Skills required in developing electronic commerce for small and medium enterprises: case based generalization approach


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Abstract

There has been a rapid growth in electronic commerce worldwide. However, the UK government and other governments had noted that electronic commerce uptake among Small and Medium Enterprises (SMEs) has been slow. In this paper we examine the skills and knowledge required for successful electronic commerce projects in the UK SME sector based upon detailed case studies in three SME organisations from the Northwest region of England over a two year period. B2C electronic commerce appears to involve a greater requirement for skills relating to website animation, website promotion, content management, and relevant legislation compared to B2B electronic commerce. Conversely, B2B electronic commerce potentially requires more detailed knowledge of electronic data interchange technologies compared to B2C electronic commerce.

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1. Introduction

The rapid growth in electronic commerce has been noted by many researchers [1–4]. The perceived strengthening of a company’s competitive position may often be the justification for a company to develop electronic commerce [5]. Davies [6] had stated that e-commerce will become the accepted medium for business transactions, not least because governments are strongly promoting it. However, the UK government and other governments had noted that uptake of electronic commerce in the Small and Medium Enterprise (SME) sector has been slow [7–9]. It is therefore worthwhile to understand what skills and knowledge are required for successful electronic commerce development work [10], especially in the SME sector where such skills will typically be harder to obtain than in large organisations [7]. In particular it is important to examine how such skills and knowledge are used in actual practice in the SME sector, and to determine how such skills and knowledge can be improved in the sector. Seffah [11] had stated that in the face of a growing
software industry labour shortage and rapidly changing technology, effective continuing education can help organisations develop and retain accomplished software developers. In this paper the results of a research exercise involving detailed case studies in three SME organisations from the Northwest region of England over a two-year period concerning the skills and knowledge required for electronic commerce development work in an SME setting are examined.

2. Literature review

2.1. Web-based development

Gellersen and Gaedke [12], Aoyama [13], and Russo and Graham [14] commented that the delivery of applications in the web-based environment is radically different from the usual ways of delivering software, and imposes a completely different structure and approach on application development. Quan et al. [15] commented upon the wide range of technical skills required for web-based application development. Niederst [16] had commented on the need for web designers to have an understanding of the human computer interface issues of website design including navigation, function and graphics, but had not examined how these skills were actually acquired or used. Wan and Chung [17] argued that website designers need to have navigational design skills, in order to avoid producing messy websites. Morris and Hinrichs [18] commented upon the new design skills required for web site design over traditional systems design skills such as an increased understanding of interaction and information handling, in particular navigation and pluralistic design. Pressman et al. [19] argued that as well as involving new design skills, web-based development projects also typically involve shorter development times and product life cycles. Palmer and Griffith [20] had commented upon the need for website designers to understand both the marketing and technical issues of website design. Conallen [21] had stated that since web-based applications execute business logic, the most important models of a web-based system should focus on the business logic, not on presentation details. Gellersen and Gaedke [12], Wiegers [22] and Russo and Graham [14] had stated that the development of web-based applications is still mostly ad hoc. Gellersen and Gaedke [12] also commented that there is no rigorous systematic approach to web development projects in general, and that most current web application development and management practices rely on the knowledge and experience of individual developers.

In summary, numerous researchers have commented that web-based systems development is quite different from other types of IT development work, however, the skills required to successfully undertake web-based systems development work in actual practice does not appear to have been examined in any detail.

2.2. Electronic commerce development

Korper and Ellis [2] had commented upon the wide range of technical skills necessary for electronic commerce projects including: network operating systems, back end systems, web servers, programming and graphical user interfaces. However, Korper and Ellis [2] had not discussed the use of such skills in actual commercial/industrial practice. Norris and West [23] argued that electronic commerce projects involve technical and business aspects, both of which need to be properly addressed in order for the project to be successful. Horowitz [24] had commented that for organisations wishing to utilise legacy systems for electronic commerce, migrating software to the World Wide Web requires a thorough understanding of systems architecture design principles in order to determine what will be executed on the client and server sides and what communication between client and server will occur. Norris [25] argued that since electronic commerce across the Internet transcends physical boundaries, it can make established legal and tax regimes difficult to apply, and electronic commerce system developers need to be aware of such difficulties.

In summary, numerous researchers have noted that electronic commerce systems development requires a wide range of skills to be conducted successfully, however, little research appears to
have been undertaken to examine such skills in actual commercial/industrial practice.

2.3. Electronic commerce skills in the SME and large enterprise sectors

Barry and Milner [9] commented that SMEs have traditionally been identified as weak across the training continuum, ranging from the identification of training needs to the sourcing and implementation of training interventions, and finally to evaluation of training provisions. Barry and Milner [9] further commented that electronic commerce training provisions are generally quite weak in SMEs, and advocated the need for SMEs electronic commerce training provisions to be examined. Darch and Lucas [8] stated that a lack of electronic commerce knowledge and skills form part of a barrier to the uptake of electronic commerce by SMEs, and that governments and industry groups need to develop a range of electronic commerce training strategies to address such deficiencies.

However, in the large enterprise sector, the provision of electronic commerce skills is quite different. Large enterprises typically have sufficient IT budgets to acquire tools and platforms necessary to develop their own electronic commerce systems. Thus, for example, large enterprises will typically be able to afford the hardware to run an electronic commerce system upon, higher performance web server software, as well as professional web development tools such as Macromedia MX studio. In contrast, SMEs will typically rent web server facilities through an Internet services provider (ISP), and will either have to outsource electronic commerce development to an ISP or software house, or use cheaper, easier to use electronic commerce development tools such as MS FrontPage and Actinic. In terms of the back end databases that support electronic commerce systems, large enterprises will typically use high performance database management systems such as Oracle 9i and DB2, whereas SMEs will typically use smaller scale DBMSs such as MS Access or MySQL.

Large organisations will typically be able to afford the overhead of a number of internal IT staff with which to develop and maintain electronic commerce systems [8]. However, in the SME sector most companies will at best have one or two IT staff, and in many cases may have to outsource all electronic commerce systems development and maintenance activities to an ISP or software house.

It is apparent from the above discussion that researchers have already identified that web-based application development, and in particular electronic commerce application development involves different activities when compared to other types of information systems development. However, little if any research appears to have been conducted in order to determine the set of skills and knowledge required for electronic commerce development projects in an SME environment (as compared to a large company environment), and the means by which such skills and knowledge can be developed in actual commercial/industrial practice within an SME setting. This is the academic origination of the research reported in this paper, that it attempts to uncover the set of skills and knowledge that are required for electronic commerce projects in actual commercial/industrial practice within an SME environment, and the mechanisms by which such skills and knowledge can be developed within the SME sector.

3. Research method

The research method adopted for this research exercise was the case study approach. Yin [26] defines the case study approach as follows: 'A case study is an empirical inquiry that investigates a contemporary phenomenon within its real life context, when the boundaries between phenomenon and context are not clearly evident, and in which multiple sources of evidence are used'. Case studies are a worthwhile research approach from both an academic and industrial/commercial perspective because they allow explanations of particular phenomena derived from empirical research which may be valuable in other settings and organisations as interpretations of phenomena, although these may not be wholly predictive for future situations [27]. Cavaye [28] commented
that statistical generalisations to a population is not the goal of case study research, as cases are not sampling units, rather theoretical or analytical generalisation is appropriate, where case study results can be used to develop theory.

The case study research techniques used included interviews, discussions, observation, document collection, and literature reviews. Darke et al. [29] noted that case studies typically combine data collection techniques such as interviews, observations, questionnaires and document and text analysis. Silverman [30] noted the predominance of interview-based studies in the area of information systems research. Darke et al. [29] stated that case study research is the most widely used qualitative research method for information systems research and is well suited to such research. Multiple case studies allow cross case analysis and comparison, and the investigation of a particular phenomenon in diverse settings [29].

The three SME organisations studied were selected purely on the basis that the organisations concerned had contacted the University for which the authors work with a request for IT consultancy work in the electronic commerce field. This gave the authors a unique opportunity to examine in depth how electronic commerce development was actually conducted within the three SME organisations. Few, if any organisations would typically allow academic researchers to conduct such a time consuming examination of electronic commerce development activities over so long a period. The duration of each project, roughly two years each, enabled the researchers to study the skills required for electronic commerce in actual practice, rather than merely eliciting the opinions of company staff in what skills they considered appropriate, which is all that a questionnaire survey could have hoped to achieve.

The first organisation (company A) was a wholesaler of industrial consumables, and the consultancy project for this organisation concerned the integration of legacy supply chain management systems with a new B2B (business-to-business) electronic commerce system. Laudon and Laudon [31] define B2B electronic commerce as electronic sales of goods and services among businesses. The second organisation (company B) was a tourism and investment marketing organisation that promoted hotel accommodation bookings, event bookings, and conference bookings as well as promoting a particular area of the UK as a place for investment by private sector organisations. The consultancy project for this organisation concerned further developing its electronic commerce systems, in particular with regard to electronic data interchange links with both large and small hotel chains, and the further development of customer relationship management systems. The third organisation (company C) was an on-line retailer of outdoor clothing and equipment. The consultancy project for this organisation centred on improving its existing electronic commerce systems, developing customer relationship management systems, and integrating both of these with existing legacy management information systems such as the accounts and stock control systems. Table 1 gives details of the organisations researched; Table 2 gives details of the organisation’s electronic commerce systems. The study of three SME organisations from different electronic commerce sectors: wholesale, retail and tourism, enabled the researchers to gain a useful insight into how the skills and knowledge required for electronic commerce in an SME environment differed between the different electronic commerce sectors.

In each of the three SME organisations studied a number of those involved in electronic commerce projects were interviewed, and examples of electronic commerce project documentation were

<table>
<thead>
<tr>
<th>Type of organisation</th>
<th>No. of employees (approx.)</th>
<th>No. of IT staff (approx.)</th>
<th>E-commerce policies</th>
<th>Business e-commerce course</th>
<th>Technical e-commerce course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wholesale</td>
<td>50</td>
<td>6</td>
<td>N</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Marketing</td>
<td>60</td>
<td>2</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>Retail</td>
<td>6</td>
<td>1</td>
<td>N</td>
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</table>
sought. Each of the three organisations studied had separate e-commerce developer roles. In the retail company studied, electronic commerce development work was carried out by an internal e-commerce executive, two staff within a small software house contracted to undertake electronic commerce development work for the company, in addition to the authors. In the wholesale company studied all electronic commerce development work was carried out by the internal IT staff, with the assistance of the authors. The job titles of those IT staff involved in electronic commerce development work within this company were IT manager, e-commerce analyst and software engineer. In the tourism and investment marketing organisation studied one of the internal IT staff (an e-business executive) was involved in electronic commerce development activities, along with four IT staff in a small IT services company that employed approximately 20 staff, in addition to the authors.

All of the aforementioned IT practitioners were interviewed as part of the research project reported in this paper. In addition, interviews and discussions were conducted with the managing director and accounts manager in the retail company; the marketing manager, marketing director, conferences manager, call centre manager, and accountant within the tourism and investment marketing organisation; and the finance director and managing director within the wholesale company.

Case studies based on personal contact are particularly appropriate for investigating IT practice. It is a holistic approach and helps overcome the problems of terminology and verification, which bedevil the use of questionnaires. A primary weakness however is the time-consuming nature of case study investigation for the researcher. Also it is disruptive for the organisation studied, and this makes it difficult to obtain the necessary co-operation [32].

The purpose of the research reported in this paper was to identify the generic skills required for electronic commerce in the SME sector, and to examine how these differed between industry sectors (wholesale, retail, tourism) and between B2B and B2C (business to consumer electronic commerce). Laudon and Laudon [31] define B2C electronic commerce as electronic retailing of products and services directly to individual consumers. In addition the research reported in this paper sought to identify and classify the strategies used for developing electronic commerce skills and knowledge in the SME organisations studied.

In particular the research project reported in this paper sought to examine the following research areas:

3.1. Knowledge and skills required for electronic commerce

What skills and knowledge are required for electronic commerce development work in an SME environment?

How do the skills and knowledge required for electronic commerce development work differ between SME industrial sectors?

How do the skills and knowledge required for electronic commerce development differ between B2B and B2C electronic commerce?
3.2. Use of electronic commerce skills and knowledge in actual practice

How are the different types of skills and knowledge required actually used in electronic commerce development work in an SME environment?

How do SME organisations organise electronic commerce development projects?

What types of electronic commerce development tools are used in an SME setting?

What types of security mechanisms are used by SMEs for electronic commerce activities?

What standards/policies/best practice guides are used for electronic commerce development within the SME environment?

3.3. Development of electronic commerce knowledge and skills

How are the skills and knowledge required for electronic commerce development acquired in an SME setting?

How can the skills and knowledge for electronic commerce development work be improved in an SME setting?

How do SME organisations actively improve the electronic commerce development skills and knowledge of their staff?

These research questions are pertinent to the IT industry and the academic IT community because for electronic commerce systems to become more commonly used in SME organisations there is an increasing need to understand what new and different skills and knowledge are required by those that develop such systems. In addition it is important to identify appropriate mechanisms to develop such skills and knowledge in an SME environment. The SME sector needs to adapt itself to the demands of Internet technologies, which looks set to have far reaching economic and social impacts. In particular, SME managers need to ensure that those undertaking electronic commerce development work have the necessary skills and knowledge to undertake such work in a competent and professional manner.

4. Research results

4.1. Classification of skills and knowledge required for electronic commerce projects in the SME sector

When the staff in the three SME organisations studied were interviewed with regard to how they would classify the skills and knowledge required for electronic commerce projects, overlapping skill/knowledge sets of technical and business skills/knowledge emerged as shown in Fig. 1.

The technical skills/knowledge identified as necessary for electronic commerce projects in the SME sector concerned:

4.1.1. Design

The design of electronic commerce systems, and in particular the linking of websites to existing application systems and back end databases was viewed as an important skill for electronic commerce development projects by those interviewed. Riccardi [33] commented that statically created web pages have increasingly been replaced by dynamically generated content from back-end databases. The majority of the web pages within the electronic commerce system in use at the wholesale

![Diagram showing technical and business aspects of electronic commerce skills](image)
organisation were generated dynamically from a back-end Lotus Notes database. The marketing organisation studied was intending to move from the static web pages they currently used to dynamically created web pages from a back-end Microsoft SQL Server database. The retail organisation studied used an on-line catalogue development tool (Actinic) that generated web pages from an internal Microsoft Access database. The IT staff in the retail and wholesale organisations stated that they had to develop an understanding of the design, coding and operation of the existing legacy systems with which the electronic commerce system was to be integrated. In the wholesale organisation, this involved integrating the organisation’s electronic commerce system with the existing supply chain management systems. In the retail organisation, this involves integrating the electronic commerce system with the legacy accounts, stock control and management information systems. In the marketing organisation a link was required between the electronic commerce system and the existing accounts software package. In both the retail and marketing organisations the electronic commerce system also had to be integrated with a new customer relationship management system.

4.1.2. Programming and testing

Programming skills in electronic commerce development tools were perceived as a vital skill for electronic commerce development work by all those interviewed involved with the electronic commerce development project in the three SME organisations studied. As can be seen from Table 2 a variety of electronic commerce development tools were in use across the three SME organisations researched. In particular, the three case studies appeared to indicate that typically electronic commerce system developers need to be able to use a number of development tools for developing and maintaining a given electronic commerce system. Testing skills and knowledge for electronic commerce projects were deemed important by the IT staff interviewed in each of the three organisations studied. In particular, the need to test the organisation’s website using different versions of different Internet browsers and navigators, and testing how easy the organisation’s website was to find using different Internet search engines.

4.1.3. Security

Internet security knowledge was perceived as necessary by the IT staff interviewed in order to ensure electronic commerce systems that are developed can provide appropriate security for personal details and in particular personal financial details. Under the 7th principle of the UK Data Protection Act 1998, UK organisations need to provide appropriate security mechanisms for all personal data held. For example, the retail organisation had initially used the encryption facility available in Actinic (an electronic catalogue development tool). However, since the encryption facility had been developed using Java applets, it would not be readily available for use by customers using Microsoft Internet Explorer version 6 (unless their computer already had the Java virtual machine already installed, or they were prepared to install it via a lengthy download) since Microsoft Internet Explorer version 6 does not support Java. The retail company therefore had to use a different encryption facility, and chose to use secure sockets layer (SSL). All the three SME organisations studied used firewall software to protect their electronic commerce systems.

4.1.4. Website promotion

Electronic commerce site promotion was perceived to involve registering the organisation’s website with a variety of the commonly used Internet search engine vendors and including appropriate metatags in web pages. It was also deemed to involve reviewing these on a regular basis in order to ensure that the organisation’s website would be found in the first few pages of Internet search results using various keywords when using the commonly used Internet search engines. In the retail company studied, Internet search engine updates were done by the small software house that had been hired by the company to undertake electronic commerce development work. In the tourism and investment marketing organisation, Internet search engine updates were performed by a software house that
specialised purely in such work. In the wholesale organisation studied, Internet search engine updates were undertaken by the internal IT staff.

The business skills required for electronic commerce development projects stated by those interviewed included:

4.1.5. Business terminology and processes

A knowledge of the business terminology associated with business operations, for example an understanding of direct marketing and customer relationship management terminology were deemed important aspects of electronic commerce development work by staff in both the retail company and the marketing company. A knowledge of supply chain management terminology was considered indispensable by staff in the wholesale organisation studied. Being able to model business processes and appreciate the differences between the operation of electronic commerce and traditional commerce activities was viewed as particularly important in the marketing and retail organisations studied. The retail company had been set up purely as an e-business. However, the managing director had had a number of years experience as a partner in a sister “bricks and mortar” company, and therefore appreciated the differences between electronic commerce and traditional commerce activities. The retail company actually used the physical infrastructure of the sister “bricks and mortar” company in terms of warehousing and distribution, which made setting up and running the e-business far easier.

4.1.6. Legislation

A knowledge of relevant legislation (e.g. the UK Data Protection Act, 1998 [34] and the UK Consumer Protection Distance Selling Regulations, 2000 [35]) was considered useful by those interviewed in the three organisation studied. Turban et al. [36] had stated that there is a potentially wide range of legal issues related to electronic commerce. For example, encouraging use of the organisation’s websites by providing links from other related websites was a method of advertising used by the marketing organisation studied. However, one potential legal drawback to links with other websites is that if the site being linked to or from is an undesirable site (e.g. pornographic) then any police investigations would also include the organisation in question (under the UK Regulation of Investigatory Powers Act 2000 [37]).

4.2. Differences in skills and knowledge between SME electronic commerce sectors

The research project reported in this paper identified a number of differences in the skills and knowledge required for electronic commerce in an SME environment between the different electronic commerce sectors of wholesale, retail and tourism.

4.2.1. Legislation

An understanding of relevant legislation was perceived as important for electronic commerce systems in the retail and tourism organisations studied. For example, the case study within the retail organisation revealed that if an organisation’s e-commerce site displays out of date product prices, or products that are no longer available, then there may be the possibility of legal action by customers against the company if misrepresentation of goods or services has occurred via the company’s website. For example, if a purchase is made via the company’s e-commerce system at one point in time (based on the website information provided), but the goods delivered to the customer are different to those ordered, due to the website information being out of date, or incorrect, or the website information having changed in that time period, then the customer may consider that misrepresentation has occurred. One solution to this problem is to keep an audit trail of the information displayed on the company’s website.

Complying with UK data protection legislation [34] was perceived as important in the tourism and retail organisations studied that conducted B2C electronic commerce transactions. In particular, it was considered important to ensure that the organisations e-commerce system complied with the 7th principle of the UK Data Protection Act 1998 “Appropriate technical and organisational measures shall be taken against unauthorised or unlawful processing of personal data and against
accidental loss or destruction of, or damage to, personal data”, and principles 1 and 4, “Personal data shall be processed fairly and lawfully”, and “Personal data shall be accurate and where necessary kept up-to-date”.

In general, those interviewed perceived legislation as being less important in the wholesale organisation studied, since it conducted purely B2B electronic commerce transactions.

4.2.2. User interface design

In general the tourism and retail organisations studied appeared to put more effort into electronic commerce user interface design than the wholesale organisation studied. For example, both the tourism and retail organisations used a number of animations in their websites, whereas the wholesale organisation’s website did not include animation. In addition, the tourism and retail organisations put far more effort into the style and language used in the website text of their electronic commerce systems. Both adopted a fairly “chatty” informal style, and included humour in the website text. However, the wholesale organisation adopted a more formal, curt style of writing for its website text.

Only one of the three organisations studied explicitly considered disability issues when designing their electronic commerce systems. The Disability Discrimination Act 1995 [39] section 21.1 Duty of providers of services states that “where a provider of services has a practice, policy or procedure which makes it impossible or unreasonably difficult for disabled persons to make use of a service which he provides, or is prepared to provide, to other members of the public, it is his duty to take such steps as is reasonable, in all the circumstances of the case, for him to have to take in order to change that practice, policy or procedure so that it no longer has that effect”. The tourism organisation attempted to design their electronic commerce system so as to cater for those with colour blindness and partial sightedness, for example, by avoiding certain colour combinations.

4.2.3. Electronic data interchange

Electronic data interchange skills were perceived as necessary in the wholesale and tourism organisations studied, in particular familiarity with XML. In the wholesale organisation electronic data interchange via the electronic commerce systems occurred between the company and its customers and suppliers. In the tourism organisation electronic data interchange via the electronic commerce systems occurred between the organisation and various hotels and hotel chains. Electronic data interchange was not perceived as particularly relevant in the retail company studied that conducted purely B2C transactions.

4.2.4. Content management

Content management of the organisation’s electronic commerce systems was generally perceived as very important in the retail and tourism organisations studied, but of low importance in the wholesale organisation studied. The tourism organisation studied decided to appoint a new full time member of staff purely for updating their electronic commerce system due to the volume of content present. The e-commerce executive in the retail company studied spent roughly one third of the time on content management of the company’s electronic commerce systems.

4.2.5. Website promotion

Electronic commerce site promotion was perceived as an important skill in the retail and tourism organisations studied that conducted B2C transactions, but less important in the wholesale organisation that dealt mainly with B2B transactions with existing business customers. Website promotion was deemed to involve registering the organisation’s website with a variety of the commonly used Internet search engine vendors and including appropriate metatags in web pages. It was also deemed to involve reviewing these on a regular basis in order to ensure that the organisation’s website would be found in the first few pages of Internet search results using various keywords when using the commonly used Internet search engines.

4.3. Differences in skills and knowledge between B2B and B2C electronic commerce in SMEs

The two B2C organisations (tourism and retail) required IT skills relating to website animation (Flash in the tourism organisation, animated GIFs
in the retail organisation) which were not required in the B2B (wholesale) organisation. The two B2C organisations in addition required IT staff to generally be more aware of legislation pertinent to electronic commerce compared to the wholesale organisation. Content management and website promotion skills also appeared to be required to a far greater extent in the two B2C organisations compared to the B2B organisation.

Electronic data interchange skills (mainly XML) appeared more relevant to the B2B (wholesale) organisation than the two B2C organisations. However, the tourism organisation did require a limited amount of electronic data interchange skills in connection with their dealings with intermediary organisations (mainly hotels) in order to have appropriate information relating to hotel room availability for users of their website.

4.4. Use of electronic commerce skills and knowledge in actual practice in an SME environment

The staff interviewed involved in electronic commerce development work in the three SME organisations studied indicated that design of electronic commerce systems involved a number of facets. In particular the need for a clear navigational structure through the electronic commerce website and the linking of the website to existing application systems and back end databases were stated by all of those interviewed. For example, in the retail company studied, the linking of the Actinic electronic commerce package to the existing stock control and account systems involved determining the underlying database structure of the two existing systems, and developing appropriate linking mechanisms in order to allow data transfer between the systems. There was a wide range of electronic commerce development tools used by the three SME organisations studied as shown in Table 2.

The IT practitioners interviewed also stressed the design issues relating to security in electronic commerce systems. For example in the retail organisation studied it was found that the existing electronic commerce system in certain instances has utilised e-mails that contained credit card and credit card holder details, which was a security concern. All three of the organisations studied had adopted Secure Socket Layer (SSL) as the encryption facility to be used for financial transactions, and had installed a firewall.

Only the marketing organisation studied had produced any electronic commerce development policies. The IT staff in the wholesale organisation stated that they had documentation and procedures for other IT projects, however they did not adopt a formal approach to their electronic commerce projects due to the smaller nature of such projects. In the retail company studied, only minimal IT documentation was produced, and all IT work was carried out in an informal manner. Reference to documentation from previous electronic commerce development projects was mentioned only in the marketing organisation studied. Lin and Henderson-sellers [38] commented upon the lack of documentation associated with web based development projects in general.

In each of the three SME organisations studied, the project management of the electronic commerce systems development projects was achieved via a committee that included one or more of the directors of the organisation, one or more of the IT staff within the organisation, one representative from the external software houses utilised, in addition to one of the authors.

In general, the three SME organisations studied appeared to successfully deploy electronic commerce systems. There were few, if any reported failures of the electronic commerce systems that were developed, and virtually all customer feedback received concerning the systems was positive. The success of the projects was possibly due to the fact that all three of the organisations were supported by the authors of this paper over the two years, and that the two smaller organisations utilised the services of external software houses that were selected on the basis that they had successfully developed similar systems for other clients.

4.5. Developing electronic commerce skills and knowledge in the SME sector

The main mechanisms for developing electronic commerce skills and knowledge encountered in the three SME organisations studied included:
4.5.1. Hands on experience
All those interviewed involved in electronic commerce development and maintenance work in the three SME organisations studied stated that actual hands-on experience of electronic commerce development projects was the most appropriate method for developing electronic commerce skills and knowledge.

4.5.2. Short courses
All of the IT practitioners interviewed viewed short courses as a useful mechanism for gaining some of the technical skills and knowledge associated with electronic commerce development projects, in particular programming skills in the relevant development tool. Apart from two of the IT staff in the wholesale organisation studied (who were both contract staff) all the other IT staff had been sent on such a course by the organisation they worked for. Russo and Graham [14] however, had commented that typically few web developers receive formal training in web development tools/languages. The IT staff in the marketing organisation studied were sent on business courses perceived as relevant to electronic commerce work, for example a direct marketing course. Table 1 shows the types of courses attended by electronic commerce project staff from the three SME organisations studied.

4.5.3. Higher education courses
All the IT practitioners interviewed quoted relevant higher education courses such as computer studies degrees as a useful means of gaining a limited amount of basic electronic commerce development skills. However, there was general agreement that higher education courses were weak at providing in depth practical technical knowledge, for example relating to firewalls or graphical web development tools. All the IT practitioners interviewed had a computing based degree level qualification.

4.5.4. Technical manuals
Regular use of technical manuals and IT vendor websites as a source of knowledge for electronic commerce development activities was quoted by only one of those interviewed. This was the IT developer in the retail organisation studied. The other IT staff interviewed stated that they made occasional reference to relevant technical manuals and IT vendor websites, for example, in order to assist in resolving queries relating to program syntax or solving technical problems.

4.5.5. Viewing other organisations’ electronic commerce sites
Viewing other organisation’s electronic commerce sites for design (and in some cases code) ideas was quoted by all the IT practitioners interviewed, as a mechanism for developing electronic commerce skills and knowledge. The IT practitioners in the wholesale organisation studied performed a benchmarking exercise against rival electronic commerce system websites using a set of usability criteria. The IT practitioner in the retail organisation studied implemented the facility to provide enlarged images of products advertised on the organisation’s website after seeing that particular facility on a number of competitor websites. The IT practitioner in the tourism organisation studied developed a cartoon style “help” character after viewing similar characters on the websites of similar organisations.

4.5.6. Consulting experienced staff
Seeking knowledge from experienced electronic commerce development staff such as external IT consultants or external software house staff was quoted as a useful mechanism for developing electronic commerce skills/knowledge by the IT staff within all three SME organisations studied.

5. Conclusions
In this paper the skills and knowledge required for electronic commerce projects in the UK SME sector has been examined based on detailed case studies in three SME organisations from the Northwest region of England over a two-year period. The main conclusions from this research exercise are:

There is a wide variety of skills and knowledge required for electronic commerce projects in the SME sector. B2C electronic commerce projects appear to potentially require slightly different IT

There are numerous mechanisms for improving the skills and knowledge required for electronic commerce projects within an SME environment. However, experience and relevant technical short training courses appear the most appropriate. A particular aspect of this research project relevant to educational institutions and training agencies was that the majority of the short courses mentioned by those interviewed were technical courses. Short courses in the business and analytical aspects of electronic commerce development work should be developed and promoted by such institutions and agencies in order to provide opportunities for current and future electronic commerce development staff to develop their capabilities in these areas.

SME organisations should attempt to make more effort to design their electronic commerce systems so as to cater for those with colour blindness and partial sightedness, for example, by avoiding certain colour combinations.

None of those interviewed mentioned academic literature, or standards bodies as a useful source of knowledge for electronic commerce skills. Universities and standards bodies should attempt to promote their work more strongly to SME organisations.

The case studies appeared to indicate that SME organisations should consider developing formalised approaches for electronic systems development projects. The apparent lack of formalised approaches for electronic commerce systems development encountered in the three SME organisations studied appeared to confirm the views of the IT practitioners interviewed that hands-on experience was the main approach to undertaking electronic commerce systems development work in the SME sector. However, given the relatively small scale of the electronic commerce systems currently in use in the three organisations studied an informal approach was not inappropriate. Without the guidance of formalised approaches, electronic commerce systems development staff may potentially develop poorly designed and coded electronic commerce systems which may not fully meet with organisational requirements, and may prove difficult to maintain in the future. However, this had not been the case in the two SME organisations studied that did not have formalised electronic commerce development approaches, from the perspective of the IT staff interviewed and from customer feedback regarding such systems. Both the wholesale and retail company IT staff were intending to adopt a more formalised electronic commerce development approach in future in order to cope with the increasing size and complexity of their electronic commerce systems. Educational institutions and training agencies should develop courses that promote the use of frameworks and standards for electronic commerce development work.

It is hoped that the result of this research exercise may be of benefit to SME organisations intending to develop the skills and knowledge of their staff who may be involved in electronic commerce projects, and to training agencies and higher education establishments who cover electronic commerce in their courses.

References


