

## Competitive advantage through e-operations

DAVID BARNES, MATTHEW HINTON & SUZANNE MIECZKOWSKA

*Open University Business School, Milton Keynes, UK*

---

**ABSTRACT** *This paper reports the initial stages of a research project investigating how UK-based organizations undertaking electronic commerce are seeking competitive advantage through the management of their e-operations. It is widely held that success in e-business is dependent upon harnessing the increased connectivity of the Internet in order to improve efficiency and effectiveness in managing business processes that produce and deliver goods and services. This requires the integration of operations management and information systems both within the organization and with supply chain partners. Results from a cross-case analysis of seven companies (three manufacturers and four financial service companies) are reported. These indicate that: (1) e-commerce investments are mainly driven by a fear of being left behind by competitors rather than a desire to improve business process performance; (2) e-commerce investments tend to automate rather than redesign existing processes; (3) e-operations are run as a discrete set of processes, with little or no integration between e-operations information systems and those of the bricks-and-mortar operations; (4) there is a lack of formal performance measures for e-commerce investments; (5) legacy systems and a lack of industry standards are major encumbrances to information systems integration.*

### Introduction

Despite the bursting of the dotcom bubble, e-commerce continues to have a major impact on the way that business is conducted around the world. In the United Kingdom alone, total e-commerce revenues (B2C and B2B) were worth over US\$17 billion in 2000 (accounting for over 20% of European e-commerce) and are forecast to rise to nearly US\$300 billion by 2004 (Forrester Research, 2002); an estimated 63% of UK companies now have a website (UK Office of National Statistics, 2001). For organizations that adopt e-commerce, there are likely to be significant effects on all of their functional disciplines. However, to date, much of the interest in e-commerce has centred on the finance (e.g. the liquidity, profitability and valuation of the dotcoms), the marketing (e.g. the design of user-friendly websites) and the human resource (e.g. IT skills shortages) functions. The interest of operations management researchers to date has tended to focus on the external impact of e-commerce, especially on the supply chain (e.g. Kehoe & Boughton, 2001). Very little attention has been given to the impact that e-commerce has made on the way that organizations configure their internal processes and systems to respond to external, competitive challenges. There is now growing recognition that success in e-business depends on a firm's internal production and supply processes (Hall, 2000; Keating *et al.*, 1999). Many companies have found that whilst 'setting up a web site is relatively easy ... the fulfilment of orders offline is problematic because

*Correspondence:* D. Barnes, Royal Holloway, University of London, Egham, Surrey, TW20 0EX, UK. E-mail: david.barnes@rhul.ac.uk

systems are not sufficiently efficient to seamlessly pass on order information and complete the order without error and/or delay' (Cox and Dale, 2001). Unless the goods and services required by customers are produced efficiently and delivered effectively, neither customer satisfaction nor profitability can be achieved (McGuffog, 1999). Achieving a competitive advantage in e-commerce depends on the extent to which the increase in connectivity offered by the Internet can be harnessed to improve efficiency and effectiveness in the business processes that produce and deliver goods and services. As Dedhia argues (2001) success in the e-economy demands 'continuous business improvements ... [from] ... quality and business process breakthroughs ... [and] ... constant improvements in responding to customers'. Proponents of Total Quality Management have long advocated its application to an organization's business processes as a means of achieving simultaneous improvements in efficiency and effectiveness. Consequently, Chou (2001) calls for the integration of TQM into e-commerce. Dale *et al.* (2000) also note the potential for TQM to ensure the effective management of key processes necessary for success in e-commerce. The importance of the management of business processes to the achievement of business excellence and quality improvement is emphasized by the central role assigned to these factors in many of the models of business excellence, such as EFQM and Baldrige National Quality Award.

The business processes through which both goods and services are produced and delivered lie at the heart of the academic discipline of operations management. It is clear that e-commerce is having a significant impact on many aspects of operations management in many different types of organization. It 'provides new channels for the global marketing of tangible goods and presents opportunities to create new businesses providing information and other knowledge-based intangible products' (Gunasekaran *et al.*, 2002). However, to date, operations management has been the neglected function in e-business. This paper reports findings from the initial stages of a research project undertaken at the Open University Business School that aims to address this deficiency. The research investigates how UK-based organizations undertaking electronic commerce are seeking competitive advantage through the management of their production and delivery operations, in other words, their e-operations. The paper opens by describing the theoretical basis for the research. It then goes on to outline the case study methodology used to apply this framework in practice. The second part of the paper reports initial results from the first seven cases in the study. These encompass three manufacturing and four financial services companies, and include examples from both the business to business (B2B) and business to consumer (B2C) markets. Cross-case analysis is used to compare and contrast the findings within and between the two industry sectors of services and manufacturing. From this analysis, five emergent themes and issues are identified. Finally, some future research directions are outlined.

### **Theoretical background**

The Internet has created the potential for almost unlimited information flows within and between organizations and their supply chain partners. E-commerce has been defined as the sharing of business information, maintaining business relationships, and conducting business transactions by means of telecommunications (Zwass, 1996). The operations of an organization are concerned with the management of the business processes that produce the goods and services supplied by the organization to its customers. The processes of order fulfilment and delivery are at the heart of any business, as they are the means through which an organization satisfies its customers. An organization can be considered to have e-operations if it uses information and communication technology (ICT) in the management of its order fulfilment and delivery processes. The ubiquitous nature of the Internet offers organizations

a unique opportunity to add value through improvements in efficiency and effectiveness. Such improvements may include lowering the cost of distributed electronic communication and collaboration, as well as 'taking huge amounts of time and cost overhead out of the supply chain equation' (Miller, 2000). Internally, improved efficiency and effectiveness may arise from the opportunity for

automating administrative processes [as well as] the new technology's ability to trigger of the business's primary infrastructure: its core processes and the software base that supports them. Web technology may enable a new round of re-engineering of the primary infrastructure and lead to faster turnaround of customers' orders, enhanced customer support, improvements in a product's unit-cost structure and shorter time to market for new products. (Feeny, 2001)

However, the use of ICT will not of itself confer a competitive advantage. In e-commerce, value will only be added when ICT is used as an enabler for the organisation's business processes to realize the organization's business objectives (Wigand, 1999). Thus, gaining a competitive advantage in e-operations depends on the extent to which the information flows afforded by the Internet can be harnessed to achieve the necessary improvements in production and delivery processes. As Grover & Malhotra (1999) assert, 'in conjunction with marketing, operations and information systems may very well form the backbone of e-commerce advances in organizations'. The literature from both operations management and information management traditions have key similarities, and thus both can inform the study of e-operations.

Operations management is concerned with activities in which resource inputs are transformed into outputs. This may involve the transformation of customers, and/or materials and/or information in the production of outputs of physical goods and/or intangible services. Traditionally, the academic study of operations tended to focus on operations at the micro-level. However, modern approaches to operations management take a more holistic view of organizational activity, emphasizing the linkages between the various micro-operations that constitute an organisation's macro-operations (see for example Slack *et al.*, 2001). From this follows the idea of a business process as a logical sequence of interconnected activities that uses organizational resources to create products and/or services to meet customer needs (Hammer, 1996). Such perspectives of operations fit well with more strategic models of organizational activities, such as Porter's (1985) value chain. Operations management is especially concerned with the business processes of order fulfilment and delivery. The business process literature (using titles such as business process improvement, business process re-engineering and business process redesign) emphasizes that these processes are likely to cross boundaries inside organizations (typically those between functions) and between organizations. Supply chain management literature (e.g. Christopher, 1998), takes the business process perspective of operations management beyond the boundaries of the organization to encompass relevant operations in the organizations of suppliers (and suppliers' suppliers) and customers (and customers' customers). The notion of flow, as exemplified in the business process perspective (Anupindi *et al.*, 1999), is prevalent in operations management. Techniques such as production flow analysis, flow process charting, and service blueprinting are widely used to assess movement of materials, people and information in business processes.

Like operations management, information management is also underpinned by systems theory (Checkland & Holwell, 1998) and the transformation model lies at the heart of the consideration of any information system. The analysis of information flows is central to the understanding of information systems. As with operations, the boundary-spanning property

of information is emphasized. The added value of information as input and output to business processes throughout and between value chains, has been acknowledged by Porter & Miller (1985) and with respect to e-business by Evans & Wurster (2000). Information management also has its own set of methodologies and techniques to aid this analysis (e.g. SSADM, data flow diagrams, systems flowcharts etc). Commonly, these methods identify a system as having a set of inputs, a set of outputs, and a set of processes that convert inputs to outputs (Avison & Fitzgerald, 1995). The study of the processes of order fulfilment and delivery in the Internet era necessitates an understanding of the interaction between operations management and information systems (Lyons, 1998). As Grover & Malhotra (1999) note, 'this interface is critically important at this juncture, particularly more so since it is highly relevant and not very well understood'. However, some BPR literature does offer some insights into the use of IT in the transformation of operational activity (Jahnke & Tijok, 1998; Knights & Wilmott, 2000; Loeffler *et al.*, 1998) and the impact of information systems integration on business process improvements (Bhatt, 2000; Weerakkoddy & Hinton, 1999).

Drawing on the literature streams of both operations management and information systems, Barnes *et al.* (2002) have developed a conceptual framework that identifies three main issues that need to be considered in the investigation of the impact of e-commerce on business processes: business process integration, information systems integration and the organizational context. The framework postulates that the benefits available from e-operations centre on the degree of integration that an organization can achieve within and between its business processes and its information systems, and those of its supply chain partners. Internal business process integration is the extent to which the business processes for e-commerce within a clicks-and-mortar model are integrated with those of the bricks-and-mortar (i.e. traditional) business processes. External business process integration is the extent to which the business processes are outsourced, including the extent to which any such outsourcing for e-commerce is integrated with outsourcing for traditional business. Another key concern is how the interface with the external supply chain, forward and backward, is managed, especially any disintermediating effects of the new technology. The consideration of information systems integration needs to define the extent to which information systems are integrated internally (both across functions, and between e-commerce and traditional activities) and externally (along the supply chain to suppliers and customers). It also needs to include the extent to which existing (i.e. legacy) information systems are able to facilitate integration (e.g. through the use of EDI, ERP or CRM).

Finally, due regard will need to be taken of the organizational context, a consideration of the customer, e-commerce, and business contexts. The customer context is the extent to which the organization is engaged in business to business (B2B) and/or business to consumer (B2C) e-commerce. The e-commerce context is concerned with the present business model (i.e. whether it is a dotcom, solely e-commerce based, or a clicks-and-mortar organization), its path to that model (e.g. it might be a dotcom start-up, or might have evolved from bricks and mortar to clicks and mortar, or even from bricks and mortar to a dotcom), and the extent to which the business processes and information systems have had to change to facilitate the adoption of e-commerce. The business context concerns factors such as the organization's objectives (profit seeking or not for profits), its size (multinational, SME), and its customer base, amongst other considerations.

### **Research methodology**

This research is empirically based, its main aim being to identify current emerging practice in the management of e-operations. As such, the research is essentially descriptive in

character. This, as Meredith *et al.* (1989) argue, is the starting point of the 'the normal cycle of research', in which description is used to form the basis for explanation, which can then be tested against reality until, through a series of research studies, a theory can eventually be built. The research seeks to examine the internal business processes of order fulfilment and delivery in e-businesses, identifying any common patterns and contingent organizational and environmental variables. This requires a level of detail and in-depth understanding that is almost certainly best achieved through a case study approach. A case study is 'an objective in-depth examination of a contemporary phenomenon within some real-life context where the investigator has little control over events' (Yin, 1994). Although both operations and information management have strong quantitative methodological traditions, calls for more qualitative research have been answered with increased case study work (Benbasat *et al.*, 1987; McCutcheon & Meredith, 1993). For areas where there is a paucity of empirical research and existing theory seems inadequate, case studies may offer a route to theory building (Eisenhardt, 1989; Meredith, 1998).

This research project therefore uses a case study methodology to study organizations from amongst those engaged in e-commerce. This research is qualitative in nature and the sample of companies included is not intended to be representative in a statistical sense. Unlike quantitative research, which uses statistical inference to generalize from a sample to a larger population, qualitative research relies on logical inference. As Yin (1994) points out 'case studies are generalisable to theoretical propositions and not populations'. Where there is more than one case, replication logic can be used to generalize more widely. Kvale (1996) notes that 'the issue of qualitative generalization has been treated particularly in relation to case studies'. Voss *et al.* (2002) assert that 'case research has consistently been one of the most powerful research methods in operations management' but acknowledge that it is more widely used in Europe than elsewhere. They further note that one of the challenges of the method is the need to exercise care in attempting to draw 'generalisable conclusions from a limited set of cases'. They suggest that triangulation may be used to increase validity. Thus, early case studies may provide 'breakthrough concepts and theories (Voss *et al.*, 2002) which could then be further tested through quantitative methods. In this way, it would be possible to obtain a level of breadth, based on statistical analysis, which would add to the depth obtained during the qualitative phase of the research.

The strength of the case study approach is its ability to obtain a rich data set by conducting an in-depth study of an organization. This concentration on the depth and quality of data enables researchers to access the meanings and interpretations that managers place on the organizational actions and decisions. This makes the case study potentially very strong in terms of both construct and internal validity. Case study research lies within the phenomenological or interpretivist paradigm (Easterby-Smith *et al.*, 1991) and its very nature is subjective. As such, qualitative data analysis inevitably relies on the interpretative processes of the individual analyst. Such an approach is often held to be an anathema to those from the quantitative positivist traditions (e.g. Donaldson, 1996). However, it has a long history within management studies (Gummesson, 1988), as well as in the social sciences more generally (Silverman, 1993).

Gathering sufficient data on business processes can only be achieved from within an organization, therefore access to the organization was deemed a prerequisite for this study. In this way, the case companies were gathered not so as to represent any kind of statistical sample, but rather, on the opportunistic basis of which companies were willing to permit sustained access for interview purposes. Data collection was principally through semi-structured interviews with executives with responsibilities for e-commerce activities within the organizations. Semi-structured interviews give researchers the freedom to explore interesting

avenues for investigation as they emerge. It is particularly important to be able to get close to the key organizational actors, not only to gather factual data from them but, perhaps more importantly, to gain an 'understanding of actions and meanings in their . . . context' (Bryman, 1988). The use of multiple interviewees in each organization not only affords greater depth and breadth of data, but also overcomes the problems of unreliability associated with the use of single respondents (Bowman & Ambrosini, 1997). The interview questions were based on the theoretical framework developed from the literature discussed above, to focus and bound the work (Miles & Huberman, 1994). Interviews were conducted face-to-face, mostly at the organizations' premises during 2001. The interview questions were aimed at discovering the firms' objectives for their e-commerce activities, how they were managing their e-operations and how they were adapting their operations to incorporate e-commerce. The questions were specifically structured around the areas and issues identified for the framework; in particular, whether processes for conventional business and e-business were integrated internally and externally; whether the information systems supporting these processes were similarly integrated, internally and externally, and what impact, if any, the organizational context had on the e-operations. The interview questions were open-ended, aiming to gather as much information as possible about the impact of e-commerce within the organizations, but also upon its impact on the organizations' customers, supply-chain partners, intermediaries, as well as interaction with competitors. Interviews were tape recorded to facilitate subsequent transcription.

There is widespread agreement that high quality qualitative data analysis needs to make use of coding techniques (Miles & Huberman, 1994). 'A code is a symbol applied to a group of words to classify or categorise them. They are typically related to research questions, concepts and themes. Codes are retrieval and organising devices' (Robson, 1993). Furthermore, the codes also function as a kind of thesaurus, grouping together similar ideas, themes and concepts from the natural language of the interview transcripts into a vocabularic framework. This framework, based on a controlled vocabulary, is the start of the process of classification, which is also recognized (e.g. Christensen & Sundahl (2001) as an essential part of theory building. Thus, the first stage of data analysis involved coding all the interview data. Analysis was undertaken using the *Atlas.ti* qualitative data analysis software package. *Atlas.ti* is very similar to the *NUD-IST* software for the analysis of qualitative data. Texts—in this instance, the interview transcripts—were formatted and pulled into a hermeneutic unit within the framework *Atlas.ti* provides. In *Atlas.ti* the hermeneutic unit consists of the primary documents, and the codes, quotations, memos and networks that are generated from the primary documents. *Atlas.ti* is less well known than *NUD-IST*, although it performs all the same functions, and has the benefit of an enhanced, thus more intuitive, user interface. Coding is more than merely labelling chunks of data—'coding is analysis' (Miles & Huberman, 1994). *Atlas.ti* allows analysts to impose their own structure on their data. In this case, the data (the interview transcripts) were disaggregated using a preliminary set of the top-level codes derived from the conceptual framework referred to above. Such an approach is recommended by Miles & Huberman (1994) and Dey (1993). Subsequently, data within each top-level code was further disaggregated using codes suggested by the data itself. This is an iterative process because 'categorisation of the data requires a dialectic to develop between categories and data' to ensure that the categories are 'grounded empirically and conceptually', and that the analysis achieves 'reliability, efficiency and flexibility' (Dey, 1993).

Once coded, the principal approach to data analysis was to identify the main points and themes emerging from the different interviewees. The findings from each case were identified and articulated in a descriptive narrative under a set of broad topic headings, such as

motivation for e-commerce, competitive advantage from e-commerce. Finally, a cross-case analysis, the systematic comparison of the main findings from each of the cases, was undertaken to 'deepen understanding and explanation' (Miles & Hubermann, 1994). The analysis also followed Miles & Hubermann (1994) in its use of displays—matrices, charts, diagrams etc (e.g. Table 2 later). For them the use of display is part of analysis, 'a major avenue to valid qualitative analysis'.

This approach to analysis is one that provides a structure within which 'to become intimately familiar with each case ... [It is one that] ... gives ... a rich familiarity' (Eisenhardt, 1989) with the data, which will yield the in-depth understanding necessary to offer meaningful interpretations. The aim throughout was to follow Yin's (1994) four principles for high quality analysis, namely use all relevant evidence, consider all major rival interpretations, address the most significant aspects of the case and use your own prior expert knowledge. Yin also points to the need to maintain a 'chain of evidence ... from initial research questions to ultimate case study conclusions'. This is provided from the interview tapes and notes, via the coding of the tape transcriptions, the application of the theoretical framework and on to the drawing of conclusions. The findings from the analysis are reported below.

### The case companies

This paper reports on findings from seven UK-based companies, three in the manufacturing sector and four in the financial services sector. All of the companies are well established in their industries and, by extending their use of ICT, they have converted from bricks-and-mortar to clicks-and-mortar business models. Some key features of the case companies and their use of e-commerce are summarized in Table 1. The main points from each of the cases are now outlined.

#### *Manufacturer 1—the steel producer*

The company is a division of a major European steel producer serving a specialist market of relatively few customers with a range of made-to-order products. The company has used an EDI system with its customers since the early 1990s, and also makes extensive use of e-mail. However, the EDI system is now proving costly, cumbersome and slow. The company recently decided to channel more of its e-business through the Internet. This has been done by creating a specialist steel industry portal, developed in conjunction with a number of its European competitors. It enables customers, suppliers and other divisions within the company to communicate with each other, even if they do not share the same communication software. The intention is to offer multiple products via a group of suppliers, in this way offering

**Table 1.** *Main features of the case companies*

Company	Products/Services	e-business model	e-commerce focus
Manufacturer 1	Steel products	B2B	Customers
Manufacturer 2	Pumps	B2B	Distributors/Customers
Manufacturer 3	Pharmaceuticals	B2B	Internal/Suppliers
Financial Services Company 1	Insurance	B2B	Suppliers
Financial Services Company 2	Share dealing	B2B/B2C	Customers
Financial Services Company 3	Insurance	B2B	Customers/Suppliers
Financial Services Company 4	Mortgage application processing	B2C	Customers

choice, and also minimizing the costs of establishing an e-channel for each of the suppliers. This European collaboration is intended to enable all participating companies to compete more effectively with steel-makers in other parts of the world, and encourage greater use of steel over other materials. The structure of the portal is also aimed at reducing supply chain and transaction costs by enabling better and speedier flows of information with customers. Customers use the website to make enquiries, request and receive quotations, place orders, receive acknowledgements, test certificates, despatch notes and invoices. Additionally customers can register order queries and complaints.

The website is primarily aimed at automating existing processes, thereby taking out costs, increasing the quality of information, reducing errors, and speeding the order and payment cycle. The site commenced in pilot form with selected customers in late 2001, but the ultimate intention is to move all customers to online trading. The company's manufacturing processes are unaffected by the website, but customers can track and trace their orders in the manufacturing process. Information on order progress is updated every 24 hours, and late and potentially late orders are flagged. The interesting feature of the development is the nature of the direct collaboration with natural competitors. This can be seen as a kind of re-intermediation through collaboration. It also attempts to raise barriers to entry for those competitors who are not taking part.

#### *Manufacturer 2—the pump manufacturer*

The company is a multinational manufacturer of pumps and associated equipment mainly for industrial use. It began to use e-commerce in the mid-1990s when it developed software to assist with pump selection and order entry. The company mostly sells through agents and distributors who use the software to compile orders that are then fed into the company's separate manufacturing information system. The software is also a web-based tool but very few customers currently have direct access to the software for direct ordering. This is because of the very technical nature of pumping equipment and the level of expertise required to order the correct equipment. Thus, the main function of the software is to support the company's local agents.

The company's main motivation for its use of e-commerce was to differentiate itself from its competitors by being a service leader, rather than a follower, in what is a conservative industry. It also perceived a need to keep up with other competitors who were announcing large e-commerce investments. At present no distinction is made between orders received via the software, and those received by conventional means. The company would like to be able to remove some of its intermediaries, perhaps through some of its more sophisticated customers using the web-based ordering software directly. However, it acknowledges that this is difficult as there are issues here of customer education, as well as the existing relationships with its distributors. Whilst internally there was strong support from management for e-commerce applications, conservative attitudes in the industry acted as a brake. The company feels that it is as yet too early to say whether its e-commerce applications have been successful. It is not conducting any formal performance measures, feeling that measuring e-commerce is difficult.

The company makes very little use of e-commerce with its suppliers. However, it recognises that there could be efficiency gains from integrating its purchasing and information systems with those of its suppliers. Although its current procurement spend is very fragmented, it has been able to reduce the number of its suppliers. As such it may be able to revisit the issue to see where electronic applications could be introduced.



*Manufacturer 3—the bio-technology company*

The company was founded as a research and development organization. It has recently received a government licence to manufacture and sell its products, mainly therapeutic pharmaceuticals. It expects that this new manufacturing function will significantly change its business. The company is not using e-commerce in sales, but rather, as a communication tool between its various sites in the UK, the US and Australia. It needs to be able to manage documents very securely, as well as to control its inventory of raw materials. It is also developing e-commerce applications for financial accounting, and setting up links between its various logistics groups and the accounts department, with that information made available across key managerial functions. At the moment, the company has not got the necessary management systems in place, and grappling with the technology issues involved is presently a very large concern. The company aims to move towards electronic ordering. It presently uses a manual system, based around faxes, written and telephone orders.

There is, as yet, no appreciable integration, either internally, or of the company's systems with those of its suppliers. The company would like to use e-commerce processes in order to assist production planning, especially as it requires and relies on specialized, certified raw materials, and needs to be able to check on their availability. However it feels that it must first get its manual systems running properly before it can fully turn to the MRP system it is intending to put into place. As a small company, investment in IT poses two significant problems. First, specifying costly hardware that will not rapidly become technologically obsolete is problematic. Second, there are issues around software and IT training. There is a lack of time in which to provide training, which tends to be done on a semi-formal basis (e.g. during lunch hours).

The company does not have any formal financial performance measures for e-commerce in place. Projects are reviewed upon completion in order to learn from their success or otherwise. The company's main objective is to bring down its costs of goods sold. One key success factor here would be using an inventory management system to reduce its inventory levels. In a small company that, at present, has no revenue, finance is inevitably an issue. The company quite freely admits that there are many issues that it is facing in both understanding and implementing technology, and says that it would tend to spend any additional available resource on increasing manufacturing capacity rather than on implementing electronically based information systems and processes.

*Financial services 1—insurer 1*

The company is the UK arm of a multinational insurer of corporate risks, including political risks, for its clients in the aviation and marine industries. The company had been using EDI messaging since the early 1990s and began to use e-commerce in 1997. E-commerce is used in the company's low value, high volume business because this is seen to afford an immediate benefit from automation, but with minimal risk to the company. E-commerce is used mainly to obtain quotes from suppliers—the insurance underwriters. The company posts information about the risk on offer, and the underwriters respond, via the web-based exchange. An electronic file and contract can be established through a structured workflow. Presently, some 2% of the company's transactions are established in this way. The company's motivation for e-commerce has been the threat of competition coupled with the lower transaction costs available through electronic 'self-service'. The company also wishes to be seen as a leader in an industry that has been slow to embrace technology.

The company runs its e-commerce operations quite separately from its traditional

business, serving only very specific market segments electronically. There is low integration of the company's business processes and information systems at present. Many of the e-commerce links are not fitted into existing systems and the organization's staff who handle the e-business transactions do not handle its other business. Many of the e-commerce systems do not fit within the company's core information systems.

The company has no specific formal performance measures in place for e-commerce. It does not employ any formal measures to assess cost, but says that some are obvious. There is a somewhat informal metric on the volume of transactions, which seeks to measure the number of transactions the company is seeking to place, against those actually placed. There is also a metric on the number of underwriters participating in a given month. No post-analysis of the cost-benefits of the company's IT and IS investments is carried out.

#### *Financial services 2—the market-maker*

The company is a 'market-maker', facilitating the sale and purchase of shares in small and medium sized companies (SMEs). It specializes in floating SMEs on this market to enable them to raise capital through publicly traded shares. The company launched its website in early 2001, enabling electronic online dealing to run in parallel with its traditional telephone-based trading. The online facility is mainly used for retail business (i.e. private individuals). The proportion of business conducted online is currently small, although no attempt has been made to quantify it. E-commerce has not yet made an impact on the company's conventional business operations. The company sees its online facilities mainly as an opportunity to test the connectivity of electronic commerce and to build up customers' familiarity with the new technology. It sees private investors as a potentially high growth market that can be best served by online trading where it can to create 'stickiness' for its customer base through both familiarity with, and ease of use of, the technology. The online facility is run jointly with a collaborator who has both the necessary systems and experience in share dealing.

The company's objective in using e-commerce is to achieve greater efficiency within the retail sales supported by the online facility, and based on a low margin/high volume formula. Orders received electronically are still channelled into conventional processes. The internal integration of its information systems is acknowledged as an expensive issue for the company. The company has gone some way towards integrating its information systems across its internal functions. It has recently invested heavily in new IS infrastructure which integrates front and back office systems. This has enabled some staff reduction to be made. The company maintains that it is still in the process of evaluating the success of its e-commerce activities. The company noted the difficulty of devising suitable performance measures for e-commerce applications and the fact that the fashionable standard for measuring website success keeps shifting.

#### *Financial services 3—the insurance and risk management company*

The company is a multinational UK-owned insurance broker, placing insurance business for clients, advising on risk management and providing funds management. Two years ago, the company launched a web-based system aimed at medium-sized company customers whereby claims could be reported and their progress checked electronically. Loss adjusters can also interrogate the system to check policy cover. The company's most recent e-commerce venture is the provision of the facility, through a partner organization, to trade all insurance products

and claims over the Internet. The company has also set up partnerships with affinity groups and is working with them to set up web-based links to insurance products.

The organization's main objective in the use of e-commerce is to improve efficiency. It has many branch offices, both domestic and international, but can foresee a time when e-commerce will allow for a reduction in their number. The company seems acutely aware of the cultural and social issues involved in electronic commerce, recognizing that young people, in particular, are becoming used to working with e-commerce and expect to have products and services available over the Internet, often on an around-the-clock basis.

In terms of the integration of business processes, clients still have the choice at the moment of having their records issued on paper, on CD or on a disk. But the company would eventually like a direct, electronic site-to-site transfer of records. The company acknowledges that this is a problematic issue, as achieving standards within the insurance industry can only be done via collaborative ventures. The online claims facility was developed with three other insurers and designing a policy document that met the needs of each was difficult and time-consuming.

The company feels that its internal information systems are quite well integrated, with the financial information from the branch structure feeding into one centre. An overall picture can be extracted from this when required. The company does not feel that its conventional business operations have changed significantly because of e-commerce. It does not send as many letters, using more e-mails, but feels that the traditional model of business is only gradually being scaled back by e-commerce. It recognizes that the insurance industry is very conservative, only adapting slowly to change, and is reluctant to give up entrenched, mainly face-to-face, working practices.

The company does not conduct any formal performance measurement of its e-commerce activities. It points out that where information is initially obtained from a website, and subsequently confirmed by telephone, there is an issue of whether performance measures would be tracking an electronic, or a telephone transaction. The company does have financial measures by which it assesses its conventional business operations. Additionally, it reconciles a monthly budget against the branch offices each month, but this is not broken down into conventional versus electronic transactions.

#### *Financial services 4—the retail bank mortgage department*

This case examines the mortgage application processing department of a major retail bank. Previously, the bank's mortgage sales were based on customer contact with a mortgage seller in a local branch. The bank is now attempting to move some of its mortgage products online. The situation is complicated by the fact that the bank has recently taken over a competitor that specialized in mortgages. The former competitor's range of products had reached a more sophisticated stage in terms both of online availability and the associated processes. At present the bank is running the acquired products in parallel with, rather than absorbed into its existing systems.

The bank is using electronic commerce, mainly within a B2C application. Customers can submit their mortgage applications in one of three ways. They can still use the traditional paper-based system; they can telephone directly to the mortgage department whose staff will input details directly into the mortgage department's system; or they can apply online via the bank's website. However, by whatever means the application arrives, even online, the application information still needs to be scanned, or re-keyed in order to be entered into the bank's systems for processing the application. At present, full online applications are only available on the former competitor's website; the bank's own website has only a 'call me'

button, whereby the customer provides a contact telephone number and the bank's mortgage department calls back to collect relevant application details. The bank appears to be having difficulty in managing the change to e-commerce. The recent addition of the former competitor's mortgage products has added an additional layer of complexity on top of other changes. However, the bank is clearly struggling with the integration of the business processes and information systems for its own mortgage products, with those it has acquired from the competitor, and there is a large amount of duplication within the current processes. The bank says that e-commerce is not a big priority for its mortgage applications, and does not feel that there is a strong financial or business case to be made. Nonetheless, it is undertaking some 'front-end' development, whereby it aims eventually to make its own group of mortgage products available via the web.

The bank is not carrying out any formal performance measurement. It is aware that the number of visits to web pages can be measured, but is not monitoring this. The bank is conscious that it needs to develop more of an 'end-to-end' process before it can increase and improve its e-commerce applications and effect any performance evaluation of them. At present the online mortgage applications account for only 2–3% of the bank's mortgage business and the bank prefers to concentrate its e-commerce efforts on developing retail online banking, which it sees as a more profitable activity in terms of achieving competitive advantage.

### **Cross-case comparison**

Some of the key findings from an analysis of each of the cases are drawn together in a cross-case comparison, displayed in Table 2, and discussed here.

The organizations display a range of uses of e-commerce which, as Table 1 shows, covers both B2B and B2C business models. The focus of the use of e-commerce also varies. In most cases the main focus is customers (Manufacturers 1 and 2, Financial Services Companies 2, 3 and 4). However, it is not confined to customers, as in some cases, the focus is rather the company's distributors (Manufacturer 2), suppliers (Manufacturer 3, Financial Services Companies 1 and 3) and/or its own internal users (Manufacturer 3).

The organization's motives for use of e-commerce can be broadly categorized as either associated with improving efficiency (Manufacturers 3, Financial Services Company 3) or effectiveness (Manufacturer 2, Financial Services Company 2 or both (Manufacturer 1, Financial Services Company 1). Financial Services Company 4 stands out, as it seems to have no clear motivation for its use of e-commerce.

The risks and problems in the use of e-commerce identified by the organizations can be broadly classified as either technologically related or socio-organizationally related. Technologically related problems include a lack of IT support and a shortage of skilled staff (Manufacturer 3), the lack of agreed operating standards in the industry (Financial Services Company 1), problems of integrating e-commerce business processes and information systems with those of the conventional business (Financial Services Companies 1, 3 and 4) and the costs of IT investments (Manufacturer 3 and Financial Services Company 1). Socio-organizationally related problems included cultural problems internally (Manufacturers 1 and 2, Financial Services Companies 1 and 2) and externally with supply chain partners (Manufacturers 1 and 2, Financial Services Companies 1, 2 and 3).

Six of the case companies seem clear about the basis on which they are seeking to achieve a competitive advantage from their use of e-commerce. These include improved supply chain coordination to raise entry barriers for competitors (Manufacturers 1 and 3, Financial Services Company 3), differentiating their service offering to raise exit barriers for customers (Manufacturer 2, Financial Services Company 1), improving customer service

**Table 2.** *Croos case comparison*

Organization	Use of e-commerce	Motivation	Risks and problems	Competitive advantage
Manufacturer 1	<ul style="list-style-type: none"> <li>● Internet portal</li> </ul>	<ul style="list-style-type: none"> <li>● move away from EDI</li> <li>● customer focus</li> <li>● reduction of supply chain costs</li> <li>● differentiation from competitors</li> </ul>	<ul style="list-style-type: none"> <li>● resistance to change both internal and external</li> <li>● ensuring successful collaboration</li> <li>● resistance to change both internal and external</li> <li>● establishment of priorities</li> <li>● cultural issues</li> <li>● recent loss of IT support following a de-merger</li> <li>● would prefer to use surplus financial resource to increase manufacturing capability</li> <li>● IT/IS training and implementation</li> </ul>	<ul style="list-style-type: none"> <li>● re-intermediation and collaboration; raised barriers to entry</li> <li>● differentiation</li> <li>● raising exit barriers</li> </ul>
Manufacturer 2	<ul style="list-style-type: none"> <li>● Software tool for ordering process</li> </ul>	<ul style="list-style-type: none"> <li>● to support manufacturing production planning</li> </ul>	<ul style="list-style-type: none"> <li>● lack of industry standards</li> <li>● conservative attitude within the industry</li> <li>● towards technology fit of e-commerce systems with the company's conventional systems</li> <li>● risks associated with being a technology leader</li> </ul>	<ul style="list-style-type: none"> <li>● better coordination within the supply chain</li> <li>● differentiation on cost and technology</li> <li>● attempt to create barriers to exit</li> </ul>
Manufacturer 3	<ul style="list-style-type: none"> <li>● Primarily e-mail communications internally and using web-based information systems to check suppliers' stock</li> </ul>	<ul style="list-style-type: none"> <li>● to speed up exchange of information and establish contract</li> <li>● desire to eliminate perceived threat from competition</li> <li>● desire to create client loyalty, 'stickiness'</li> <li>● lowering of transaction costs through client self-service</li> </ul>	<ul style="list-style-type: none"> <li>● expensive investment in IT/IS</li> <li>● cultural issues; conservative industry; negative image of share dealers</li> <li>● difficulty of collaborative ventures</li> <li>● multiplicity of sales channels = multiplicity of processes (difficulty of streamlining)</li> <li>● lack of conviction about benefits from e-commerce</li> <li>● non-interoperability of processes</li> </ul>	<ul style="list-style-type: none"> <li>● position as market-leader</li> <li>● tapping into new and potentially fruitful markets</li> <li>● responding to customer needs</li> <li>● exploiting non-obvious partnerships (e.g. with other sector)</li> <li>● no obvious source at present</li> </ul>
Financial services 1	<ul style="list-style-type: none"> <li>● information exchange for risk placing and underwriting</li> <li>● used for low-value high-volume business</li> </ul>	<ul style="list-style-type: none"> <li>● test of connectivity</li> <li>● using the Internet channel to leverage increased business</li> <li>● desire to target private investors as a 'high growth' market</li> <li>● need for 24/7 operations</li> <li>● improve efficiency</li> </ul>	<ul style="list-style-type: none"> <li>● acquisition of competitor whose online systems are more advanced</li> </ul>	
Financial services 2	<ul style="list-style-type: none"> <li>● online share dealing</li> </ul>			
Financial services 3	<ul style="list-style-type: none"> <li>● online claims reporting</li> <li>● sale of insurance products via partner organisations in other industry sectors</li> </ul>			
Financial services 4	<ul style="list-style-type: none"> <li>● online mortgage information, application, valuation</li> </ul>			

(Financial Services Companies 2 and 3) and entering new markets (Financial Services Companies 3). Financial Services Company 4 again stands out as it seems to have no clear idea about how e-commerce can be used to achieve a competitive advantage.

However, it is by no means clear that these companies understand how they can manage their e-operations to realize added value through improvements in efficiency and effectiveness in order to achieve the desired competitive advantage.

### Emergent issues

The following key issues emerge from the analysis of the cases.

- (1) *Investment in e-commerce is primarily technology driven.* The main motivation appears to be to make use of the Internet for business because use can be made of it. Underlying this is a fear of being left behind by competitors, that if the company does not seize the opportunities on offer, it may be left at a competitive disadvantage by those that do. Companies do not always seem to have a clearly articulated strategic logic for their e-commerce investments, and do not appear to follow Wigand's (1999) treatise to align their use of ICT with their business processes. Improving business process performance seemed to be a largely secondary consideration. All companies seemed to be seeking lower operating costs through the potential efficiency gains available through e-commerce, although some recognized that this would take time to achieve. Whilst some companies spoke of using e-commerce to improve customer service and create customer 'stickiness' some of this may have been *post hoc* rationalization.
- (2) *Investments in e-commerce are tending to automate, rather than re-design existing processes.* This reinforces existing, largely functionally based, organizational structures rather than creating process-based structures. This may be a surprising finding especially given all the interest in business process re-engineering (BPR) over the last decade, much of which was driven by those who saw the possibilities for IT-driven business process improvement. It very much runs counter to the calls for the 'obliteration rather than automation' of existing organizational activities led by Hammer (1990) and other advocates of BPR.
- (3) *E-operations are run as a discrete set of processes.* There is little or no integration between e-operations information systems and those of the bricks-and-mortar operations. In some cases, this perhaps stems from a desire to keep e-commerce as a separate activity, either to reduce the risk to existing business and/or to learn as much as possible from early forays into e-commerce. In other cases, problems with IT hardware or software, (discussed in (5) below) militate against integration. An interesting manifestation of the separation of clicks from bricks can often be observed in the attire of those working in the two areas, where more casual workware (open-necked shirts, chinos etc) is as much *de rigueur* as the smarter workware of the more formal counterparts (business suits, ties etc).
- (4) *There is a lack of formal performance measurement in e-commerce.* Scant attention is being paid to the performance evaluation of either ongoing e-operations, or to evaluating of the impact of e-commerce investments. Given the importance of e-commerce to these companies and the cost of some of the investments made, this seems surprising. A logical assumption might be that these initial investments in e-commerce would be subject to the closest scrutiny, as organizations seek to determine the future scope and direction of their e-business. Where formal performance

measures are applied, they are used on an *ad hoc* basis and there is no consensus as to which e-commerce performance measures are effective. This seems a neglected area of study and practitioners are evidently confused. One interviewee decried the changing fashions in e-commerce performance measures. There is clearly a need for some consensus that can offer guidance to those engaged in e-commerce.

- (5) *Legacy systems and a lack of industry standards are major encumbrances to information systems integration.* The legacy system issue is primarily an internal factor within organizations, and is particularly acute where organizations have been subject to merger and acquisition. This is by no means surprising as to undergo an organisation-wide IS change is bound to involve major expenditure. However, it is clear that ongoing IS incompatibility represents a significant barrier to the integration of e-business within larger organizations. It is much easier and cheaper for a small business to undertake complete wholesale replacement of both hardware and software. The lack of industry standards is, of course an external issue, but it has a major impact on those companies operating in an industry that relies on the widespread interaction of many interlinked organizations offering very specialised services. This is typically the case in the financial services industry and is perhaps typified by the insurance industry. It is clear that, in this sector in particular, greater use of e-commerce B2B is being held back by lack of agreed standards.

It should be noted that no attempt has been made within this research to determine the success of these companies' moves into e-commerce. Indeed, how to define and measure organizational success in e-commerce is a major issue in its own right. As such, it is to be emphasized that this research is not attempting, at this stage, to judge whether the approaches observed in the case companies represent good or bad practice. The main objective of the research is merely to describe and catalogue those practices. One of the avenues for further research would be to attempt to determine what practices, under what circumstances are more likely to lead to organizational success in e-commerce. In particular, it would be of great value to study the impact that the adoption of different approaches to quality improvement might have on e-business performance.

#### **Future research directions**

This paper has reported findings from the first seven cases of the research project. As this research is limited in terms of the number of organizations and of the industrial sectors studied, these findings must be viewed as emergent only at this stage. As such, they provide an indication of issues for further in-depth study. Nonetheless, these initial findings offer some pertinent insights into how firms in two important sectors of the UK e-economy are striving to achieve competitive advantage through their e-operations. In addition to a more detailed analysis of the data from these cases, in the next phase of this research project, additional case studies will be undertaken that will encompass examples of pure dotcoms as well as firms in other industry sectors. Data from the various industry sectors and business models will be compared to see where, and how, organizations are achieving improvements in efficiency and effectiveness in their business processes to meet the challenges of, and to gain, competitive advantage from e-commerce.

#### **Acknowledgement**

The authors wish to thank the Open University Business School and the Chartered Institute of Management Accountants for the provision of additional funding for this project and the case study companies for their cooperation.

## References

- ANUPINDI, R., CHOPRA, S., DESHMUKH, S.D., VAN MIEGHEM, J.A. & ZEMEL, E. (1999) *Managing Business Process Flows* (Upper Saddle River NJ, Prentice Hall).
- AVISON, D. & FITZGERALD, G. (1995) *Information Systems Development: Methodologies, Techniques and Tools* (London, McGraw-Hill).
- BARNES, D., HINTON, M. & MIECZKOWSKA, S. (2002) Developing a framework to investigate the impact of e-commerce on the management of internal business processes, *Knowledge and Process Management*, 9(3), pp. 133–142.
- BENBASAT, I., GOLDSTEIN, D.K. & MEAD, M. (1987) The case research strategy in studies in information systems, *MIS Quarterly*, 11(3), pp. 369–386.
- BHATT, G.D. (2000) An empirical study of the effects of information systems integration on business process improvement, *International Journal of Operations & Information Management*, 20(11), pp. 1331–1359.
- BOWMAN, C. & AMBROSINI, V. (1997) Using single respondents in strategy research, *British Journal of Management*, 8, pp. 119–131.
- BRYMAN, A. (1988) *Quantity & Quality in Social Research* (London, Unwin Hyman)
- CHECKLAND, P. & HOLWELL, S. (1998) *Information, Systems and Information Systems* (London, Wiley).
- CHOU, D.C. (2001) Integrating TQM into e-commerce, *Information Systems Management*, Fall.
- CHRISTENSEN, C. & SUNDAHL, D. (2001) The process of theory building, Harvard Business School Working Paper.
- CHRISTOPHER, M. (1998) *Logistics and Supply Chain Management*, 2nd edn (Hemel Hempstead, Prentice Hall).
- COX, J. & DALE, B.G. (2001) Service quality and e-commerce: an exploratory analysis, *Managing Service Quality*, 11(2), pp. 121–131.
- DALE, B.G., WILLIAMS, R.T. & VAN DER WIELE, T. (2000) Marginalisation of quality: is there an answer? *The TQM Magazine*, 12(4), pp. 266–274.
- DEDHIA, N.S. (2001) E-commerce quality, *Total Quality Management*, 12(3), pp. 397–402
- DEY, I. (1993) *Qualitative Data Analysis: A User friendly Guide for Social Scientists* (London, Routledge).
- DONALDSON, L. (1996) *For Positivist Organization Theory: Proving the Hard Core* (London, Sage)
- EASTERBY-SMITH, M., THORPE, R. & LOWE, A. (1991) *Management Research: An Introduction* (London, Sage)
- EISENHARDT, K. (1989) Building theories from case study research, *Academy of Management Review*, 14(4), pp. 532–550.
- EVANS, P. & WURSTER, T. (2000) *Blown to Bits: How the New Economics of Information Transforms Strategy* (Harvard, Mass., Harvard Business School Press).
- FEENY, D. (2001) Making business sense of the E-opportunity, *MIT Sloan Management Review*, Winter, pp. 41–51.
- FORRESTER RESEARCH INC. (2002) Forrester Findings—Internet Commerce, <http://www.forrester.com/ER/Press/ForrFind/0,1768,0,FF.htm> (accessed 24 January 2002).
- GROVER, V. & MALHOTRA, M.K. (1999) A framework for examining the interface between operations and information systems: implications for research in the new millennium, *Decisions Sciences*, 30(4), pp. 901–920.
- GUMMESSON, E. (1988) *Qualitative Research in Management* (Bromley, Chartwell-Bratt).
- GUNASEKARAN, A., MARRI, H.B., MCGAUGHEY, R.E. & NEBHWANI, M.D. (2002) E-commerce and its impact on operations management, *International Journal of Production Economics*, 75(1–2), pp. 185–197.
- HALL, J. (2000) Are your processes fit for E-Commerce? *Management Services*, April pp. 12–16.
- HAMMER, M. (1990) Re-engineering work: don't automate, obliterate, *Harvard Business Review*, July-August, pp. 104–112.
- HAMMER, M. (1996) *Beyond Re-engineering* (London, HarperCollins).
- JAHNKE, B. & TIJOK, C. (1998) Identifying IS support alternatives for business process re-engineering, *Knowledge and Process Management*, 5(1), pp. 41–50.
- KEATING, M., METZ, P.D., HOLCOMB, C. NICHOLSON, M. & JONES, D.L. (1999) How electronic commerce is transforming business processes, *Prism (USA)*, 1, pp. 41–51
- KEHOE, D.F. & BOUGHTON, N.J. (2001) New paradigms in planning and control across manufacturing supply chains—the utilisation of internet technologies, *International Journal of Operations and Production Management*, 21(5–6), pp. 582–593.
- KNIGHTS, D. & WILLMOTT, H. (2000) *The Reengineering Revolution: Critical Studies of Corporate Change* (London, Sage).
- KVALE, S. (1996) *Interviews: an Introduction to Qualitative Research Interviewing* (Thousand Oaks CA., Sage).
- LOEFFLER, T.R., STRIEMER, R. & DEITERS, W. (1998) A framework for identification & support of semi-structured business processes, *Knowledge and Process Management*, 5(1), pp. 51–57.



- LYONS, G. (1998) The role of information technology in enterprise re-engineering, *Knowledge and Process Management*, 4(4), pp. 268–277.
- MCCUTCHEON, D.M. & MEREDITH, J.R. (1993) Conducting case study research in operations management, *Journal of Operations Management* 11, pp. 239–256.
- McGUFFOG, T. (1999) E-commerce and the value chain, *Manufacturing Engineer*, 78(4), pp. 157–160.
- MEREDITH, J. (1998) Building operations management theory through case and field research, *Journal of Operations Management*, 16, pp. 441–454.
- MEREDITH, J.R., RATURI, A., AMOAKO-GYMPAH, K. & KAPLAN, B. (1989) Alternative research paradigms in operations, *Journal of Operations Management*, 8(4), pp. 297–326.
- MILES, M.B. & HUBERMAN, A.M. (1994) *Qualitative Data Analysis* (London, Sage).
- MILLER, E. (2000) 'E' isn't enough in e-business, *Computer-Aided Engineering*, December, p. 56.
- PORTER, M. (1985) *Competitive Advantage* (New York, Free Press).
- PORTER, M. & MILLAR, V. (1985) How information gives you a competitive edge, *Harvard Business Review*, 63(4), pp. 149–160.
- ROBSON, C. (1993) *Real World Research* (Oxford, Blackwell).
- SILVERMAN, D. (1993) *Interpreting Qualitative Data* (London, Sage)
- SLACK, N., CHAMBERS, S. & JOHNSTON, R. (2001) *Operations Management*, 3rd edn (London, Pitman)
- UK OFFICE OF NATIONAL STATISTICS (2001) *First E-commerce Survey of Business* (London, ONS).
- VOSS, C., TSIKRIKTSIS, N. & FROHLICH, M. (2002) Case research in operations management, *International Journal of Operations and Production Management*, 22(2), pp. 195–219.
- WEERAKODDY, V. & HINTON, M. (1999) Exploiting information systems through business process improvement, *Knowledge and Process Management*, 6(1), pp. 17–24.
- WIGAND, R. (1999) Electronic commerce: definition, theory and context, *The Information Society*, 13, pp. 1–16.
- YIN, R.K. (1994) *Case Study Research* (London, Sage).
- ZWASS, V. (1996) Electronic commerce: structures and issues, *International Journal of Electronic Commerce*, 1(1), pp. 3–23.



Copyright of Total Quality Management & Business Excellence is the property of Routledge and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.