabilities in their model, which distinguish three assimilation stages: initiation, adoption and routinization.

There have been relatively few new conceptual developments since the early 2000 s. This is partly due to the technology convergence discussed previously, and partly because internet-based business has become so pervasive that it can be analysed within standard business and technology frameworks. Nevertheless, as Jelassi and Enders (2008) suggest, "it's too early for e-business to drop its 'e'". There have thus been a series of refinements of the early e-business adoption models – notably the stages of growth model (McKay and Marshall, 2004 – see Figure 4) – and the exploration of new dimensions to e-business focussing on required competencies (Hungenberg, 2006), organisational readiness (Chaffey, 2009), risk analysis for SMEs (Sukumar and Edgar, 2009), and historical analysis of the rise and assimilation of e-business over the past 20 years (Jelassi and Enders, 2008). In addition, we have seen a plethora of new ideas and frameworks that, for example, attempt to differentiate between long and short term e-business objectives (Bauer *et al.*, 2010 – see Figure 5) and between strategy, tactics and the different types of e-business model that a company might pursue (Casadesus-Masanell and Ricart, 2009 – see Figure 6). Whilst these developments are undoubtedly of value, they do not materially add to the analytical framework developed in the early 2000 s that allows an understanding of how e-business impacts on core business processes in SMEs.
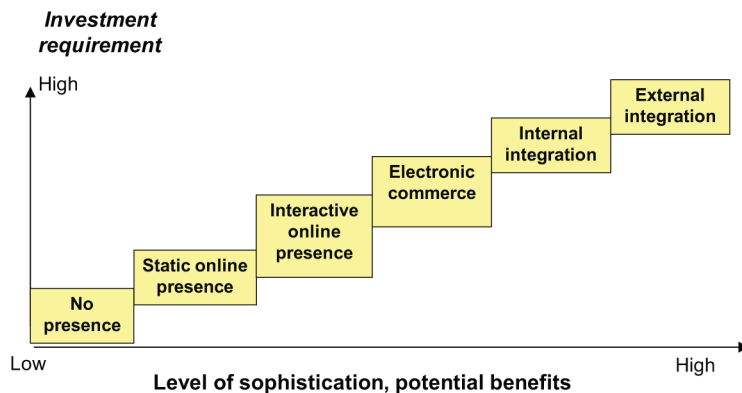

Figure 4.
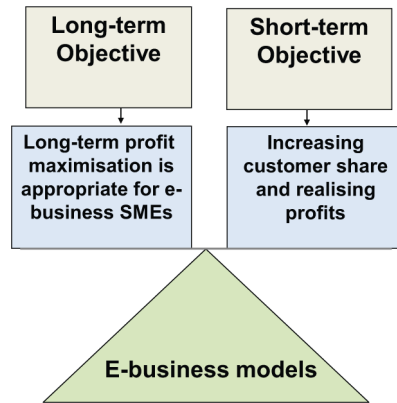E-business stages of
growth model

Figure 5.
Matching e-business
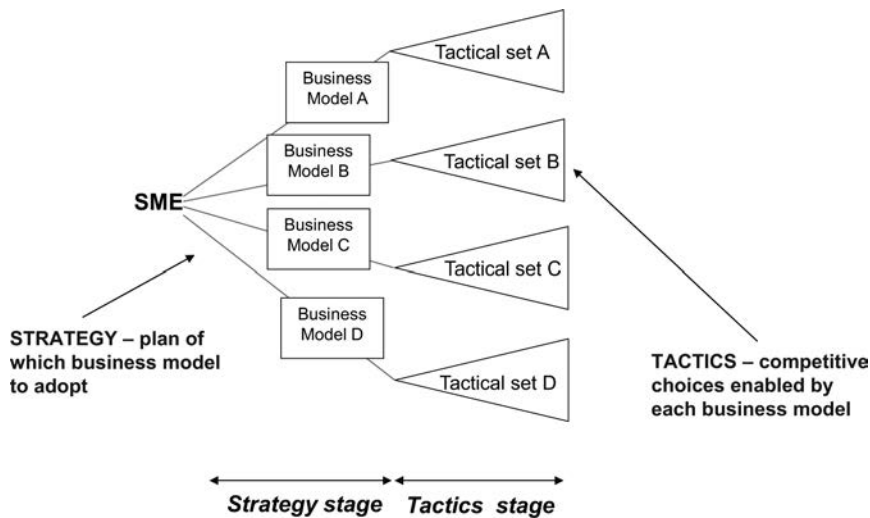models to long and short
term objectives

Figure 6.
The relationship between
strategy, tactics and
adopted e-business model

Within the previous conceptual framework, the research focussed on a number of key issues in the case study companies:

- What have been the impacts of e-business at process level?
- What are the skills and organisational factors impeding greater uptake of e-business?
- What have been the bottom-line benefits of e-business adoption?
- Does the application of certain models support a framework that can be used to allow international case study comparisons of e-business impacts at process level?

Research methodology

This research is based on qualitative case studies, which may be used to "develop theory as a result of data analysis" (Saunders *et al.*, 2003). They allow a "detailed

investigation of one or more organisations, or groups within organisations, with a view to providing an analysis of the context and processes involved in the phenomenon under study" (Hartley, 1994). Qualitative, inductive research can be carried out in a number of ways, encompassing case studies, the development of grounded theory, and ethnography. Remenyi *et al.* (1998) assert that widely accepted theories are unlikely to be available within a business context and that Glaser and Strauss's (1967) grounded theory methodology needs to be used as a basis for theoretical conjecture. Grounded theory is "an inductive, theory discovering, methodology that allows the researcher to develop a theoretical account of the general features of a topic while simultaneously grounding the account in empirical observations or evidence" (Martin and Turner, 1986). Remenyi *et al.* (1998) conclude that case studies can be used as part of a grounded theory approach. Multiple-case design increases the validity of generalisations developed from the research (Benbasat *et al.*, 1987). Yin (2009) also suggests that single case studies are vulnerable, and that there may be substantial analytical benefits of having multiple case studies. Grounded theory can emerge through analysis of the evidence from the case studies.

Data collection was pursued through a combination of interview, observations and documentary evidence from the case study companies gathered over a two year period.. These were collaborative university-business projects conducted within the Knowledge Transfer Partnership (KTP) programme (Wynn, 2009, Wynn and Turner, 2013). At TPG DisableAids, a full time Associate worked on developing e-business systems at the company in the period December 2008-December 2010, and another full-time Associate worked over a similar period at Optimum Consultancy. The authors were fully involved as either Associate, supervisor or line manager, allowing first hand observation from multiple sources. The conduct of these case studies can therefore also be viewed as action-research – as Mansell (1991) notes, "action-research must involve analysis of a problem situation not controlled by the researcher, the making of plans for intervention in the situation, and the attempted execution of these plans". This is a reasonable assessment of the interventions effected by KTPs, where a joint team of industry and university professionals address key business problems – in this case, the development of e-business capabilities in the two companies.

Yin (2009) suggests that the utilisation of multiple sources of evidence is one way of increasing the construct validity of case studies, and this underpins the research results. Interviews were conducted across the two year period with the majority of company management, and technical and operational staff. Remenyi *et al.* (1998) also suggest that observation is one of the most valuable ways to collect evidence, whereby the researcher may observe individual behaviour, culture, and the impact of technology on the organisation. This was done systematically through weekly meetings and reviews, in conjunction with findings from a review of literature to assess, apply and develop models, theory and concepts. This has allowed empirical evidence to be developed and assessments made against selected models (Remenyi *et al.*, 1998). These conclusions were fed back to the senior management team in each company (who acted as a Project Board in each of the case studies) for discussion and validation (Remenyi *et al.*, 1998). The Project Board played a key role in validation of research results. Wu *et al.* (2003) suggest that subjects must be in a position to generalise about business behaviour – people who have a comprehensive knowledge of the business, and who would be in a position to identify the problems the organisation had in changing

business processes and introducing new e-business technologies. Only employees at the level of manager or higher were included on the Project Boards in both case studies.

Findings

TPG DisableAids

TPG DisableAids is a family business founded in 1984 and now run by the second generation Gibbs family. It is a provider of equipment for the elderly and disabled, assembling and distributing a wide range of products from primary manufacturers, such as Stannah who make a range of stair lift products. The company currently has an annual turnover of £4.0 million (2011), and employs 49 staff.

TPG DisableAids' market can be divided into different segments (NHS, local authorities, district councils, residential and nursing homes, private individuals). Nationwide, this is a multi-billion pound market, which is growing as the age profile of the population increases. Competition comes from some of the national equipment dealers operating in the region (e.g. Stannah Lifts, who are also a supplier to TPG DisableAids) and one or two other smaller locally based companies.

There has, for some years, been a clear business opportunity to rapidly grow market share, particularly in the new market segment of public authority care management. TPG DisableAids business plan is to double their turnover within five years to £8.6 million in 2015/2016 which is dependent on exploiting e-business capabilities to meet the trading requirements of NHS and public authority procurement practices. The NHS e-procurement initiatives require specific inter-organisational systems integration capabilities. This alignment is critical to the expansion plans of the company.

TPG DisableAids' information systems strategy is centred on the Sybiz software packages for sales order processing, back-end financials, inventory management and service management. These packages have served the company well, but the database technology has become outdated and unwieldy, and the package suppliers currently offer no web portal functionality. Yet the e-procurement initiatives instigated by the NHS and other public bodies highlighted the need for TPG DisableAids to transform itself from a traditional family business into a modern SME with a workable e-business capability, particularly at the customer interface. Failure to support electronic trading would cause significant damage to the company's ability to tender for upcoming supply contracts (and post sales services) and have a detrimental effect on efficiency. In 2009, a project was agreed with senior management with the following objectives:

- Implement new web based order capture capabilities to allow transaction processing with NHS and other key customers, in response to their e-procurement initiatives.
- Upgrade the technology infrastructure to support cross supply chain information exchange.
- Identify and drive through improvement in the customer facing processes
- Develop new information reporting capabilities providing improved communication and sharing of information in-house and with key clients and suppliers. This was seen as particularly significant in the tracking of large contracts covering several years' transactions.

After evaluating the costs and benefits of a wholesale systems replacement, the company elected to base its e-business technical strategy on preserving their old legacy systems and using a range of technologies to build new e-business capabilities on the legacy systems platform. The e-business systems deployment had several main elements:

- An information portal was built to sit on top of the in-house legacy systems to allow electronic order capture and invoice posting.
- Bespoke "middleware" was developed and installed to link these new technology elements together and to post and receive data to and from the old legacy systems.
- A data mart (a subject specific data warehouse) was developed to extract, aggregate and summarise key performance data from the company's old Sybiz legacy financial systems.
- Business processes (see Figure 7) were adapted to support and exploit the business opportunities afforded by the technology innovation.

The key new strategic element was the need to develop an electronic trading capability through a web portal linked to the middleware infrastructure which fills a technology gap between the company's old back office systems and new modern technologies possessed by key customers. To understand TPG DisableAids business needs, it was deemed essential to understand company business processes. This was not a simple task because of a complex and tight relationship between business processes and the company's legacy accounting software package (Sybiz Vision). Often software packages are customised or adapted to fulfil the needs and requirements of an organisation, but here company growth has been a very gradual transition that has occurred around their accounting system.

It was also essential to upgrade the existing IT infrastructure to provide a solid foundation for future e-trading. Information security is a significant issue and implementing information security controls on existing systems has provided a secure environment for future development. The company elected to use open source/freeware support for in-house development which provides a secure, reliable and a flexible platform to develop in house systems capabilities. MySQL Community Server and PostFix Email Server, both secure and reliable open source technologies, were deployed in the infrastructure upgrade.

The development of the new web portal was another critical deliverable and was dependent on the stability and reliability of the middleware synchronisation of the

Figure 7.
Main business processes
at TPG DisableAids,
Hereford

database, data mart and legacy systems. A one-way synchronisation technique was used to extract data from the middleware database and populate the data mart on a regular basis. The main task of this synchronisation is to clean and transform primitive data from the middleware database into the technologically modern data mart objects. Extracting data from the legacy accounting systems and posting it to the web portal required the utilisation of different open source products, freeware utilities and intelligent architecture design and development with tight integration. This allowed the production of capabilities and functionality not possible in the old legacy systems.

Optimum Consultancy Ltd
Optimum Consultancy was formed in 2008 through the merger of two companies – Hama Ltd, a project management services business, and J Orchard Consulting Ltd, a surveying services business. In its first trading year (2008-2009) it achieved a turnover of £2.4 million and this has grown to over 3 million in 2010/2011. Optimum Consultancy is a specialist provider of professional services to the infrastructure, energy and property sectors with 35 employees; its core business is project and cost management in the property, engineering and construction fields; its customer base includes major retailers, rail operators, major financial and banking corporations and sustainable developments.

An internal review of systems and processes found that the company information systems were inadequate to support the company's current and future operations, particularly relating to the operation of sales processes and the conduct of major projects on client sites. Improved communications and collaborative working capabilities were seen as key requirements to support steady growth and improved margins, without the stop-start addition of administrative overheads. A major requirement was a new process and associated systems and procedures to respond in a consistent and streamlined manner to customer enquiries, across the organisation. This encompassed a review and evaluation of how Optimum's services and products could best be combined to meet varying customer needs and improve customer service.

Optimum Consultancy inherited a range of systems that had been acquired and set up in an *ad hoc* manner whenever a need arose. Separate software and hardware systems were purchased without detailed analysis of requirements. Project documentation – the life blood of the company – had become a major operational issue, with multiple versions and no master copy which could be accessed by everyone in the company. The ever expanding filing systems, delays in the sharing of project information, problems with locating the right electronic version of a document on the company networks, were all of major concern. As is common within the sector, systems become embedded in spread sheets and Word documents which are inherently difficult to control. Reporting becomes dependent on individuals chasing around at key points in the month to ensure that the correct information has been submitted. Optimum required collaboration tools and workflow software that would allow the coordination of project management activities, both within and across the company's thee offices, but also with field-based project managers working on client sites. This also involved the coordination of a range of activities carried out by architects, designers and surveyors. The need for access to the new systems via the web soon became evident as specific requirements were detailed and analysed.

The e-business project was launched in 2008, shortly after the merger of the two companies, and divided into distinct stages. High-level business process mapping (see Figure 8) was carried out to develop a better understanding of Optimum's core processes and to generate ideas for process improvement. The analysis found that existing technologies were not integrated, although most processes were interrelated with each other. Information workflows around the main systems still involved a significant amount of manual intervention. For example, the Sage software package was used by the finance department for sales order processing and invoicing, but it was not linked with systems used in the project management function. After the evaluation, a web-based enterprise portal solution was recommended to the Project Board to provide an integrated collaborative environment for all business processes and to streamline the process flow across the three offices in different locations.

There is a variety of web enabled collaboration software available on the market, and they vary in terms of features and industry specialisation (e.g. CRM, Accounting software, ERP, etc.). Suitability of collaboration software solutions available in the market was systematically assessed, which led to the procurement of the Workspace web-enabled collaboration management package.

The project team elected to roll-out the system in phases. Phase 1 focussed on the priority areas of document control, contact information and access to enquiry/project information. Phase 2 focused on integrating the Optimum finance system into Workspace. Key users from each office were selected and sent for training on the key functional aspects of the new system and took responsibility to cascade their knowledge to the rest of the company members. The company embarked on an internal communications exercise via company meetings and newsletter to ensure that everyone was aware of what was coming. Other activities during this period included unit testing of the main software modules, data migration of existing files/documents from the two old servers to the central server. The implementation phase took place almost at the same time with the monitoring and control phase to ensure that things are going to plan.

Analysis
Delivery of e-business trading capability at TPG DisableAids
TPG DisableAids can now trade electronically with key customers including NHS Shared Business Services and local authority organisations responsible for the provision of disabled facilities grants and associated products and services. This includes trading via third party data transfer intermediaries or other similar agencies. Improved efficiencies can be seen throughout the order and sales processing

Figure 8.
Main business processes
at Optimum Consultancy

procedures utilising web portal technology, whereby order information is accepted over the web and returned to the customer as an invoice, thus minimising the opportunity for human or machine error. The company's environmental impact has also been improved by removing the need to print paper documents and post to customers.

The main impacts of e-business technology adoption have been in the sales and marketing process, where the use of the bespoke portal development for order capture and order processing with key public sector customers has introduced new ways of working (see Figure 9). Hitherto, managerial thinking and outlook and day-to-day management of contracts has been hit and miss, with, in particular, *a priori* adherence to Service Level Agreements with KPI reporting for the customer and in-house managers absent or hard to produce. The gradual change from fire-fighting contract management to properly managed, KPI/dashboard based operations is the first fundamental shift in decision support and monitoring of operations that is starting to take place in the company. The e-business initiative has provided KPIs for contracts to date, reduction in errors in pricing for larger customers and errors during invoicing, and in the day-to-day management of existing contracts and the creation of new contracts pricing structures. The company can now compete with the increasing number of large multi-nationals entering the consumer disabled-equipment sector. The e-business project has manifestly demonstrated that application of middleware and data warehouse concepts to an old legacy systems platform can facilitate e-trading through a bespoke portal.

The CPIT analysis also indicates some use of e-business technologies in the services management process. This results from an earlier urgent business requirement to track the location of the fleet of field engineers responsible for installation, maintenance and emergency repair for TPG DisableAids' customers. Through the implementation of a web-enabled vehicle tracking system (Tracker), the company was able to meet its need for accurate and reliable fleet positioning to plan and provide on-site presence to customers within an 80 mile radius of headquarters within hours (rather than same day). In addition to basic requirements to meet contractual service level agreements, fleet engineers were able to exceed stated minimum times in order to re-assure and help customers out of stressful equipment failure situations with minimum delay. The vehicle tracking system went live in 2007 and is now a proven planning and control tool key to successful vehicle management in the company.

Cross company deployment of web-enabled systems at Optimum Consultancy
The new enterprise portal solution (Workspace) at Optimum runs on a single database and a unified technology platform, allowing universal access for all office users and remote workers, and ensuring consistency of data across all systems functions. User access to all documents and information is provided through a simple browser-based interface. The in-built security platform allows confidential content to be protected by enabling or restricting access by roles or individuals. All actions or changes that take place in certain areas of the system are recorded and logged in the database. The reporting functionality of the new system constitutes a significant improvement over the previous system, when it was difficult to generate reports regarding project performance evaluation (e.g. time planned vs time spent). The lead time to generate
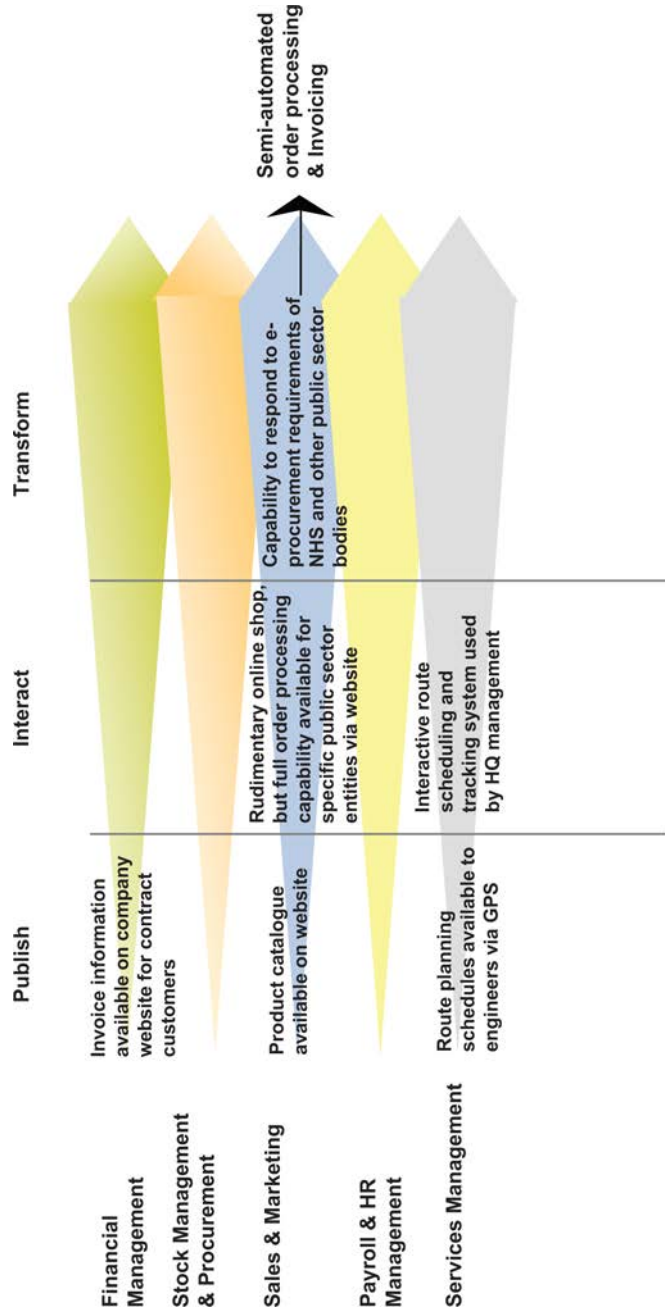
Figure 9.
TPG DisableAids: impact
of e-business at process
level

reports has improved significantly with most reports being generated very easily through standard systems functions.

The CPIT model for Optimum (see Figure 10) illustrates how the deployment of new e-business systems has impacted in all main process areas in the company. In the financial management process, Optimum has integrated their existing accounting software (Sage) with the new Workspace enterprise portal system. In the past Optimum had managed the financial aspects of projects through a collection of disconnected systems which included Sage 50, Winforecast and a myriad of spread sheets. Optimum now has one underlying system that manages the entire financial lifecycle of its projects without the need to rekey any data. Numerous benefits have been achieved through introducing the software, including the reduction of the reporting cycle from monthly to weekly, improved cash flow due to faster raising of invoices and more than 50 per cent reduction in the bookkeeping time required at the business. The directors and team leaders have instant access to information about overall company performance, forward workload and future prospects as well as full detail of every job (e.g. fee type, value, allocated costs and the margin that is being achieved). This enables the directors to take corrective action when the indicators are not moving in the expected direction.

In the core Operations process, the management of projects has been made more efficient through the new web enabled system. Once a bid is won, all the information is ready to be automatically transferred to the project record. This ensures continuity and reduces errors. The ability to find things more quickly proves increasingly useful as projects progress. Previously, field-based project managers had been struggling to access the information they needed. Now, via the web-enabled interface, they can access key financial project information but also update the system with day to day operational activity, allowing directors to be better informed about project progress. As regards business development, the Workspace e-business system plays a significant role in keeping track of sales enquiries. Any work done on prospective jobs is kept in the system. This allows the senior management team to track and manage the new work pipeline more easily, whether at head office or working remotely. When Optimum wins a job, it is migrated to a project record form which holds all relevant history. Previously, as a job flowed through the Optimum business from enquiry to completion, it was recorded and tracked using spreadsheets and staff spent a lot of time each month searching for or collating information relevant to a particular job. There was no way of using a laptop to get a complete picture of any particular job across the various systems. A lot of manual processes were required to bind together project data from the various applications and, furthermore, there was a lack of version control on these documents.

Deployment of the new collaboration software has also improved the people management processes, integrating the management of time and resources and the recording of skills and training into the mainstream corporate database. Previously this was a paper based process which provided little visibility to senior management to enable timely planning of resources. Benefits include having instant access to forward schedules and availability without reliance on monthly paper/spreadsheet reports, which have proven very difficult and time-consuming to maintain in the past. New analytical tools allow a range of scenario planning options to support the strategy development process. Looking at the "big picture" outwards and downwards, in a
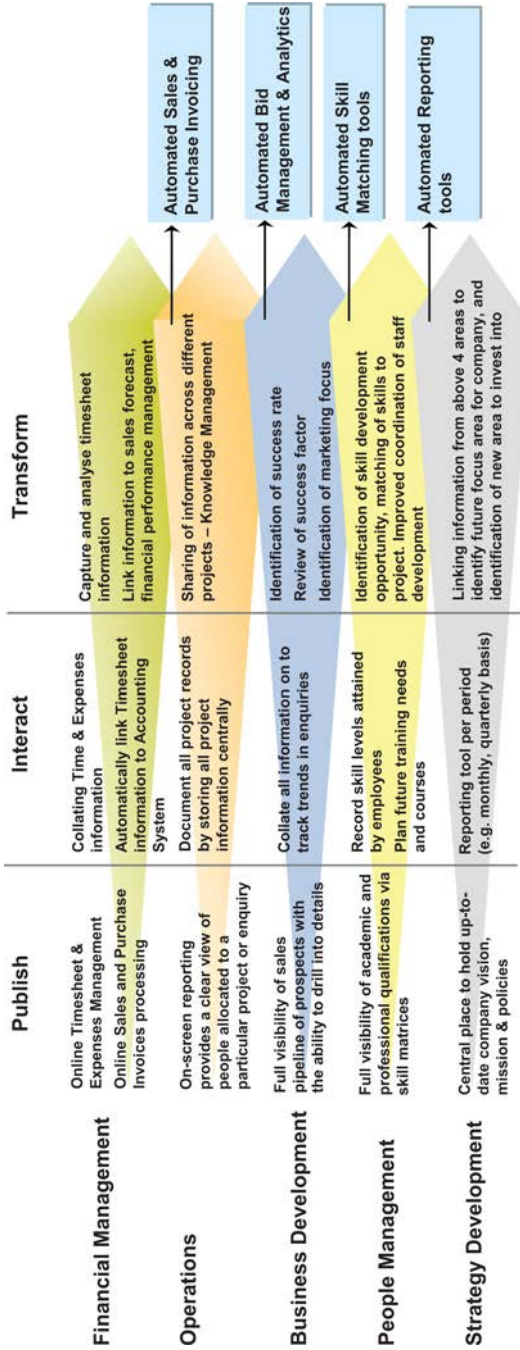
Figure 10.
Optimum Consultancy:
impact of e-business at
process level

systematic way allows the business to resolve complexity more easily, with systems information now being an integral part of this key business process.

Improved efficiencies have come from time savings and the avoidance of additional administrative headcount. Of working time 5 per cent was previously wasted due to inefficient systems and associated procedures. Removing this waste contributes £70k per year to the bottom-line and avoidance of additional administrative headcount is providing an additional saving of at least £60k per annum. The ability to access information instantly about overall company performance, forward workload and future prospects as well as full details for every job, including who is looking after it, the client, fee type, value, allocated costs and the margin that is being achieved will greatly improve the efficiency in all business activities. Based on the bottom-line benefits noted previously (£130k p.a.), investment in the Workspace system has a payback period of under one year, given the initial investment in software, hardware and staff was circa £105k.

Concluding remarks: towards a framework for case study comparison
As the scope and scale of e-business systems have developed in the past decade, many SMEs have grappled with the technical and business issues of effectively deploying e-business technologies to the clear benefit of their operations. The two case studies show significant progress and benefits delivery following the deployment of new e-business technologies as components of different information systems strategies. Organisational factors have been a key differentiator in determining the degree of benefit derived. As regards Zhu *et al.*'s (2006) model, TPG DisableAids have successfully "adopted" e-business in the sales process, but as yet have not achieved significant "routinisation". On the other hand, Optimum has successfully embedded the new web-based systems in all activities across the company, and a clear degree of "routinisation" of their usage has been achieved.

Given the multi-dimensionality of e-business, we suggest that a process based analytical framework that uses a customised version of the CPIT model is a good platform for further analysis. This can be seen as a "base camp" that provides a clear common framework for case study comparison which can then be developed in a number of directions. The essential elements of this comparative framework are:

(1) Establish a clear common understanding of what e-business is: as stated earlier, we suggest a pertinent definition of e-business in today's business and technology environment is: "the deployment of internet or web technologies to enhance core business processes, to include the use of mainstream business systems if they are accessible via the internet or intranet; but to exclude the use of other information systems and tools that do not leverage advantage from the use of web technologies".

(2) Draw up a top-level process map for the organisation – this will typically contain five to eight main processes that will almost certainly differ from the standard processes suggested in the core CPIT model put forward by the DTI in the early 2000 s. This has been trialled with over 100 companies and organisations over the past four years, with the involvement of third year undergraduate students. The range of processes differ vastly between, for example, a manufacturing SME (Wynn and Olubanjo, 2012), a professional practice (architects or solicitors), an educational institute (a school or

university), or a large financial company. It is important to ensure these processes are fully comprehensive and encompass all activities one way or another. (This will inevitably be a subjective exercise to some degree, and thus all activities should be included somewhere in a top level process).

(3) Apply the CPIT model at process level, adopting the hybrid definition of e-business noted previously and customising the process axis to reflect the processes of the organisation being researched. This moves the CPIT model forward a decade in its relevance, because it broadens the concept of e-business compared with that originally envisaged and recognises the need for process variety and customisation.

Once this baseline analysis has been confirmed through observation, interview and workshop feedback, then other models and concepts can be applied, depending on the nature and objectives of the research; and the process analysis can be updated as the adoption of e-business impacts the organisation.

For example, in this study, the stage model put forward by Willcocks and Sauer (2000), illustrates that TPG DisableAids are still struggling to bridge the organisational capabilities gap between stages 2 and 3 in their advancement of e-business (see Figure 11). Despite their new e-trading capabilities with their public sector clients, certain company policies and procedures are still in need of modification and process owners must fully take on their responsibilities to drive through process change. Attitudes and skill sets are also important and further training of in-house workers to use the portal will be needed to fully exploit the portal's potential.

The major achievement at Optimum has been to move very rapidly to adopt and exploit the new e-enabled systems and the company merger in 2008 was probably significant in signalling a new era, with staff expecting change and generally willing to "get on board" with new technology and related process change. Strong leadership from the senior management team was also critical and the selection of software that was well matched to solving the problems that the merged company faced eased the transition to the new ways of working required by the senior team. As such, Optimum have to some extent crossed the "value transformation" gap identified in Willcocks and Sauer's model and are consequently gaining more business value than TPG
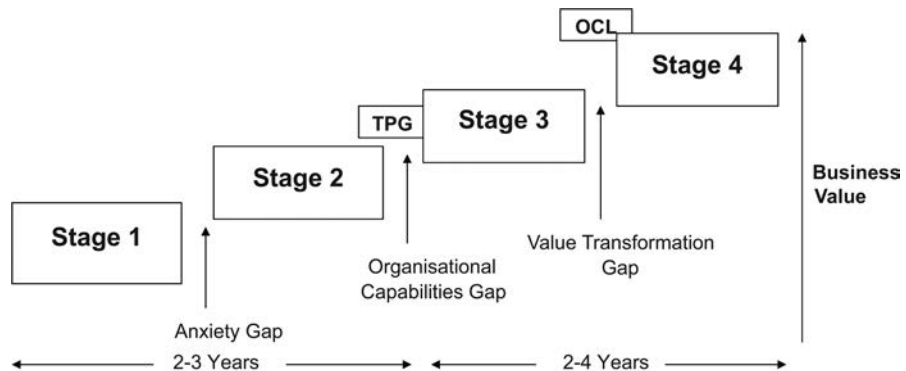

Figure 11.
E-business stage model

Source: After Willcocks and Sauer (2000)

DisableAids (see Figure 11). The acquisition of new knowledge generated in the process mapping, software package evaluation and implementation phases is also significant and will be carried forward and used in subsequent iterations of the project. Optimum had very little in-house e-business knowledge or capability, but now has the overall competence and know-how to move forward with further embedding and 'routinisation' of e-business systems and related processes.

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