Edith Cowan University

Copyright Warning

You may print or download ONE copy of this document for the purpose of your own research or study.

The University does not authorize you to copy, communicate or otherwise make available electronically to any other person any copyright material contained on this site.

You are reminded of the following:

- Copyright owners are entitled to take legal action against persons who infringe their copyright.
- A reproduction of material that is protected by copyright may be a copyright infringement.
- A court may impose penalties and award damages in relation to offences and infringements relating to copyright material. Higher penalties may apply, and higher damages may be awarded, for offences and infringements involving the conversion of material into digital or electronic form.
Internal Operations Channel

According to Holland, C. P., Lockett, A. G., and Blackman I.D, (1992), the authors states, 'the internal operations were concerned about the implication of EDI with suppliers and customers on internal operations, and how these can be exploited for the benefit of the organization'.

In organisation # A's case, legacy web-based EDI has created a knowledge repository for storing explicit knowledge. It also created a virtual 'information Library' accessible 24 hours a day to organisation #A's staff across all branches within Australia. This means the improved information exchange will result an increase in intangible benefits, cost reductions and quality improvements.

Organisational Structure and Process Channel

According to Holland, C. P., Lockett, A. G., and Blackman I.D, (1992), 'EDI may link customers with suppliers thus affecting the nature of business relationships. Individual roles and tasks associated with managing customer and supplier relationships therefore change. In picture, staff and cost reductions have been achieved throughout the whole organisation. This concept is not new and could simply be viewed as an extension of the value chain'.

In organisation #A’s case, the uses of legacy web-based EDI for information sharing between their suppliers and customers, strategic communications between their subsidiary companies, and information application processes, such as order entry etc, is seen as being significant. In addition, legacy web-based EDI has also enable organisation #A to facilitate the ability to invoice electronically, and tie the transactions into accounting and purchasing systems. This in turn improved organisation #A’s quality and timeliness of information, so orders can be placed more frequently and in smaller quantities.

Customer-Related /Distribution channels

In organisation #A’s case, the length of the supply chain, from its supplier to its end customers is measured by the number of ownership stages. If there are a high number of ownership stages, it is more likely that it involved a traditional chain of market hierarchies (ie producer, wholesaler, retailer and consumer). However, a potential alternative chains for organisation #A to utilise would bypass the wholesaler, resulting in a lower purchase price for its customers. In reality, organisation #A is likely to retain as high a portion of the savings enjoyed by its customers and members as is possible.

Moreover, in organisation #A’s case, the introduction of legacy web-based EDI and its subsequent integration has lead to gains in efficiency and a reduction of manual data entry errors. This can be coupled with redirecting employees from tedious manual tasks to resolving critical business issues in order to improve margins, reduce inventory levels, improve internal processes, and otherwise reduce extraneous costs. Having explored how the implementation of legacy web-based EDI integrating with suppliers, members and customers through Porter's supply chain, the next section will discuses how Internet technologies effect competitive advantages to organisation.

THE IMPACT OF INTERNET TECHNOLOGIES EFFECTING COMPETITIVE ADVANTAGE TO ORGANIZATION #A.

In this section, I shall turn to explore the integrated value chain analyses. Integrated value chain analyses were selected, as they are suitable for investigating information flows of organisational business processes. They also focus on competitiveness and the role of technology.

The integrated value chain analysis may assist organisation # A in the extent to which its staff members are involved in different functions (general management vs. regional action networks staff vs. technical staff).

http://ro.ecu.edu.au/ecuworks/6760
Figure 4, presents a diagram of the traditional value chain for organisation #A.

In figure 4, the value activities contribute to the value for organisation #A members, and the margin is the difference between the value added and the cost of producing that value.

Hence, by modelling the activities of organisation #A, it is possible to distinguish between its primary activities, (those that contribute to bringing the service closer to organisation #A’s members), from its secondary activities, (those, whose role is to support the primary activities).

Having identified the ability that the traditional value chain model can distinguishes the primary and secondary activities through modelling. Consequently, there is a need to propose a new model that can allow organisation #A to investigate the impact of implementing e-commerce applications on its business processes. This means that a model to investigate the information flows of organisation #A’s business processes conducted in the new digital economy, (which in this case is the application of web based service application)

With this in mind, by optimising and integrating the traditional Porter's value chain model as figure 4 show, beginning with analysis and design of the business transactions, progressively moving into process automation, and then information sharing and information access. I am able to develop the proposed integrated value chain model as figure 5 show.

In this proposed model, Internet applications are seen to be taking on a much broader and more strategic role in support of business requirements that go well beyond efficiencies and cost saving achieved through electronic publishing.
Figure 5: the proposed integrated value chain model for organisation #A

In organisation #A case the greater its ability to extend its Internet applications and move up this stack, the more value is returned, as simpler applications deliver cost savings and efficiencies, while the upper layer applications create value, not just cost savings. For example, publishing quarterly & annual reports, the member’s directory, events of activities (an electronic publishing application) can save time, paper, printing and postage costs.

Furthermore, allowing customers to purchase products, and make contributions Online, and integrating the customer service application with the purchase process, will save money. This may also open up a whole new market- let’s say, an international market – which was not previously available to the business.

In order to improve the interoperation support for e-commerce, leading Internet applications have evolved from the current simple page-serving environments to rich application platforms providing server-side application runtime engines – and in some cases integrated security, encryption, indexing, messaging, scheduling and database services.

This means that it is desirable for organisation #A to look beyond publishing applications to the business processes and opportunities that need to be addressed. Three such opportunities are outlined below.
Firstly, profitability from commercial activity on the Web includes productivity savings, information management savings, and incremental or new revenue streams (members fees collection).

Productivity savings arise from reduction in order and processing costs, and more efficient information management. Improvements in information management make information easier to find and share as content/document management, correlation and indexing information, dynamic publishing, and custom profiling can facilitate collaboration. The increases in collaboration achieved as a result of more efficient personnel may also lead to productivity gains.

Secondly, savings may also be realised from improved efficiencies in the marketing and human right's campaign functions. The Internet shifts more of these functions to the customers and members. As a result, savings on marketing may result through reduced brochure printing and distribution costs. In addition, savings on expenditure related to human rights campaign functions may also result from making information easily and widely available. As standard efficient information access is made available to members, I speculate that members' satisfaction may actually be increased.

Thirdly, incremental or new revenue streams are available for organisations participating in digital commerce, through, for example, online sales, advertising revenues, or information brokering. Incremental revenues may be achieved for organisation #A by using the Web to expand into new channels of collaboration and knowledge management and the new market segments of electronic commerce.

DISCUSSION AND CONCLUSIONS

The results of this study show that the implementation of legacy web-based EDI for organisation #A has successfully increased the number of electronic connections, simplify interorganisational process and at the same time discover ways to shrink, speed up, and virtualise it's supply chain. The study also address how the Internet technologies have effected competitive environment to organisation #A. It also explore the supply chain management strategies for organisation #A through the followings:

order management, planning, forecasting and replenishment (eg competitive advantage and higher revenues from reduced stock outs, lower cost through reduced inventory and lower costs through reduced returns);

sourcing (eg competitive advantage and increased revenue through faster product introductions and decreased costs and increased revenue from higher quality);

design and product management (eg competitive advantage through faster time to market and lower distribution cost); and

merchandising/category management (eg competitive advantage and increased revenue through effective pricing and promotional strategies).
LIMITATIONS AND DIRECTIONS FOR FURTHER RESEARCH

The approach used in this paper is geared to provide successful supply chain management strategies to a non-profit organisation. In addition, the result of this study can be easily generalised to other similar organisations – in particular, to Government Non-Profit Organisations, in other states and other countries.

However, the directions for further research will concentrate on the virtual value chains. This means we need to focus on what is likely to happen to organisations strategic directions? Are they going to be disintermediated or are they likely to survive by transforming their businesses into new types of intermediaries operating in a neutral market?

REFERENCES


An Inter-agent Communication Framework for B2B and B2C Trading in an Active Networked E-marketplace

R. G. de Silva¹, W. J. Dewar² and G. C. Low¹

¹School of Information Systems, Technology & Management
University of New South Wales, Australia
Email: r.de-silva@unsw.edu.au, g.low@unsw.edu.au

²School of Electrical Engineering & Telecommunications
University of New South Wales, Australia
Email: b.dewar@unsw.edu.au

ABSTRACT

Internet-based e-marketplaces are locations where mobile agents of merchants and customers can perform trading. As a result of the high competitiveness and the growing popularity in B2B and B2C trading in the e-business world today, these transactions have to be executed in a minimal time and with a minimal cost. This paper proposes a new framework of Inter-agent communication in e-commerce transactions by performing them in the network layer instead of in the application layer of the OSI model thus reducing the execution time and cost. The proposed method makes use of the user programmability feature of the active routers.

Keywords: B2B and B2C trading, e-commerce, mobile agents, communication protocols

INTRODUCTION

Agent technology is becoming increasingly important in the Internet-based electronic markets. Agents are software programs that can act on behalf of a user or an organisation in order to accomplish a task. There are two types of agents known as stationary agents and mobile agents. Stationary agents are executed only in the machine that they started execution and may use remote procedure calls (RPC) to interact with the agents that are not on the same machine. Mobile agents are programs that can autonomously migrate through the network to a different location and perform tasks on behalf of its owner (Chih-Lin et al 2000). A mobile agent has the ability to halt the execution at one place, migrate through the network and resume the execution at its new location. When mobile agents are used for e-commerce transactions, they have to communicate with each other in order to exchange information, negotiate services or delegate tasks. This is known as agent to agent communication or inter-agent communication. In the last few years, some agent frameworks, languages and protocols have been developed, especially for inter-agent communication in a mobile agent environment (Dasgupta et al 1999). While some of these approaches are language-specific, the others are more general in nature.

There is also an emerging concept known as e-marketplaces where the merchant’s agents, broker’s agents and customer’s agents can meet and negotiate the services (Feldman 2000). E-marketplaces introduce new networking challenges as they can be located anywhere in the network. For example, an e-marketplace can be located at a special place such as at a broker’s site or at a common location to a group of consumer agents. As far as the performance of mobile agents and their e-commerce transactions are concerned, languages and protocols developed for inter-agent communication at application layer level become questionable. Although these protocols enable us to use an open standard, they will inevitably increase network traffic as well as response time. Furthermore, they will be inefficient especially when mobile agent technology will be widely used for e-commerce transactions.

To address the issues, we propose to explore a method that makes use of the emerging communication technology known as active networks. An agent-to-agent communication protocol operating in the network layer can address the issue of improving efficiency and reducing latency. Such a protocol designed using the same philosophy as the IPsec, mobile IP or IPv6 protocols (Comer 2000) should provide a network level solution for
an open standard. Just as we can communicate between applications like FTP or Telnet by using IP datagrams, we will be able to realise inter-agent communication using a new protocol at network level. This globally defined protocol will also overcome the problem of how heterogeneous agents from different users (using different languages) can communicate with each other. The packets that flow through the network using this protocol will be recognised by the active routers and will be processed to identify the type of the agent. We perceive two locations for the negotiation between the merchants’ agents and the customers’ agents: In the e-marketplace scenario, the information delivered by the merchants’ agents will be stored in the active router and the mobile agents of the customers will visit these routers to find a suitable matching. In the door-to-door selling scenario, mobile agents of the customers will store the information in the active routers located in the home network of the customers and the merchants’ agents will visit these routers in order to find a prospective customer. The active router in the latter case may be an edge router of the organisation.

The rest of the paper is organised as follows. In the background section, we provide a brief description of the existing forms of inter-agent communication and in the following section, we present our proposed method. The security issues are dealt with in section 4 and the paper is concluded in the section 5.

BACKGROUND

In this section, we will examine some existing forms of inter-agent communication and discuss the advantages and disadvantages of them. Traditionally, multi-agent systems have used Agent Name Servers (ANS) to enable interaction between agents (ISAG 2001). In the case of Internet-based systems, agents use ANS simply to look up the IP address of another agent and then to use that address to make a socket connection directly to that agent for the purpose of exchanging messages. The problem with this approach is that if the IP address of the latter changes, the former will only find it out when the next attempt to send a message fails. Also, if an agent crashes due to some reason, it is the responsibility of the other agents with whom it was communicating to properly save any interrupted messages and re-transmit them later. Improved approaches include the JATLite Agent Message Router (AMR) (CDR 1998) and the middle agent entity. AMR is a specialised application that receives messages from registered agents, and queues these messages in the file system before routing them to the correct receivers. Middle agents are entities to which other agents advertise their capabilities, and are neither requesters nor providers from the standpoint of the transaction under consideration. Their operations are similar to that of AMR, but include other important functions like acting as facilitators and mediators.

All the forms of inter-agent communications we discussed above involve an Agent Communication Language (ACL) such as KQML, FIPA or ACL (Breugst et al 1998) that provides a tool and framework to handle the interoperability problems of inter-agent communication in the application layer. However, so far, there is no common standard developed on which the agent communications can or should be based. Figure 1 shows an example of the inter-agent communication scenario which occurs in the application layer.
Any inter-agent communication model which involves communication between the two application layers in the OSI model would be less efficient and costly compared to the communication in a lower layer such as in the transport layer or network layer. Besides, as described in the following paragraph, it is the trend in modern network design to facilitate more flexible communication in the network layer using the concept of active networks.

Communication takes place in the Application Layer.

![Diagram of inter-agent communication](image)

Figure 1: Inter-agent communication in the application layer

Because of the difficulty of integrating new technologies and standards into the shared network infrastructure, poor performance due to redundant operations at several protocol layers, and difficulty of accommodating new services in the existing architectural model, the concept of active networks was conceived in 1994 following the discussions within the Defence Advanced Research Projects Agency (DARPA) research community (Tennenhouse et al 1997). Today’s networks transport data from one end of the network to another without modifying them. Processing of packets flowing through the network has been largely limited to routing, providing quality of service (QOS) and congestion control (Legedza et al 1998). In contrast, in an active network, the routers or switches of the network perform customised computations on the messages flowing through them (Tennenhouse et al 1996). For example, a user of an active network could send a program code to each router and arrange for the program to be executed when their packets are processed. An active router can perform all the existing tasks of current routers in the network. Instead of insisting that all the routers perform equivalent computations on every packet, active networks specify that all nodes support equivalent computational models. Active networks raise the level of abstraction at which interoperability is realised, allowing applications to customize message processing to suit their purposes.

With the deployment of active routers in the near future, it can be anticipated that different proprietary transport or network level protocols of organisations will be recognized by active routers belonging to different telecommunication companies. These routers will store information and perform specialised tasks on the user packets passing through them.

**PROPOSED METHOD**

In our approach, we propose to exploit this concept of active networking to enhance the inter-agent communication. To this end, we need to design a framework for an inter-agent communication protocol. Active routers will recognise this communication protocol, and read the information of the agent that is contained in certain fields in the packets.
In the following simple example (see Figure 2), we show how agents interact with our communication protocol in an active networking environment. Let us assume that Merchant A is an authorised user of an active router that is connected to the Internet. That is, Merchant A has the permission from the owner of the router to store information and run loaded applications. Merchant A has an agent that has the responsibility to advertise and sell certain products of the company. This agent then sends packets using our protocol to the active router. The active router being pre-loaded with the command application, recognises agent A’s packets and stores the agent's information such as its type, products and prices etc. that it has on offer. The active router will then look for packets from all the agents, who could be potential customers. Customers that have user agents of our protocol will be recognised by the active router which, in turn, will help them find or locate the merchants and merchandise if requirements in all the fields such as products and prices are matched. Customer’s mobile agent will then send a request of confirmation to its home counterpart and the normal transaction will follow.

In our method, each agent has a set of fields. These fields are arranged in an inverted-tree hierarchy. The top field or the root field corresponds to the agent itself. The second field defines whether the agent represents a service or a product. At the third level, the product or the service is divided into many categories. For example, if it is a product, it can be associated with a broad product category (such as furniture). This will be very similar to the listings in the yellow pages. At the third level, the product is further refined in its category. At the bottom or leaf level we find the fine details of the product such as price (or price range expected), lead time of delivery (or lead time that can be allowed), quantity available (or required) etc. This means that a path from the root to a leaf in the merchant’s product tree specifies a particular product that the merchant has to sell and a path from the root to the leaf in the customer’s product tree specifies a particular product required by the customer. When the agents generate the packets, they simply create a main IP header and a set of extension headers. The first extension header corresponds to the second level of the product tree, the second extension header to the third level and so on. For the current version of the Internet Protocol that uses IPv4, we recommend to encapsulate each of these IP datagrams in IP (IP-in-IP encapsulation). With the deployment of IPv6, the transmission of these packets will be straightforward as the IPv6 has the provision for extension headers.

Each agent that is registered with an active router knows the IP address of the router and will send its mobile agent to the router. Once these packets arrive at the active router that is pre-loaded with the required code, it will intercept the data stream and store the information contained in the extension headers. Our active router now contains the information of the product and is ready to work as an e-marketplace. If a customer's agent passes through this router, the router intercepts the data stream and looks for the first extension header. If that matches with that of the stored first extension header it will copy the second extension header and will try to match it with the second extension header stored. This process continues until the extension headers at the leaf level are compared. If there is a perfect match, the customer's agent returns to the customer informing the details about the match. The normal transaction can now take place between the merchant and the customer.

The advantage of this method is that, by simply examining the first few extension headers, the router and the customer’s agent can decide whether it is useful to continue the comparison or not. Apart from that, the router does not have to intercept and read the entire data stream of the agent. This reduces the processing time of the router and, in turn, the cost of using the active router. Moreover, the packets of the agent will not travel end-to-
end across the whole network to communicate with the other agent. All these reasons contribute to the reduction of network traffic dramatically as well as to decrease the response time. This simple and efficient solution of inter-agent communication is therefore a valuable asset considering the growing popularity of agent technology, e-commerce and active networks.

Note that the agents that do not use our communication protocol can operate alongside with the agents that use our protocol. For example, in the event that the active router does not recognise a customer’s agent, the agent can migrate to the merchant’s site and perform the transaction there at the application level. Our model pursues the idea of developing customer agents that have only the knowledge of the location of their active router, and it is the duty of the merchant’s agent, and in turn, that of the active router to identify the potential customer by intercepting packet flows and investigating certain fields in the header of the packets. While agents can utilise our idea of network layer communication, agent developers will only need to add on some fields according to our design format without changing its entire implementation. The active routers communicate with each other and share the information of the merchants’ agents. Also, they will forward the customer’s agents to the next active router.

One problem that we anticipate is the memory requirement of the active routers. As the popularity of the marketplaces grows, the number of agents that wish to register with an active router to store the information of their products or services may rise exponentially. We propose to handle this situation by introducing timestamps. Each product or service must be associated with a timestamp and if the time limit is exceeded the product is considered to be obsolete and will be removed from the memory.

SECURITY ISSUES

The most frequently mentioned problem with active networking and mobile agent technology is the security of the information that flows in the network. Active networks expose the now closed environments in the routers to the users by allowing user programmability. As such, the network level security will become more vulnerable. However, in our method, well-known security measures designed for network level security should be adequate as only the matching of a particular product and not a real business transaction is involved. We can achieve this by encapsulating the IP datagrams in IPsec, a security protocol designed for the information protection in the network layer (Comer 2000). We believe that this should provide adequate security to prevent interception and masquerading by unauthorised persons.

It is also possible to create an IP tunnel (Comer 2000) between the customer’s network and the active routers and the active router and the merchant’s network (see Fig 3). Providing security for mobile agents is currently an active area of research (Xudong et al. 2000). This is a much harder problem than providing security at the network and lower layers as is in our case because it involves providing security at all levels. The research community engaged in active networks has provided some solutions to improve security in active routers (Wetherall et al. 1998) but further investigation and experimenting are necessary before commercial active networks are deployed.
CONCLUSION

With the increased demand for e-commerce in the current Internet-centred marketplace, capacity for data transmission will be adversely affected due to the nature and the increased frequency of transactions. Present e-commerce transaction protocols operate in the application layer of the OSI reference model. In B2B and B2C transactions the mobile agents have to travel all the way through the internet from the source to the destination. This involves processing in the application layer at the destination. Besides, even after travelling to the destination and after processing, the mobile agent may still not find a suitable match to execute a successful transaction. In that event the mobile agent has to re-traverse the internet until it meets a matching merchant’s agent. This contributes to increased internet traffic, congestion, response and decision times and eventually the cost involved.

We have introduced a new framework for inter-agent communication that takes place in the network layer. This method makes use of the functionality of active routers and creates a virtual e-market place in them. In contrast to the inter-agent communication methods that are executed in the application layer, our method reduces network traffic, decision and response times, network congestion and the cost. By assigning the properties of the product or service to a tree hierarchy and associating each level of this hierarchy to an extension header in IP datagrams, we have developed an elegant and simple method to execute B2B and B2C transactions. We believe that this method would be very attractive for inter-agent communication.

Currently, we are developing this protocol and implementing it on Linux. We plan to report the results and outcomes in a future paper.
REFERENCES


E-Commerce: A Victorian Case Study

M.Warren¹, S.Leitch¹ and P.E.D. Love²

¹School of Computing & Mathematics
Deakin University, Australia
Email contact: mwarren@deakin.edu.au

²School of Architecture and Building
Deakin University, Australia
E-mail: pedlove@deakin.edu.au

ABSTRACT

The paper relates to an investigation of the uptake of electronic commerce by businesses in Geelong, Victoria, Australia between 1999 and 2000. The projects focused upon how small and medium sized organisations view and use E-commerce and also how Geelong and Australian organisations responded to the use of e-mail. The results of these investigations are reported within this paper.

Keywords: E-commerce, SMES, e-mail, adoption of information technology.

INTRODUCTION

In the developed world the influence of information systems can be seen in most operational areas of business. A significant result of these advances is that organisations have become increasingly dependent upon the availability of systems and reliant upon the data that they hold. In recent years the Internet has grown from a solely military/academic network to one that can be used by businesses and individuals. In the years since the first World Wide Web applications were developed, there has been an explosion in the global use of the Internet. Clarke (Clarke, 1993) has proposed the concept of electronic commerce as a means of drawing together a wide range of business support services.

Australia has been quick to realise the opportunities associated with online developments, or the new ‘information economy’. Close to half of the Australia’s population are accessing the Internet, Australia has the fourth highest usage in the world. All medium-sized businesses and over 80 per cent of small businesses in Australia use personal computers. Over 35 per cent of all businesses have an online presence, a comparative business advantage that translates into Australia being consistently rated in the top ten nations globally for its E-Commerce environment (NOIE, 2000).

PROFILE OF GEELOUGH

Geelong is located in the state of Victoria, Australia’s smallest mainland state. Geelong is Victoria's second largest city after Melbourne. It covers 250,000 square kilometres and, as at 1996, has a population of 203,000. Major industries include manufacturing and processing, a wide range of primary industries, wholesale and retail trade, service industries and tourism (Geelong Council, 2001). The Geelong region is expected to experience large productivity gains from the increased use of E-Commerce. These productivity gains will result in a steep increase in Gross Regional Product up until 2006, when it peaks at 3.8 per cent. This will be greater than the Australian national average. The retail trade industry is expected to decline the most (3.9 per cent). The fall in this sector is dominated by the disintermediation effect, that is, a reduction in margins associated with greater use of E-Commerce (NOIE, 2000). The aim of research was to determine what the actual situation was within Geelong. The research covers a two-year period and focussed upon attitudes towards E-commerce and the use of E-Commerce services.
The aim of the first project was to determine the attitudes that businesses in Geelong had towards E-Commerce and what they perceived to be the barriers or advantages of E-commerce. The candidate organisations selected for this survey were randomly chosen from the Geelong Chamber of Commerce web site (http://www.geelongchamber.com.au). One hundred businesses were selected and received a questionnaire which was designed to investigate their actual use of and attitudes towards information technology and their perceptions about the use of technology in their industry. All organisations were categorised as SME’s that is an organisation with less than 150 employees. A total of 47 responses were received of which 36 were categorised as using information technology, in particular on-line services, and the remaining 11 were not using information technology, this being 77% and 23% of returns respectively (Warren and Hutchinson 1999). These organisations will be referred to here as IT-related and non-IT related organisations respectively. The survey was anonymous; hence there was no follow-up on the 53 non-respondents to the questionnaire, as we had no way of identifying who they were. Table 1 shows the diversity of businesses that took part in this pilot study. The most common business was manufacturing with retail trade a close second. The ‘Other’ category included a miscellany of businesses ranging from Advertising and Tourism, a Disability Contractor, an Electric Motor Repairer to Winegrowers.

<table>
<thead>
<tr>
<th>Business type</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>11</td>
<td>23.4</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>7</td>
<td>14.9</td>
</tr>
<tr>
<td>Health and Community Services</td>
<td>3</td>
<td>6.38</td>
</tr>
<tr>
<td>Property and Business Services</td>
<td>3</td>
<td>6.38</td>
</tr>
<tr>
<td>Construction</td>
<td>2</td>
<td>4.26</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>2</td>
<td>4.26</td>
</tr>
<tr>
<td>Agriculture</td>
<td>1</td>
<td>2.13</td>
</tr>
<tr>
<td>Communication Services</td>
<td>1</td>
<td>2.13</td>
</tr>
<tr>
<td>Cultural and Recreational Services</td>
<td>1</td>
<td>2.13</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>1</td>
<td>2.13</td>
</tr>
<tr>
<td>Government Administration and Defence</td>
<td>1</td>
<td>2.13</td>
</tr>
<tr>
<td>Mining</td>
<td>1</td>
<td>2.13</td>
</tr>
<tr>
<td>Personal and Other Services</td>
<td>1</td>
<td>2.13</td>
</tr>
<tr>
<td>Other</td>
<td>12</td>
<td>25.52</td>
</tr>
<tr>
<td>TOTAL</td>
<td>47</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 1: Types of businesses surveyed
Table 2 shows the distribution of the number of staff in the organisations surveyed. The data is presented for IT and non-IT categories as well as for all businesses. The relative frequency is shown in brackets. Over 25% of businesses surveyed have staff numbers of between 2 and 20. Further, there were no non-IT businesses that were “one-man bands” or were in the largest category (100+). Both non-IT and IT related businesses are more likely to have 20 or less staff.

<table>
<thead>
<tr>
<th>Staff Nos.</th>
<th>Non-IT</th>
<th>IT</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0 (0%)</td>
<td>2 (5.6%)</td>
<td>2 (4.3%)</td>
</tr>
<tr>
<td>2-5</td>
<td>4 (36.4%)</td>
<td>9 (25%)</td>
<td>13 (27.7%)</td>
</tr>
<tr>
<td>6-20</td>
<td>2 (18.2%)</td>
<td>10 (27.8%)</td>
<td>12 (25.5%)</td>
</tr>
<tr>
<td>21-50</td>
<td>3 (27.2%)</td>
<td>6 (16.7%)</td>
<td>9 (19.1%)</td>
</tr>
<tr>
<td>51-99</td>
<td>2 (18.2%)</td>
<td>3 (8.3%)</td>
<td>5 (10.6%)</td>
</tr>
<tr>
<td>100+</td>
<td>0 (0%)</td>
<td>6 (16.6%)</td>
<td>6 (12.8%)</td>
</tr>
<tr>
<td>Total Businesses</td>
<td>11 (100%)</td>
<td>36 (100%)</td>
<td>47 (100%)</td>
</tr>
</tbody>
</table>

Table 2: Distribution of businesses by number of employees

Table 3 shows the number of years the surveyed organisations have been in business, again by non-IT, IT and Total. Over half the non-IT businesses have been operating for more than 10 years. Surprisingly, even more (60%) of the IT-related industries had been in business for a similar time. All of the non-IT organisations appeared to be well established, having been in business for at least 4 years.

<table>
<thead>
<tr>
<th>No. of years</th>
<th>Non-IT</th>
<th>IT</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1</td>
<td>0 (0%)</td>
<td>3 (8.3%)</td>
<td>3 (6.4%)</td>
</tr>
<tr>
<td>1-3</td>
<td>0 (0%)</td>
<td>5 (13.9%)</td>
<td>5 (10.6%)</td>
</tr>
<tr>
<td>4 - 5</td>
<td>3 (27.2%)</td>
<td>4 (11.1%)</td>
<td>7 (14.9%)</td>
</tr>
<tr>
<td>6 - 10</td>
<td>2 (18.2%)</td>
<td>2 (5.6%)</td>
<td>4 (8.5%)</td>
</tr>
<tr>
<td>11-15</td>
<td>3 (27.2%)</td>
<td>8 (22.2%)</td>
<td>11 (23.4%)</td>
</tr>
<tr>
<td>16+</td>
<td>3 (27.2%)</td>
<td>14 (38.9%)</td>
<td>17 (36.2%)</td>
</tr>
<tr>
<td>Total</td>
<td>11 (100%)</td>
<td>36 (100%)</td>
<td>47 (100%)</td>
</tr>
</tbody>
</table>

Table 3: No. of years of operation
Of the 47 organisations responding, 36 used the Internet for business purposes. But only 55.5% (20) of these have a policy in place concerning the use of the Internet for business purposes. The remaining 44.5% (16) have no such policy. Businesses were asked to identify the main Internet services they used. 'Electronic mail' was the dominant service with 'Promotional Web sites' and 'News and Reference' both being the second most common activity. The results are summarised in table 4.

<table>
<thead>
<tr>
<th>Internet Use</th>
<th>No. of Orgs.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-mail</td>
<td>32</td>
<td>23</td>
</tr>
<tr>
<td>News &amp; Reference</td>
<td>22</td>
<td>16</td>
</tr>
<tr>
<td>Promotion/Own Web site</td>
<td>22</td>
<td>16</td>
</tr>
<tr>
<td>Vendor/product Information</td>
<td>17</td>
<td>12</td>
</tr>
<tr>
<td>Research</td>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>Software Downloads</td>
<td>13</td>
<td>9</td>
</tr>
<tr>
<td>Shopping /Financial Transactions</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Education</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Chat</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Discussion Groups</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Entertainment</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Experimentation</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Hobbies</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 4: Business use of the Internet

Organisations where queried about their use of the Internet for organisational web sites. Of the 36 IT-related businesses, two-thirds (24) responded that they had their own web site. Of these, over half (14) had employed staff specifically to build the site, whereas the remaining 10 had used existing staff. One respondent further indicated dissatisfaction with the need to employ staff. The most common service offered via their web sites was the most basic of 'providing information', but this is equalled by 'promotional services'. The full range of services, together with their relative frequencies, is shown in table 5.

<table>
<thead>
<tr>
<th>Type of service</th>
<th>Relative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Providing information</td>
<td>32</td>
</tr>
<tr>
<td>Promotional service</td>
<td>32</td>
</tr>
<tr>
<td>Providing links to contact staff via email</td>
<td>19</td>
</tr>
<tr>
<td>On-line ordering or other business transactions</td>
<td>8</td>
</tr>
<tr>
<td>Direct input or access to databases</td>
<td>4</td>
</tr>
<tr>
<td>Other services</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 5: Service provision on current Web sites
ATTITUDES TO E-COMMERCE

The 46 organisations where asked if they have any concerns with using the Internet. The responses indicated that there was not a substantial difference between the non-IT related and IT-related businesses. Approximately half of the organisations indicated they did have concerns. Table 7 shows the frequency of responses to the question relating to their major concerns with using the Internet. The most frequently mentioned concern is 'Security of Financial Transactions' with 'Privacy' coming a close second. However, it is interesting to note that among non-IT related organisations, 'Privacy' is of greater concern. Only IT-related organisations seemed to be aware of, or were concerned with, issues relating to the proliferation of junk mail.

<table>
<thead>
<tr>
<th>Concern</th>
<th>Frequency of Mention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-It</td>
</tr>
<tr>
<td>Security of Financial Transactions</td>
<td>2 (18%)</td>
</tr>
<tr>
<td>Privacy</td>
<td>4 (36%)</td>
</tr>
<tr>
<td>Junk Mail</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Cost of Internet Access</td>
<td>1 (9%)</td>
</tr>
<tr>
<td>Response Times</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Don't know enough to specify</td>
<td>2 (18%)</td>
</tr>
<tr>
<td>Initial Setup Cost</td>
<td>1 (9%)</td>
</tr>
<tr>
<td>Sceptical</td>
<td>1 (9%)</td>
</tr>
<tr>
<td>Cost of Upgrading</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Total</td>
<td>11 (100%)</td>
</tr>
</tbody>
</table>

Table 6: Major concerns with using the Internet

Despite the high priority given to security, the same data presented as a relative frequency paints a slightly different picture. The relative frequencies are included in brackets in table 6. A surprisingly high percentage of IT-related business (22%) where concerned with the proliferation of junk mail. This was presented as being equally as important as 'Privacy' (Warren et al, 1999).

DISCUSSION OF QUESTIONNAIRE RESULTS

Despite the survey sample being relatively small (47 organisations), the mix of organisations is representative of industry present in the Geelong region, including professional services, manufacturing, retail and wholesale industries. All organisations were categorised as small to medium sized enterprises (SME’s) as no organisation had over 150 employees. The survey highlighted some interesting trends, which are discussed below. A relatively high proportion of the organisations surveyed in Geelong are using online services. Of those who are not, about half are intending to do so in the near future. This is an encouraging trend. But of particular concern is the large number of Internet users who do not have an Internet usage policy in place. Of those who are not, about half are intending to do so in the near future. This is an encouraging trend. But of particular concern is the large number of Internet users who do not have an Internet usage policy in place. It is possible that because of the type of transactions many of these organisations are carrying out, they are not aware of the impact that such lack of principles and procedures could have on their organisation. It would seem appropriate to provide SME’s with an education service to supply information relating to ‘safe’ online practices to ensure the integrity and security of their data and transactions. As was highlighted in KPMG (1999), the approach to the adoption to E-Commerce influenced the success of the venture. It would seem that appropriate education would be beneficial to organisations to ensure that they adopted the ‘right’ approach.
A STUDY OF E-MAIL USE WITHIN GEELONG ORGANISATIONS

The second study related to the way in which Geelong organisations and national Australian organizations use and respond to E-mails.

With millions of e-mails being sent around the world every hour, there is no surprise that businesses are also taking part. In the US alone it is estimated that “300 million e-mails are sent per day” (Brightware, 2000). Although part of that figure will be personal e-mail communication, business e-mail communication will constitute a large percentage. On most large organisational web sites, visitors will find either a contact e-mail address or an online form for submissions. Often you are invited to submit any concerns or questions that you may have. It is this offering of an e-mail address that forms the basis for this second investigation. Is offering consumers this contact information functional, i.e. will we get a reply as quickly as we would if we telephoned the organisation directly? Or is this purely a “we must be on the web” type of philosophy, where the contact details are supplied, but the organisation has no infrastructure to support the replies to such e-mails.

As an ever increasing number of business are turning to the Internet to expand and improve their business functioning through customer support, e-mail and information resource access, it is necessary that their presence on the web provides the kind of support that the public needs and expects. For most organisations that are conducting business on the web, they have received huge amounts of e-mail. They receive lots of complaints, questions and thanks from customers. To keep up with this demand computer technology is trying to solve the problem it helped to create by using software that scans the text of an incoming e-mail and responds intelligently without any human intervention (Shaffer, 1999). This is not an attempt to downsize a workforce, but rather a requirement to keep up with consumers. Consider the situation in the US. There are already over 91 million Internet users, with 50% of all families having Internet access in the home contributing to over 60% of the world’s total volume of e-mail traffic (Electronic Design, 1999). However, in Australia, this number is significantly lower at only 1.6 million (DIST, 1998).

This new way of doing business requires trust and security to boost the confidence level of consumers to persuade them to partake in the use of E-Commerce (Goh et al, 1999). National studies of email replies in USA (Brightware, 2000) found that only 13% of top US organisations answered an on-line query within three hours. The aim of the study was to repeat the same study but using Geelong and national Australian organisations.

STUDY METHODOLOGY AND RESULTS

The survey email was sent out to a total of 135 organisations in Australia. Of those, 60 organisations were considered to be national, while 75 were Geelong based. The Geelong based organisations tended to be smaller organisations. The e-mail addresses of the organisations surveyed were obtained from business telephone directories, organisations web sites and listings found within print media. The e-mail query was sent out from a private Internet Service Provider e-mail address, during Tuesday 7th of March 2000. The emails were sent in several batches between 9am and 10am on the day in question. The differences in time for the e-mails were recorded. The query was simple; it asked the organisation for their physical address. The question was chosen for its applicability to all organisations, i.e. that all organisations have an official mailing address. It was also deemed to be a neutral question, not inflammatory or intrusive in anyway. Of the 135 e-mails sent, there were a total of 88 responses; an overall response rate of 65%. Figure 1 indicates the response rate from national organisations whilst figure 2 indicates the response rates from locally based Geelong organisations.
No %
Replied 43 71%
Did not reply 13 22%
Undelivered 4 7%

No %
Replied 45 60%
Did not reply 20 27%
Undelivered 10 13%

Figure 1: Response from National Organisations

Figure 2: Response from Geelong Organisations

From the above, we can see that there was a higher response rate from the national organisations. There were also less undelivered e-mails from the national organisations (7% as opposed to 13%) due to the supply of incorrect e-mail addresses. However the “did not reply” category were comparable in size. The possible reasons for these results will be discussed later.

All email response times were tested for significance at the 5% and 1% levels of probability (p=0.05, and p=0.01). This was undertaken using a 2-Sample T-Test. E-mails that did not provide a response were removed from the significance test and used only to provide descriptive statistics, as were the undeliverable e-mails. However, those organisations that responded asking why we required a mailing address were included. This was then tested for significance at the two levels of probability. Results were found to be significant at the 5% level, but not at the 1% level, as shown by figure 3.

<table>
<thead>
<tr>
<th>Sample Number</th>
<th>Mean</th>
<th>St Dev</th>
<th>T obt</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>National</td>
<td>43</td>
<td>431 mins</td>
<td>667 mins</td>
<td>+/-2.4</td>
</tr>
<tr>
<td>Geelong</td>
<td>45</td>
<td>1001 mins</td>
<td>1441 mins</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3: Results of Statistical Analysis

Of the national organisations, 11 replied in less than 1 hour, with 4 minutes being the quickest response time. The results were very similar for the less than 1-hour category in the Geelong organisations, with 10 responding, and the quickest time being 5 minutes. After about 9 hours, the majority of national organisations had replied to the request, but this was not the case for the Geelong organisations. In the “more than 30 hours” category, only 1 national organisation was included, with a response time of 2 days, 6 hours and 46 minutes, but 10 Geelong organisations took more than 30 hours, with the worst response time being 4 days, 8 hours and 46 minutes. The breakdown of the time responses is shown by figure 4.

<table>
<thead>
<tr>
<th></th>
<th>National Organisations</th>
<th>Local Organisations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1 hour</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Between 1 and 2 hours</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Between 2 and 3 hours</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Between 3 and 9 hours</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Between 9 and 14 hours</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Between 14 and 30 hours</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>More than 30 hours</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>43</td>
<td>45</td>
</tr>
</tbody>
</table>
Of the organisations that replied the vast majority, supplied friendly accurate information. However, there were a number of organisations that wanted more of an explanation from the enquirer about the motivation for asking for the address. It was these responses that were some of the most interesting. For organisations that rely on the goodwill and loyalty of the public, some were a little impolite. However it must be noted that as the organisation had supplied an e-mail address. It is possible that the organisations did not see the need for anyone to send them anything in the mail, although the reluctance to supply a mailing address is an interesting phenomenon.

The main thrust of this research was to discover to what extent customer service was taken seriously within organisations with an Internet presence. Does the use and response to e-mail reflect the level of customer service of that organisation? Is there a difference between emailing an organization and calling a toll free hotline, and being unable to get a response to a query for almost 4 days? One of the main benefits of e-mail is the convenience of not having to put so much effort in eliciting that response. From the results of this research, it seems as if timely is not a priority. The majority, national organisations had significantly faster response times than the local organisations, but still that almost 20% of these took more than 9 hours to reply to a simple e-mail request.

The local organisations performance was much poorer. It is perhaps fair to look at reasons why these local organisations should fall behind their national counterparts, considering that e-mail is as cheap and as accessible to them as it is to large organisations. Large organisations can afford to invest in staff and technology as part of their E-commerce strategy to handle customer queries. Generally, smaller organisations have less staff whose job it is specifically to deal with e-mail queries. However the counter argument could be that all organisations deal with queries, although they are mainly via the telephone. It would surely take less time and be more time effective for staff to answer e-mails than it would be to answer a call, search the answer and then respond (perhaps sometimes having to call the inquirer back). If nothing else, organisations could be seen to be making an effort and do as Singh (1999) suggests "If you do a simple job of acknowledging to the customer that you have received their e-mail and somebody will get back to them, that is a big step forward. Keeping silent is extremely frustrating for the customers".

CONCLUSION

The two projects undertaken in relation to E-Commerce in Geelong have shown a number of issues. The first study was successful in showing that E-Commerce applications are used within Geelong and that Geelong organisations have similar concerns as their counterparts in other parts of Victoria. The uptake of E-Commerce in Geelong appears to be occurring faster than in rural districts, but many smaller organisations are still hesitant regarding the potential benefits and perceived problems of the new technologies. SME’s in particular require appropriate information to make informed decisions about new technologies. They may not have in house expertise and may not be able to, or wish to, afford consultants to provide expert advice.

The second study showed that organisations based in Geelong were not using e-mail as an effective tool to handle the simplest E-commerce applications - answering customer queries. E-mail was designed for and is, effective, efficient and an extremely quick communication medium, that fits into the multi-tasking work environment of modern organisations. Therefore there seems to be little excuse for the unacceptably slow response times apart from poor customer service. Organisations should remember that e-mail is an easily accessible means for customers to contact organisations, and poor response rates could result in a loss of custom.
REFERENCES

http://www.brightware.com


Electronic Design, (1999). So you can’t keep up with your E-mail. Electronic Design, V 47, No 15, July 26th, USA.


A Distributed Cognition Approach to Integrate Security Management and Business Processes

Christopher Lueg

Department of Information Systems
Faculty of Information Technology
University of Technology Sydney, Australia
Email: lueg@it.uts.edu.au

ABSTRACT

Virtually unlimited information dissemination in the age of the Internet has enabled novel ways to threaten companies. Relevant activities are taking place outside corporate spheres of influence which means that it may be difficult to become aware of activities happening online. In this paper, we argue that this task exceeds the traditional scope of security management and propose a distributed approach to account for the broad scope of the challenge. In particular, we argue for viewing organizations as distributed cognition systems as this provides a conceptual basis for integrating shared problem awareness and distributed threat recognition with regular business processes.

Keywords: Information Dissemination, Security Management, Distributed Cognition, Social Scaffolding.

INTRODUCTION

Security in the age of the Internet seems to be a topic for technicians in the first place as most Internet-based attacks target corporate networks and computer systems. Examples for attacks that received a lot of attention are the Microsoft hack (e.g., Bridis and Buckman 2000) and the Denial-of-Service (DoS) attack against their domain name servers (e.g., Yasin 2001). The specific circumstances that allowed for these attacks are less important because, as Bellovin (2001) points out, it is unlikely that there will ever be a 'security end state'. This means that even state-of-the-art computer security will only provide some protection against attacks. Accepting that software will be buggy, will have holes, and will be insecure is an important step towards a realistic assessment of computer security and towards a lasting change of attitudes and expectations (Bellovin, 2001). This is especially true in the case of malicious code, such as the Melissa virus, the Love Letter virus or the recent SirCam virus exploiting popular combinations of notoriously insecure software and thoughtless users. Accordingly, it is unlikely that computer security efforts will ever become obsolete.

Apart from attacks on corporate networks and computer systems, Internet activities have brought a variety of other less technical risks. Lichtenstein and Swatman (2000) provide an extensive list of such risks. Examples are inappropriate email, low quality data, accidental disclosure and non-business usage of corporate systems. Looking at e-business security management and policy from a holistic point of view, Lichtenstein and Swatman discuss a variety of issues that are involved, such as legal issues and organizational and administrative issues. An issue of particular concern are human issues as these are typically hard to 'control'. For example, Lichtenstein and Swatman found that employees, for the most part, are aware of the non-business usage of Internet resources, and some are deliberately 'behaving badly'. Moreover, Lichtenstein and Swatman found that some security breaches were not due to 'behaving badly' but were due to ignorance, carelessness, or oversight. Examples were misdirected important emails and sent-out confidential emails.
Batten (2000) takes a broader perspective than Lichtenstein and Swatman (2000) when discussing the need for distributed security and argues that prevention alone is not sufficient. In particular, Batten argues that the basic approach to information warfare security is the same as for general business information security: prevent, detect, respond. Detection involves several components ranging from prior knowledge about potential attackers to appropriate reactions.

In this paper, we are looking at ways to cope with potentially threatening activities that are based on the virtually unrestricted dissemination of information. We proceed as follows. First, we list a few examples of actual information-based threats that were reported in the literature and discuss why they are difficult to address. Then, we outline the need to address the information dissemination challenge and discuss the necessary conceptual tools which are distributed cognition and social scaffolding. Finally, we provide conclusions and an outlook on future research.

INFORMATION-LEVEL ONLINE ACTIVITIES

As described in Lueg (2001c), information-level online activities have specific characteristics:

- Information-level activities take place outside (secure) corporate environments.
- Information disseminated may influence the environment in which companies operate (e.g., reputation, shares price).
- Information-level attacks may unfold on a variety of levels. Moreover, the level on which an attack can be observed (i.e., where information dissemination takes place) is different from the level on which the attack unfolds (e.g., creating a certain image of a company).
- Information-level activities may be difficult to recognize as significant domain knowledge may be required to understand the threat potential (e.g., fake sales figures).

These characteristics suggest that information-level activities exceed the scope of traditional corporate security efforts.

Examples for information-level online activities

Incidents reported in the literature indicate that the range of potentially threatening activities is rather broad. A few examples reported in the literature:

- Urban legends circulating online. Reports in the literature indicate that companies have been forced to post corrections in order to prevent further damage (e.g., Ulfelder 1997, Brauer 1998).
- Hoaxes, i.e., false email messages with the only purpose to spread to as many people as possible, promising gifts from companies if they forward the letter to at least twenty people (Park, 2000).
- A web site set up by a company providing the information that products of competitors may be horribly dangerous. It seems that the information is nothing but a myth (Fumento 1999).
- A web site imitating the site of a well-respected information agency making fake announcements that lead to an increase of interest in the shares of a particular company mentioned in the announcement. Information about the fake site were distributed in web-based message-boards.
- A web site (URL http://www.mcspotlight.org) providing information a fast food giant tried to suppress in a famous libel case ('McLibel') and lots of other (potentially biased) information.
- Spam sent under the name of another person's domain, or web pages ('joe job'). The effect is that lots of people complain to the Internet service provider (ISP) hosting the domain or the web page advertised in the spam as they mistakenly assume they know the source of the spam.
Search engines manipulated to direct online customers to other web sites than they were looking for. Some years ago, the cyber artist group eToy used this technique to 'capture' about one million surfers. Chai (1999) reports an incident where information describing a popular web site were used to direct customers to a porn site.

Online communities sharing information about internal quality standards set by a particular fast food company and how these quality standards are sometimes ignored in the company's own restaurants (Lueg 2001). The information are circulated in a particular Usenet newsgroup but can be found even by casual Internet users when using regular search engines, such as Google (URL http://www.google.com).

We have described these incidents in more detail elsewhere (e.g., Lueg 2001b). It is reasonable to assume that incidents reported in the literature are just the tip of the iceberg. For example, companies may not be aware of threatening information circulated online or they may have chosen to deliberately ignore these information. An example for the latter is an US-based car manufacturer who decided not to go online to combat a certain revenge web site as the company was afraid that anything they would do on their own web site would validate what is described on the revenge web site (Ulfelder 1997).

**Information-level activities and technical limitations**

There are claims that 'companies that fail to monitor Internet traffic may be headed for a public relations disaster' (Ulfelder, 1997). Companies, such as eWatch (URL http://www.ewatch.com), CyberAlert (URL http://www.cyberalert.com), and Intelliseek (URL http://www.intelliseek.com), offer specific tools that allow to search the web and other information sources to find out 'what is "being said about [a] company and its products", and that provides "a way to identify potentially damaging rumours"' (Manktelow, 2001). However, strengths and weaknesses of these tools are largely unknown and information on how to incorporate search results into business processes are hard to find.

Moreover, search technology is subject to a variety of fundamental limitations when it comes to information-level Internet activities. First of all, only a limited number of electronic communication channels are publicly accessible. Among the open channels are Usenet newsgroups, parts of the world wide web and public mailing-lists. Contrary, email is mostly private, many mailing-lists are for closed user groups, and many web servers have password-protected areas. Also, many web servers generate web pages on the fly which means that scanning all dynamically generated pages is almost impossible.

Second, even in the case of the publicly accessible web, it is simply impossible to monitor all traffic for resource reasons (bandwidth, storage capacity, processing power). Back in 1998, researchers found that coverage of the web by search engines was severely limited: no single search engine examined indexed more than about one-third of the 'indexable Web' (Lawrence and Giles 1998). The web has expanded enormously since then which means that coverage can be expected to be much worse.

Third, even state-of-the-art search and retrieval technology is only good at searching for known terms. When people use special nick names when talking about products or companies it is hard for search technology to find out whether people are talking about particular products or companies. Extremely simple examples observed in online discussions are "Wuergerking" (a German language pun) instead of 'Burgerking' or 'McDoof' (another language pun) instead of 'McDonald's'.

Fourth, it is difficult for automatic search tools to find out what people actually do when they are talking about things. Removing discussions from their particular social contexts ('de-situating' in the sense of Grudin, 2001) may result in wrong interpretations. Lueg (2001b) describes a situation where an online community shares information about internal quality standards set by a particular fast food company and how these quality standards are often ignored in the company's own restaurants. Without knowledge about the newsgroup, such discussions could be interpreted as 'fast food bashing' but in fact the community is a 'fan community' consisting mostly of fast food lovers.
Then, even if search technology detects mentions of corporations or brands, this information is already disseminated. Web sites can be closed but this process takes some time and often the pages are already scanned by search engines, such as Google (URL http://www.google.com), that store images of pages indexed. Email cannot be 'removed' once disseminated over mailing lists and stored in personal mailboxes. Usenet articles can be deleted on some news servers but many servers do not honor cancel requests; private archives are mostly inaccessible.

To sum up, it would be naive to assume that it is feasible to 'monitor Internet traffic' in any more general sense.

INTERNET ACTIVITIES AS CHALLENGE

E-business customers are online savvy by definition which makes companies involved in e-business easy targets. However, the example of the online community discussing the ignoring of internal quality standards in fast food restaurants indicates that the impact of information-level Internet activities is not limited to e-business companies.

We argue in particular that the challenge of information-level online activities demands an orientation from what is happening within corporate spheres of influence to the broader information environment. The most important thing in addressing information-level online activities is becoming aware of these activities as early as possible. However, delegating this tasks to dedicated teams that monitor Internet traffic is limited for several reasons. The three most important ones are:

Any technical approach to monitoring Internet traffic is severely limited (see above). It would be naive to assume that all Internet traffic could be monitored.

Every team (or, more precisely, every member of a team) has a certain perspective on the Internet and its information dissemination channels which means that his or her surveillance activities will focus on certain areas and pay less attention to others.

Especially small and medium enterprises may not even have financial and other resources that are required to set up specialized Internet surveillance teams. As Warren and Hutchinson (2000) report, even allocating resources required for undertaking (basic) security reviews may be a problem for such enterprises and monitoring online activities would require further resources. Similarly, hiring external specialists for monitoring Internet activities may be limited to large companies. There are expectations that outsourcing security to professional businesses will become common (Batten 2000).

These limitations suggest that information-based online activities should be addressed by establishing 'corporate awareness' which means that corporations as a whole should be on the alert. Such an approach requires a sound conceptual perspective and practical ways to implement the vision. In particular, individual awareness of the threat potential of information-level online activities needs to be increased in order to enable corporate awareness.

Corporate awareness, or distributed awareness, make use of specific characteristics of corporations as social groupings. Among other things,

employees are people who are interested in different communities and information sources and who look at different online information sources;

different employees may have a different understanding of what they read;

employees may use different tools. Research has shown significant differences between what search engines cover (Lawrence and Giles 1998);

employees may have access to otherwise inaccessible resources.
However, in order to benefit from these characteristics, a conceptual perspective is required that allows the following:

describe (and understand) the situation and
organize necessary activities without requiring re-engineering of business processes.

We believe that research on distributed cognition and scaffolding minds provides the conceptual tools required. In the next sections we briefly the two research areas and outline how they can help to establish corporate awareness.

**DISTRIBUTED COGNITION**

The theory of distributed cognition (Hutchins, 1995) seeks to understand the organization of cognitive systems but unlike traditional cognitive approaches, it extends what is considered as cognitive to include interactions between people and their environments:

'Distributed cognition looks for cognitive processes, wherever they may occur, on the basis of the functional relationships of elements that participate together in the process. A process is not cognitive because it happens in the brain, nor is a process noncognitive simply because it happens in the interactions among many brains.' (Hollan et al. 2000, page 175)

Settings that have been analyzed as distributed cognition systems are small sociotechnical systems such as an airline cockpit or the bridge of a ship. In the airline cockpit, for example, an examination of memory processes has found rich interactions between internal cognitive processes, the manipulation of objects and the traffic in representations among the pilots.

In the context of information-level online activities, we find it helpful to consider an organization along with its members as a distributed cognition system in which each employee contributes his or her capabilities and interactions with online environment without being expected to be capable of constructing the "big picture" of a situation.

**SOCIAL SCAFFOLDING**

Apart from conceptual tools to describe and understand a company's situation, concrete techniques to implement activities are required as well. We refer to the perspective that humans are best described as scaffolding minds (Clark, 1997). This particular perspective suggests that human intelligent behavior is to a large extent dependent on structuring and exploiting the physical as well as the social environment. The human brain is viewed as a kind of highly-specialized "associative engine" and less as a device that performs extremely complex information-processing operations.

The assumption is that the human mind, i.e., the brain in its bodily context plus external structures, depends to a large extent on its capability to transform complex "information-processing tasks" into simpler associative tasks by exploiting structures of the real world and by actively re-structuring problems into series of simpler problems so that they better fit the peculiarities of human cognition. Indeed, much of the environmental interactions consist of iterated series of relatively simple pattern-matching operations. The re-structuring of problems in the scaffolding perspective, however, should not be confused with the de-composition of problems as done in computational divide-and-conquer approaches. The latter is an abstract activity that can be performed in isolation from the embedding situation whereas the "simpler problems" that result from the re-structuring of in the scaffolding perspective still are part of the ongoing interaction of the human with the environment (Lueg, 2001a).
Similar to the distributed cognition perspective, the scaffolding minds perspective suggests that human cognition cannot be investigated without embodiment. In addition, the scaffolding minds stresses that human minds depend on being embedded in a well-structured ("scaffolded") environment created by human minds. Examples for corresponding external structures are physical, symbolic and social-institutional structures.

PUTTING TOGETHER BITS AND PIECES

In Lueg (2001a) we have described an example of 'information scaffolding' in an academic research environment. Individual members of the lab forward important scientific or organizational information to the head of the lab. Members focus on their particular research topics (which reduces the complexity of each member's "task") whereas the scaffolding contributes to the "informating" of the lab's head. In a way, the lab can be regarded as an 'information ecology' with different niches occupied by different researchers. An information ecology is defined as a system of people, practices, values, and technologies in a particular local environment (Nardi and O'Day, 1999).

In the context of information-level security management, the distributed cognition perspective allows to understand threat recognition as a cognitively distributed activity. By this we mean that observing online activities and interpreting these activities in relation to the company can be done by different minds mediated by technology. Observing online activities may happen whenever employees interact with the Internet and its information sources. However, employees are not required to have the expertise to assess the threat potential of online activities which makes observing a cognitively less demanding activity. Social scaffolding supports the forwarding of information concerning activities recognized to the relevant departments which have the expertise to further investigate and handle activities observed.

It is important that information concerning activities detected is not kept but shared with others. As Lichtenstein and Swatman (2000) report, knowledge of regular Internet security matters is often available on lower levels in a company but effectively blocked at this point of the managerial chain to the top. It is reasonable to assume that similar block effects could occur in the context of threatening online activities.

Our approach to corporate awareness is related to Batten (2000)'s approach to distributed security. A significant difference, however, is that Batten's first step -prevent- is hardly applicable in the case of information-level online activities as relevant activities happen outside the scope of corporate influence. Our approach also relates to Lichtenstein and Swatman (2000)'s holistic point of view but we broaden the focus of attention to include an organization's environment. This does not imply, however, that the organization itself becomes less important or deserves less attention.

TECHNICAL SUPPORT FOR DISTRIBUTED SECURITY MANAGEMENT

Information systems technology can be used as mediator between the different minds involved in corporate awareness. A shared (information) system is an information system that is used by multiple communities of practice (Pawlowski et al. 2000). Pawlowski et al. describe how information technology (IT) professionals supporting shared information systems learned about their stakeholder communities and their specific characteristics. Maintaining shared systems is challenging as system changes may be triggered in any of the stakeholder areas while effecting other areas. Pawlowski et al. argue that the IT group observed has acquired an amazingly broad view, spanning both the informal boundaries of communities and the formal organizational boundaries. In particular, the authors argue that the professionals are put in brokering roles (brokering in the sense of Wenger, 1998) and discuss how they could be used to enable knowledge transfer among communities. In the context of this paper, shared information systems would be used to support propagation of information about threatening online activities.
RELEVANT DISCIPLINES

It is important to involve other disciplines apart from those traditionally concerned with security management. For example, lawyers are becoming more and more interested in what has been called 'commercial terrorism through the Internet' (Braun et al., 2001) in a rather controversial article.

Public relations has some expertise in coping with information-based online activities and has been involved in addressing some information-level online activities. Brauer (1998), for example, describes how a company specialized in public relations was hired to stem the damage caused by an Internet fraud.

Disciplines dealing with handling information, such as information and library science, can be expected to have some valuable expertise. Ebbinghouse (2001), for example, has collected a lot of information on how to handle threatening situations such as cyber smear and revenge web sites once they have been recognized. Examples discussed range from complaining to the owner to "bringing in the cavalry" which would be the relatively new Internet Fraud Complaint Center (which is located in the US and probably not too helpful in other countries) to launching a law suit.

Finally there is a discussion among privacy and free speech advocates whether corporations will use the new monitoring technology to suppress legitimate online dissent (Kumar, 2001).

CONCLUSIONS AND FUTURE RESEARCH

In this paper, we have outlined how research in distributed cognition and social scaffolding can be used as conceptual tools for novel approaches to coping with information-level online activities. The contribution of this paper is that we have related security management issues to recent advances in research on human cognition and behavior. The need for novel approaches is based on the understanding that virtually unlimited information dissemination in the Internet may be a serious threat to companies.

Future research in this area includes investigating in more detail how distributed cognition and social scaffolding can be supported by appropriate technology. We are also working on conceptual tools that support the assessment of Internet activities and their threat potential (see Lueg (2001c) for first results).

ACKNOWLEDGMENTS

The author would like to thank the anonymous reviewers for their helpful comments on the draft version of this paper, Robert James Steele for valuable discussions and Jim Underwood for his ongoing support.
REFERENCES


Porter and Profit: On-Line Newspapers Prove the Point

D W Maguire

School of Management Information Systems
Edith Cowan University, Australia
E-mail: allmaguires@bigpond.com.au

ABSTRACT

The Internet is making a place for itself in the Information Age but not at the expense of traditional media such as newspapers against which it is squeezing into the market. The Internet is becoming another alternative information source at a time when consumers are showing an ability to absorb more information channels, as happened with the advent of radio, television and films. This paper compares in the context of two of Michael Porter’s competitive models the business viability of the Internet-based virtual e-paper with the traditional newspaper. It finds the newcomer unable to meet criteria critical to profitability, thus raising questions about its stand-alone viability.

Keywords: newspapers, media, Internet, Porter, delivery, information, economy, profit

INTRODUCTION

The Information Age is developing an increasing variety of distribution channels to disperse traditional forms of packaged information, i.e. text, sound and image, that in the early, transitional stages of the new era posed challenges to established systems such as newspaper, radio and television. It is clear that traditional economic fundamentals apply to old-business and e-business alike as the first wave impact of change associated with the implementation and wider use of new technologies becomes understood and rhetoric gives way to reason. This paper compares the viability of traditional and on-line newspapers and concludes on the results that the paperboy will hold onto his delivery round as newspapers emerge strongly viable in the electronic information age.

The newspaper is preferred over the Internet by the current generation of users for delivery of news and information and shows no sign of being weakened as an information supply and transportation industry. A study (Stempel et al., 2000) of the relationship between growth in Internet use and changes in media use found that while the Internet had arrived as a major mass medium, it was not playing the role that many assumed. Changes in Internet use from 1995 to 1999 revealed that any decline in use of TV news, newspapers and magazines could not be blamed on the Internet. It found that Internet users were more likely to be newspaper readers and radio-news listeners than were non-Internet users.

The authors’ found those using the Internet as a source of news were clearly information seekers. Internet users may turn to their newspapers or newspaper readers may go to the Internet for more information on a given topic, both being sequentially possible as a supplemental information-seeking behaviour. Less logical was going from either the Internet or the newspaper to TV news to seek additional information. An independent similar study in the United Kingdom confirms the findings (BMRB Research, 2000). It found that news and sport overwhelmingly attracted visitors to newspaper sites with business/finance also having strong appeal. Independent industry surveys that show user growth in both media back up such behavioural trends in regular reports. Newspaper sales measured over a six-month period, April-September in 2000 (Anonymous, 2000) by the Audit Bureau of Circulations, increased modestly in the major cities of the United States. Measured web site visits in
June 2000 (Nielsen/NetRatings) showed sizeable increases in audience, in four instances for the most popular sites in quantities exceeding one million.

Wurman (2001) believes the information explosion is showing humans can handle increased information channels, such as easily switching between the morning paper and surfing for financial news, that we have increased appetites and can cross platforms. Hence the market-entry of a new medium without decimating an old medium. The amount of information generated by the technology age has been studied by a team from University of California at Berkeley (Lyman and Varian, 2000) which found the world produces between 1 and 2 exabytes of unique information per year, roughly 250 megabytes for every man, woman, and child. (An exabyte is a billion gigabytes, or 1018 bytes). Soon it will be technologically possible for an average person to access virtually all recorded information.

The study underlines the point that data and delivery systems are available for every IT connected person. The researchers were surprised by the “paucity of print” with printed material of all kinds making up less than .003 per cent of the total storage of information. They noted this did not imply that print was insignificant, rather it meant that the written word was an extremely efficient way to convey information. The main focus of the report was on the supply of information but it is interesting to look at data measuring the consumption of information as well. Table 1 depicts hours per year of time spent on various media in US households in 1992 and in 2000.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>1992 Hours</th>
<th>2000 Hours</th>
<th>2000 Mbytes</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>TV</td>
<td>1,510</td>
<td>1,571</td>
<td>3,142,000</td>
<td>4</td>
</tr>
<tr>
<td>Radio</td>
<td>1,150</td>
<td>1,056</td>
<td>57,800</td>
<td>-8</td>
</tr>
<tr>
<td>Recorded Music</td>
<td>233</td>
<td>269</td>
<td>13,450</td>
<td>15</td>
</tr>
<tr>
<td>Newspaper</td>
<td>172</td>
<td>154</td>
<td>11</td>
<td>-10</td>
</tr>
<tr>
<td>Books</td>
<td>100</td>
<td>96</td>
<td>7</td>
<td>-4</td>
</tr>
<tr>
<td>Magazines</td>
<td>85</td>
<td>80</td>
<td>6</td>
<td>-6</td>
</tr>
<tr>
<td>Home video</td>
<td>42</td>
<td>55</td>
<td>110,000</td>
<td>30</td>
</tr>
<tr>
<td>Video games</td>
<td>19</td>
<td>43</td>
<td>21,500</td>
<td>126</td>
</tr>
<tr>
<td>Internet</td>
<td>2</td>
<td>43</td>
<td>9</td>
<td>2,050</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>3,324</strong></td>
<td><strong>3,380</strong></td>
<td><strong>3,344,783</strong></td>
<td><strong>1.7</strong></td>
</tr>
</tbody>
</table>

* Lyman and Varian (2000)

Worth noting are hours spent on TV and radio consumption and their consistency over time, reduction in time on printed information and the dramatic increase in home video, video games, and Internet usage. Total time spent in media access has hardly changed in eight years.

Contrary to the self-generating hyperbole of the Internet, manufacturers of the newspaper printing press are looking forward to a strong start to the first decade of the new century. There is demand for new printing equipment, owing to newspapers’ needs to add colour capacity and control waste, and advances in press technology are making it feasible for publishers to replace presses that are less than 20 years old (Rosenberg, 2000). New technology could make the digital printing press a possibility within the next 20 years.

A workable, i.e. profitable, business model to enable the paper to change its hard copy presence and migrate all to the Internet has so far eluded the newspaper which is the founding format of information transfer. It is doubtful, as this paper outline that a model exists which will allow the traditional newspaper economic structure to be replicated in a paper-less, Internet environment. Venkatraman (2000) believes publishing is likely to be significantly reshaped by the Net, even though dominant new business models with assured profitability have yet to emerge. Like most businesses, newspapers are built on a vertically integrated value chain. Newspaper companies exist as intermediaries between the journalist and the reader because there are enormous economies of scale in printing and distribution. But when high-resolution electronic tablets advance to the point where readers consider them a viable alternative to newsprint, those traditional economies of scale will come under greater pressure. Readers could be able to mix and match content from a virtually unlimited number of sources (Evans and Wurster, 1997) when free from the necessity of subscribing to entire physical newspapers. This deconstruction process, or un-bundling, can happen now with electronic news, movie reviews, recipes and weather able to be accessed from different sources. The newspaper remains, though, an extraordinarily cheap and user-friendly way to distribute information, which sustains the traditional business model.

2nd International We-B Conference 2001
COMPETITIVE PUBLISHING ENVIRONMENT

The task of newspaper publishing is primarily to collect, package and deliver news and information in a timely manner, an expertise which is transportable by other delivery systems such as the Internet. In the new paradigm, the critical negative barrier in the value-chain for newspapers is the free, front-end electronic delivery system that fundamentally deconstructs the existing contract relationship between supplier and customer. The result is the newspaper forgoes revenue because it isn’t charging for the physical product.

Newspapers are collaborating with technology to shore up their competitive position as they deal with the new information economy environment. Just as they bought start-up radio and television stations in previous generations, publishers are establishing Internet operations and forming Web businesses to protect their newspaper franchises. They are publishing on-line versions of the daily or weekly newspaper under the same brand-name with variations of the same news and information. If the Internet was to damage any other medium, the newspaper was a prime candidate. Its physical format has changed marginally since the invention of the printing press but the technology is still linked to reels of paper and electronically-smart iron presses. The Internet is all the newspaper cannot be as a delivery system. It is fundamentally text-based (as is the newspaper, and the similarities are telling) but with flexibility to splash around colour and add moving visual lures. Whereas the paper needs to go to press late at night to be physically delivered in time for morning consumption, the on-line version’s content deadlines are more fluid, being able to be changed at will for access at will. Where earlier phases in a story’s development have to be sourced back through previous days’ newspaper editions, the on-line service can offer an accessible archive. The newspaper is purely mono-media, unable to carry sound-bites or video grabs or facilitate inter-facing chat lines with reporters or story subjects. As it did, however, because of habit, convention and convenience through the advent of silent pictures then talkies, radio and TV, the newspaper has survived the initial phase of the Information Age. The new technology needed to be something a bit more than what it was, despite its bells and whistles, to make the centuries’ old tradition of newspapers disappear.

CHALLENGE FACING PUBLISHERS IN THE E-BUSINESS ERA

The challenge for newspapers is to find a new business model matching the new technological media or manipulate an old one to replace revenue lost in transition from the traditional format. Virtual newspapers have been set-up in the interim by traditional operators to establish an electronic foothold, to protect the turf and as brand extensions. Two of Michael Porter's competitive models have been applied below to compare the sustainability of the traditional newspaper format against the web-based version to ascertain their competitive resilience. The comparative diagrams Figure 1 and Figure 2 are indicative of the different models. Porter (2001) recognises the Internet as an important new technology but warns of the danger of assuming it changes everything to the extent that the old rules about companies and competition become obsolete. He recommends it is time to take a clearer view of the Internet and see it for what it is: an enabling technology, a powerful set of tools which can be used in almost any industry and part of almost any strategy. The great paradox of the Internet, he says, is that its very benefits – making information widely available, reducing the difficulty of purchasing, marketing and distribution and allowing buyers and sellers to find and transact business with one another more easily – also make it more difficult for companies to capture those benefits as profits.

OFF-LINE, ON-LINE AND THE FIVE FORCES

Porter (1980) contended that the state of competition in an industry depends on five basic forces and the collective strength of those forces determined the ultimate profit potential of an industry. He said "in the economists' perfectly competitive industry, jockeying for position is unbridled and entry to the industry very easy". This kind of industry structure, he said, offered the worst prospect for long-run profitability but the weaker the forces collectively, the greater the opportunity for superior performance. The traditional and web-based models of a newspaper are examined on merit in the context of each of the forces.

Threat of Entry

Traditional: Highest costs are materials and labour so a start-up operator needs substantial capital to sustain old technology practices. Market dominance and product loyalty is costly to break for a new entrant. There are
significant transport costs from factory to consumer but all distribution channels are easy to access. A maturing industry with strong cash-flows whose buy-in price could be a deterrent.

Web-based: Start-up cost is relatively cheap with few consumables required. Labour costs are not as great, depending on the range of information planned for inclusion on the web site. No transport costs as the Internet is the distribution channel. There are extensive marketing costs to attract consumers but the audience is limited by its access to technology. Nil cashflow will come from on-line usage, or hits, and minimal cashflow from advertising, commensurate with an audience not as large as newspapers or television.

Verdict: Traditional version is established but cost-bound and generating profits; Web version appears to offer ideal operating environment but generating little cashflow.

Powerful Suppliers

Traditional: Materials and labour are cost centres critical to the business and subject to price maintenance, foreign exchange fluctuation, industrial environment and market demand. The business model relies on specialist distribution channels from factory to consumer which are subject to fluctuation in labour, fuel and consumable prices. Industry members are important to supplier groups that tend to sector-specialise.

Web-based: Labour is the only significant cost centre after start-up; establishment of distribution channel has minimal comparative cost. No supplier is capable of disrupting the business.

Verdict: Traditional version burdened by costs and complex partnerships; Web version has no such baggage.

Powerful Buyers

Traditional: Newspaper purchasers and advertisers buy in large volumes, are cash-flow positive to the business and therefore cover major costs. However they are cyclical, fair-weather customers who cancel when they go on holiday or have long-weekends.

Web-based: Out-goings on labour cannot be off-set by unit purchase as the Internet is free; some newspapers are having moderate success in charging advertisers a listing fee for inclusion on their web-site. Web-site visitors have not yet proven to be habitual.

Verdict: Traditional version has customer relationships that generate benefits; Web version has no such loyalty relationship with users and no facility to charge.

Substitute Products

Traditional: Television, radio, cinema, books, Internet are competing for the newspaper reader's time and attention. There are low switching costs and a varying propensity to substitute. All media are price sensitive.

Web-based: All of the above plus hundreds of thousands of other Internet sites. Favourable price sensitivity, i.e it's free; high propensity to substitute.

Verdict: Both the traditional and Web version exist in a crowded environment but only one gets paid for its output.
Traditional Paper (Figure 1)

CLASSIFIEDS

R+

CIRCULATION (DELIVERY)

(News)paper

Advertising

R+

News

R-

Virtual E-Paper (Figure 2)

CLASSIFIEDS

R+

CIRCULATION (DELIVERY)

R-

(News)paper

Advertising

R+

News

R-

Legend

R = Revenue
R+ = Revenue Positive
R- = Revenue Negative
Industry Competitors, Rivalry

Traditional: mature industry; high fixed costs; strong brands; diversity of competitors across the media spectrum; powerful corporate identity; strong product differentials between rivals; high exit barriers.

Web-based: blue-sky industry; low fixed costs; no stand-alone brand identity; diversity of competitors across the media spectrum; no corporate identity or power; strong product differentials between rivals; low entry and exit barriers.

Verdict: The traditional version is a bulwark against a brash alternative.

AND GENERIC STRATEGIES

Porter (1985) believes there are but two "basic types of competitive advantage a firm can possess: low costs or differentiation". These combine with the "scope" of a firm's operation (the range of market segments targeted) to produce "three generic strategies for achieving above-average performance in an industry: cost leadership, differentiation and focus".

Cost Leadership Strategy

Traditional: Newspapers bear heavy production and labour costs but strive to sustain cost efficiencies to deliver and market a product more efficiently than competitors. Lower costs allow the business to earn adequate returns under heavy competition and benefit from increased volume sales.

Web-based: Production and labour costs are minimal in comparison to the traditional version but so is revenue. No amount of cost control will be reflected in more "hits" revenue because the user is not paying for the service.

Verdict: The traditional version returns more to the bottom line if costs are reduced but in the Web version this, importantly, reduces losses.

Differentiation Strategy

Traditional: Buyer loyalty is generated by the newspaper's unique and superior value to customers in terms of product quality, current content, home delivery and value added sections. If it can generate strong sales, the company is rewarded by being able to charge a premium for its advertising space or additional special products.

Web-based: The service is free so the consumer does not judge its relative value and therefore the degree of buyer loyalty is immeasurable. If the site is successful in attracting "hits", a premium can be charged for advertising space. Content is also important however the interactive and colourful nature of web sites create a vastly different "information absorption" environment.

Verdict: The traditional version potentially generates greater value and yields with its differentiation strategy whereas the result is minimal for the Web version.
Focus Strategy

Traditional: Product differentiation strategies are often focused on narrow segments of the market by one-off promotions, improved services at different times to cover events such as elections, budgets and tragedies and initiatives to generate more sales, i.e. home delivery. There is also the potential to enhance perceived quality and thereby add value.

Web-based: Differentiation focus is more possible because of the interactive nature of the Internet and sound and video bites of content subjects have a standout advantage over the newspaper.

Verdict: Each version is equally able to benefit from focused differentiation however the traditional approach results in more newspaper sales and hence cash.

The ultimate verdict of the two studies is that the traditional strategy rejects the Web-based business for its most outstanding flaw, the inability to generate a replicable amount of cash.

CONCLUSION

The traditional newspaper business model is more economically robust in comparison to an on-line version. The model under which newspapers have operated, charging to buy the product as well as charging to advertise in it, stands up to scrutiny under Porter’s Five Forces and Generic Strategies principals. The on-line version fails the test for lack of revenue but that is a multi-dimensional problem that goes to many aspects of the value chain. Ultimately, the expertise of the publisher is to collect, package and disseminate information. The advent of the information economy era has caused traditional publishers to reassess, in context of the rapid acceptance of new technology and its suitability as an information delivery system, the future methods by which their products will be presented. The new technology offers radio-immediacy delivery of text but operators are unable to offset the full cost of business by charging a reasonable fee. Without a profit, the potential of the medium in publishing may not be fully realised.
REFERENCES


Wurman, R. S. (2001). Information Anxiety 2. QUE, Indianapolis, Indiana, USA

[On-line]
http://www.BMRB.mediatel.co.uk/social
E-commerce, Management Information Technology and the Organisation: A Study of Factors Influencing Change In a Large E-enabled Company

Robyn Watters¹ and Andrew Wenn²

¹School of Information Systems
Victoria University
Email: Robyn.Watters@research.vu.edu.au

²School of Information Systems
Victoria University
Email: Andrew.Wenn@vu.edu.au

ABSTRACT

E-commerce has been flagged as the catalyst responsible for creating global competitive markets, changing the business process interface, and challenging the structure, culture, and management practices of the traditional, hierarchical organisation. It is foreshadowed that businesses will need to restructure in accordance with this new order if they are to be competitive, and indeed survive, in a technology driven, global economy. An exploration of the principal factors driving change appears, on the whole, supportive of this prognosis. However, some inhibiting factors have emerged, which suggests that the breadth of change is very much dependent on the organisation culture and structure, and the industry regulators.

Keywords: E-commerce, Organisation Structure, Organisation Culture, Management Information Technology

INTRODUCTION

There appears to be little known about the impact of e-commerce on the organisation structure, culture, and the management of information technology. This exploratory study was undertaken to provide an insight as to how one organisation manages global e-commerce solutions, specifically, in terms of the organisation structure and culture, and the management of information technology.

In 1998, Boudreau et al stated that, over the last 12 years, sweeping changes aligned with 'customer demands', 'industry regulations' and 'technological innovations' had created global competitive markets, which have challenged traditional organisational and management strategies. They also acknowledged that organisations had to restructure accordingly, if they were to be competitive in the global market place (Boudreau et al 1998).

These market transformations have evolved through a combination of the Internet and interactive technologies (Australian Government 1998a) and, subsequently, comprehensive 'new management approaches' were needed in order to maximise e-commerce opportunities (Kalakota & Whinston 1997).
Kalakota & Whinston (1997) acknowledged some difficulty when attempting to define electronic commerce, stating that its terms of reference were underpinned by any number of the participating intermediaries. However, in board terms, e-commerce is defined as 'doing business online' through a mix of technology and business strategies. The Global Information Infrastructure Commission (GIIC) describes e-commerce as embracing all electronic networks and technology used in the conduct of electronic transactions and/or other economic activity (1998).

For the purpose of this paper our definition of e-commerce will align with the definition provided by the GIIC.

A review of the literature found no previous research concerned explicitly with the impact of e-commerce on the management of information technology and the organisation structure. Some research had analysed changes in the key issues of the management of information systems, indicating that the management of information technology principles had changed and that the reported change was largely attributable to the impact of e-commerce activity. Other research had reported on the change management principles and outcomes of organisations' adoption of information technology. It was shown that structured (hierarchical) organisations were more likely to resist technological change.

Most e-commerce research, in Australia, had targeted small-to-medium sized business use of e-commerce. Although, a very loose comparison could be made between some of the findings outlined in the National Office for the Information Economy (NOIE) survey (June 2000), and the outcomes of this study, the survey targeted small-to-medium sized businesses rather than large businesses.

The purpose of the study, upon which this paper is based, is to provide some understanding of the interrelation between e-commerce, the organisation structure and culture, and the management of information technology. This information, in turn, could be used by other organisations to make informed decisions as to appropriate e-commerce solutions.

The following section will outline the research approach chosen to implement this study, along which this paper is based. The object of the study will be identified and the preliminary data analysis derived from the interviews will be described in the context of the findings.

**RESEARCH METHODOLOGY**

**Research Approach**

The following research subproblems are being addressed in the study:

What is the organisation's scope and level of e-commerce activity?

What are the organisation's management of information technology principles and has there been any change since the implementation of e-commerce?

What is the organisation's structure and culture?

Have the organisation structure, culture, and the management of information technology principles changed, and if so, are these changes related to the implementation of e-commerce?

In the absence of any related, researchable outcomes - measurable objects and their relationships - the purpose of this study is to 'explore' and 'describe' a situation at a given point-in-time. This type of research is best suited to the qualitative research method (Leedy 1999).
Participants

We required that the chosen organisation was Australian owned, or at least based in Australia, had both national and global business interests with high level e-commerce activity, and had to fit the description of a large sized organisation. For the purposes of this research we used the Australian Bureau of Statistics definition of a large business, which is defined as having 200 or more employees (Australian Bureau of Statistics 1999).

The organisation finally selected to participate in the study had shown considerable growth in the short period since entering the global market, and it was felt that this organisation would provide a clearer picture as to how a large business manages global e-commerce. There was also a strong technology focus, which was considered an excellent base from which to explore the impact of e-commerce on the management of information technology.

The business is a global, financial service provider and technology organisation that manages over 52 million account holders worldwide. Established in 1978, the company, which for ethical reasons we shall refer to as ‘ShareTradersOnline’, was a local, niche, technology company totalling approximately 30 - 40 staff members. In 1994 it embarked on the acquisition of Australian and New Zealand finance businesses, and in 1997, entered the overseas markets. ‘ShareTradersOnline’ now provides a range of technology products and financial services to over 15 countries.

This study focused on gathering information from the high-end decision makers within the organisation's respective, strategic business components. Taking this approach provided a broad overview of the issues associated with the research problem and by not focusing narrowly on one aspect of the problem, information could be drawn from a range of related components.

Data Collection

According to Myers' (1999) description of qualitative data techniques it was decided that a case study would best serve to 'describe', 'explain' or 'evaluate' the research problem. In the light of the research aims, the study needed to focus on describing the situation and in choosing the case study approach, open-ended interviews were used.

The interviews were recorded with the approval of the participant and manually transcribed immediately to ensure their accuracy, then returned to the interviewee for verification (Seidman 1998). In addition to the interview materials, the study has also incorporated the relevant textual materials and documents provided by the organisation.

Method of Analysis

Creswell (1998) has identified case study data analysis as relying on 'description', 'themes' and 'assertions' with research findings best conveyed using the 'narrative form'.

As this research was an explorative, single case study it was deemed inappropriate to use a data analysis technique that was based on tables, matrices, figures, or any other structured reporting process. There were no known datasets to compare, group or codify. Instead, the free-flowing interview profiles, literature and other data materials, were combined to provide a preliminary snapshot of events at a given point in time, exploring the interrelation of e-commerce, the organisational structure, and the management of information technology.
PRELIMINARY ANALYSIS OF DATA

A comparative analysis of the literature, textual materials and documents provided by the organisation, and the data derived from the four, initial, open-ended interviews will form the basis of these preliminary findings. Each of the four interview data represents an operational component of ‘ShareTradersOnline’, the organisation chosen for this case study.

The object is to explore the factors that influence the interrelation of e-commerce, the organisation structure and culture, and the management of information technology. This was undertaken by first identifying, then comparing any recurring issues arising from the interview data, and the existing literature. Although, the analysis of the data is by no means exhaustive, some distinctive factors are already emerging. What follows is a description of those factors.

The Organisation Structure

Three of the four interview participants, representing four of the organisation's business units, described the organisation structure as ‘flat’. It was also said to have a ‘fluid structure’, in that the business was geared to respond readily to global market demands and opportunities.

Each business unit is serviced, at the ‘regional level’, by the common support areas, Finance, Human Resources, Development and Training, and Marketing, for example. Three of the four participating business units have a global operational focus. The fourth unit, Financial Services, has functionality at the regional, and local levels. Each of the local divisions operate on a ‘stand-alone’ basis, and are responsible for their ‘end-to-end’ processing operations.

There is a ‘global team’, comprising a representative from each of the main business units, who work together to ensure that the business units maintain objective consistency within the regional, local, and global market place.

The Organisation Culture

The organisation culture is collective of the ‘enterprise and its members’, and comprises, in part, the vision, behavioural standards, value judgements, principles and practices, and business acumen of that organisation (Morden 1996).

The term ‘schizophrenic’ was used to describe this company's culture because of the two distinct cultures that co-exist. First, there is the culture that is flexible, has an ‘open door policy’, and is said to represent the ‘organically grown’ (original) components of the organisation. It also includes those business units that were newly formed under the company's global expansion.

The other culture was said to have evolved from the organisation's acquisition of established, hierarchical structured businesses. These businesses were described as being ‘very old fashioned’, and ‘very process driven’. They had traditionally been components of accounting firms or banks, and their business practices were heavily controlled through departments, divisions, and heads of business. Once acquired, these businesses were merged into the Financial Services business unit.

Even though there is more open communication, and free-flow of information within this business unit than there was three or four years ago, there are still cultural differences between the components of the original organisation structure, and those businesses that were acquired.

‘When you put those organisations together and grow them into a business, which is owned by "ShareTradersOnline", with its culture, and whilst there has been a blending of the two, Financial Services, which has come from an established traditional background, has still got some of that baggage - in fact lots of it. There is a distinct difference in culture and operating procedures’.
The decision making process is one example of the cultural differences that exist between the two organisation structures.

There are, effectively, two decision-making streams within the organisation. The first method comprises the 'corporate level', which is a relatively 'informal' process involving a Board of Directors, who oversee the 'big ticket items' - those projects that 'significantly commit the organisation'.

The second method is a more formal process that is applied to the organisation's structured business units (Financial Services).

'Financial service providers are significantly risk management businesses and they have quite formal decision making structures within them.'

'It seems that we can make big decisions that have a big impact seemingly quite quickly, but when it comes to incidental type decisions that have a minimal impact on the organisation overall, it seems to take forever'.

Another cultural difference is the business process. There are two business processes that coexist within Financial Services. There is the internal business process, which is electronic based, 'automated and streamlined', then there is the external business interface, which is very much paper-based.

'The interface with shareholders is very old fashioned, they are all streamlined forms but it's still bits of paper that goes in the mail and comes back to us in the mail'.

'ShareTradersOnline' other business components are said to be technology driven, in that their business processes are largely based on the dissemination of information, which is predominantly electronic activity.

'We are leaning more and more toward technology and what the technology can give us'.

'We are now doing a lot more stuff on the web. Web delivery to customers who are companies, whose finances we run, and web delivery of services to those company clients, which is sort of fattening the relationship up'.

A commonality across the business units is a commitment to client service strategies. All enterprise units are committed to adding value to their respective client relationships, and this strategy forms part of the organisation's overall business culture.

The Internet is considered a strategic tool that could play an even larger role in the organisation's 'value-added equation'.

'As a business we are going to be delivering more and more electronically to clients. There is no question in my mind about that.'

'There are things that a client has to do by law. We constantly value-add by making those tasks smarter, better, quicker, and cheaper'.

E-commerce, the Organisation and Change

Information Technology was described as the organisation's core competence, and consequentially, the biggest influence in the decision-making process. Technology was where the organisation initially started, and to 'keep abreast of the world, which is what the organisation does, there's a lot of focus on developing new technologies'. E-commerce, specifically web technologies, is currently the organisation's biggest development area.
Web enabling technologies, or e-commerce, have brought considerable change in the workflow activities of the respective business units. There has been an increase in the electronic interchange of information, both internal and external, at every operational level, which has streamlined many business processes. Historically, clients were provided with 'hard-lines', a 'classic one-to-many' network arrangement, supporting the business transactions.

'Now we have our global web development.......the webserver is attached to every system that we have in the world. That's a perfect example of how one development can cater for a global requirement, which it does in terms of seamless collaboration between the US, and North America, the UK, and here.'

As the organisation became more globally focused, only minor changes were required in the technology management practices.

'There are certain things that we need to do now that we have got bigger and global. We do Board reporting and we do things like formal reviews, salary planning, and budgets. That's the only thing that's changed in terms of technology management practices.'

There is one exception. The organisation has always managed its own technology infrastructure, but given its global operations; there is now a need to enter into contractual arrangements with third party, 'telco providers'.

'We had some hick-ups, and some teething problems about letting go of that responsibility overseas. We've always done all of our own things, and if something goes wrong - to have a third party - they don't react as quickly as we would like them to in certain instances. That's something that is quite difficult to adjust to.'

As recent participants in the global market, the organisation has adopted various types of e-commerce, strategic relationships, for example, partnerships, alliances, and preferred providers. Alliances were said to be more business driven than technology driven. It's about adding value for all parties concerned - a concept that was said to be 'old, but new'.

It was also acknowledged that, an organisation requires a different approach to business development in a global, e-commerce, market place.

'Anyone who's got a three-year business plan doesn't understand what is happening in the world. Because no one knows what it is going to look like in three year's time'.

In the global market, an organisation needs to be flexible about how it implements its strategies and achieves its objectives.

Within this organisation, global, e-commerce activity has been the driver of change at the structural and cultural level. There is now a 'global management team' that oversees the organisation's global business operations, and most of the business units have been restructured or redefined, so as to reflect the organisation's expanding global activities.

'The way technology is, is that the finance retail investors are getting much more access to international markets so that they can broaden their risk base and their investment strategy much more. We understand what the needs of the markets are. We can see where the technology is going.'
PRELIMINARY FINDINGS

The consensus of the interviewees was that, ‘ShareTradersOnline’ had changed considerably as a result of e-commerce, and its global expansion. This change was considered for the better. However, with respect to Financial Services it was acknowledged that while there had been some change, it had been less dramatic. These changes, although minimal, were considered to be positive. From a technology viewpoint, it was said that the Financial Services business unit was slowly coming to terms with these change driven technologies.

‘Part of the industry that we've been in, - we've come from a banking and accounting industry - people aren't apt to change (technology). So you do have to have a technology arm in those types of businesses to drive that business forward’.

Its legislative framework also binds the Financial Services industry. There is some business transactions that can be done electronically - are physically achievable - but are not legally allowed. Clearly, there are some legislative issues that are impeding the progress of some electronic transactions.

Another factor influencing change is that in many cases the finance businesses that were acquired by ‘ShareTradersOnline’ already had established support departments, which had developed a ‘silo mentality’. These businesses were ‘looking after their local business needs in isolation of any global considerations’. A consequence of this was said to be the fragmentation of the organisation's overall image.

Proposals to establish a global perspective were initially met with opposition from the Finance Services business heads because it entailed changing their organisation structure and culture. With much persistence, the latter end of 2000 saw the elimination of the ‘local’ support departments, in favour of a ‘global’ strategy. Decisions that impinge on the company's overall corporate strategy have been removed from the local operational level. Eventually, the term ‘global’ will be phased out as the corporate strategy focuses on servicing the organisation's international businesses.

SUMMARY AND FURTHER WORK

There are a number of factors attributable to the drivers and inhibitors of organisation change in this particular e-commerce environment. This research has identified the emergence of two very distinct influences, namely, organisation culture and structure and, an industry related regulatory framework. The ability of this organisation to effect change in an e-commerce, global environment appears to be dependent upon these factors. As demonstrated in this study, organisation restructure does not necessarily secure an e-commerce interface. In this instance the transition from paper-based to electronic processing has, to some extent, been inhibited by the controlling framework of the finance industry.

There are a number of other change factors such as global change management, the role of internal company politics, and external influences that require further work. Another emerging issue is the way the strategic planning process is handled given that the company sees the market place as changing very rapidly. These all require further exploration from the case organisation perspective, and will be reported on at a later time.
REFERENCES


The Characteristics of Goods, Web Site Features and Added Value: A Decision Chart

Stephen Burgess and Geoff Sandy

School of Information Systems
Victoria University of Technology
PO Box 14428
Melbourne City MC
Victoria, Australia, 8001

ABSTRACT

This paper describes some exploratory research that is designed to help businesses to maximise the application of Internet technology to add value to their product or service. It uses the type of Consumer Good as a basis to develop a decision chart to help organisations to identify ways of adding value to a Consumer Good using Internet technology. It provides a classification scheme that businesses can examine in relation to their goods. The 'classification path' that they follow leads to the suggested internet features that provide added value for the consumer.

Keywords: Internet; Added Value; Consumer Good; Decision Chart

THE IMPORTANCE OF THE INTERNET

This paper describes some preliminary research that is designed to help organisations to maximise the application of Internet technology to add value to their goods. It incorporates the proposition that the type of Consumer Good can be used as an important determinant of the successful application of Internet technology. The main purpose of the research is the development of a decision chart to help organisations to identify ways of adding value to a Consumer Good using Internet technology. This paper describes the development of the initial decision chart.

The importance of web site design, promotion and evaluation are recognised as being important to a firm's web site strategy. These important issues are not the focus of this paper.

ADDING VALUE USING IT AND THE INTERNET

It has been recognised for a number of decades that the use of computers can provide cost savings and improvements in efficiencies in many organisations. Porter and Millar (1985) have generally been credited with recognising that the capabilities of information technology can extend further to providing organisations with the opportunity to add value to their goods. Value is measured by the amount that buyers are willing to pay for a product or service. Porter and Millar (1985) identify a number of ways that organisations can add value to their commodities or services (known as generic strategies for improving competitiveness). One way is to be the lowest cost producer (an organisation produces a product or service of similar quality to competitors, but at a lower cost). Another way is to produce a unique or differentiated good (providing value in a product or service that a competitor cannot provide or match, at least for a period of time).
IT can be used to differentiate to goods in a number of ways (Sandy and Burgess, 1999):

Quality: this relates to product or service traits (such as durability) that provide a degree of excellence when compared with the goods of competitors.

Product Support: the level of support provided for the product or service. This can include information on how to use the product, product replacement/return strategies, and so forth.

Time: this works on the concept that buyers will pay more for a good that is provided/delivered quickly, or will choose a product of similar price and quality if it is available now over a competitor's product that is not currently available.

Personalisation/Customisation: this is the process of customising/tailoring a product or service to the purchaser.

Other incentives, such as buyer loyalty ('reward') programs.

**ADDING VALUE USING THE INTERNET**

Web site development is often incremental. Many businesses, especially small ones, do not start with a complex web site. Previous research of the authors (Sandy and Burgess, 1999) has linked the types of value added described in the previous section with some typical features found on these different types of web sites.

Table One summarises the link between levels of web sites, web site features (as listed by Burgess and Schauder, 1999) and types of added value.

Table One: Levels of Facilitation of Web Sites and Types of Added Value

<table>
<thead>
<tr>
<th>Facilitation of Web Sites</th>
<th>Internet Feature</th>
<th>Added Value</th>
<th>Example of benefits to Consumer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic Brochure (EB)</td>
<td>Product details</td>
<td>Cost</td>
<td>Lower price</td>
</tr>
<tr>
<td></td>
<td>Information about the firm</td>
<td>Differentiation</td>
<td>Increased assurance about quality and reliability</td>
</tr>
<tr>
<td></td>
<td>FAQ/ Product Usage Directions</td>
<td>Differentiation</td>
<td>Extra product support</td>
</tr>
<tr>
<td>EB + Order</td>
<td>Ordering Capability</td>
<td>Possible Cost Differentiation</td>
<td>Lower price More convenient ordering</td>
</tr>
<tr>
<td>EB + Order Plus Payment</td>
<td>Payment Capability</td>
<td>Differentiation</td>
<td>Faster delivery</td>
</tr>
<tr>
<td>Interactive Publishing</td>
<td>Direct goods download</td>
<td>Cost Differentiation</td>
<td>Lower price Faster delivery</td>
</tr>
<tr>
<td></td>
<td>Personalisation</td>
<td>Differentiation</td>
<td>Individually customised products</td>
</tr>
<tr>
<td></td>
<td>Frequent Purchaser incentive schemes</td>
<td>Differentiation</td>
<td>Extra (loyalty) benefits</td>
</tr>
</tbody>
</table>

2\textsuperscript{nd} International We-B Conference 2001 Page 290
CLASSIFICATIONS OF CONSUMER GOODS AND THE INTERNET

Having established the link between Internet features and added value, this section examines the concept of matching consumer good properties with Internet features.

Peterson et al. (1997) have developed a means for assessing the suitability of the Internet for products and services with different characteristics. Three dimensions of product and service characteristics have been identified:

- **Cost and Frequency of Purchase.** Goods vary from low cost, frequently purchased goods (such as milk) to high cost, infrequently purchased goods (such as a stereo system).
- **Value Proposition.** Goods vary between being 'tangible and physical' and 'intangible and service related'.
- **Degree of Differentiation.** This is determined by the extent to which a seller is able to create a competitive advantage by differentiation.

Peterson et al. (1997) argue that consumers are unlikely to search for a long time for low outlay, frequently purchased goods. They are still likely to buy goods such as wine or milk in a retail store, but will be more likely to buy goods such as stock market quotes over the Internet. This is more likely to be because of the speed in which they can get the goods. The purchase of high outlay, infrequently purchased goods allows the consumer more time to search for them and purchase is likely to occur either traditionally or on the Internet. With intangible or informational products where there is a high degree of differentiation (such as with software packages), the swiftness of delivery by direct download may cause some consumers to purchase over the Internet (Peterson et al, 1997). This classification of a good by 'differentiation' is not the most suitable for this type of exercise, as there are so many ways in which differentiation can occur.

There has not yet been a direct attempt to match the inherent properties of products with specific Internet features. In the remainder of this paper the authors will attempt to achieve this.

Consumer Goods and Types

Economic theory, as found in any introductory text (Samuelson and Nordhaus, 1989; Jackson et al, 1994; Reynolds L G, 1988) postulates a world dominated by relative scarcity. The wants of consumers are unlimited, but the production of goods to satisfy these desires is limited. Thus, the role of an economic system is to provide a mechanism to distribute the limited goods amongst the consumers. A good that is relatively scarce is known as an "economic good". Economists make a distinction between “Consumer’s Goods” and “Producer’s Goods”. The former (which this paper is concerned with) are goods, which satisfy the consumer’s wants directly.

Economists usually identify two main types of consumer’s goods. First, are commodities (or ‘products’) and secondly, are services. Commodities and services are further classified as to whether they are necessities or luxuries. Commodities are also classified as to whether they are single-use or durable-use and whether they are perishable or non-perishable. Figure One depicts the usual classification of goods adopted by economists. It is based on the older, well-respected work of Hicks (1960). The most important property that distinguishes a commodity from a service is that the former is tangible whereas the latter is intangible. Motor Vehicles, spoons, VCR’s and bread are tangible or material goods. Haircuts, train rides, massages and telephone calls are intangible goods.

The notion of single-use is that a commodity is used up in a single act of consumption (foodstuffs, fuel, matches and writing paper are examples). Durable-use commodities are those like furniture, motor vehicles, television and clothing can go on being “consumed” for an extended time period. The fact that they are “consumed” one day does not prevent them being “consumed” the next day and so on. The length of time they can be continually consumed however will vary from commodity to commodity. Each durable-use commodity will have a “normal” length of life before it “wears” out.
Another distinction often made by economists in relation to commodities is to whether they are perishable or are non-perishable. The distinguishing property that is relevant here is whether the commodity can be stored for a long period of time without serious deterioration. Durable-use commodities are usually non-perishable (and will be considered so for this paper), but not all single-use commodities are perishable (such as coal, which can be stored for a long period of time).

CONSUMER GOODS AND THE INTERNET

The "traditional" classification has proved to be a sound basis upon which to classify goods. When investigating whether such a classification is useful for determining suitable web site features with which to interact with consumers, one problem that immediately emerges is a "blurring" between the categories such as the advent of the Internet and digital goods. For example, one area where there is rapid change at the moment is in the area of music. When sold as a recording on a compact disc, it is a durable-use and a non-perishable commodity. When music is downloaded over the Internet, the good is now 'intangible' and therefore a service, but services are by definition single use! 'Downloaded' music can be played over and over again. An extended classification system is therefore needed in these cases.

Classification Issues

The Internet is seen by businesses as more suitable for their sales where the purchases are infrequent. This will generally apply more to non-perishable goods as opposed to perishable goods and to luxury goods than necessities. In the case of a non-perishable good, the consumer is afforded more time to be able to search the Internet for different options. In the case of a luxury good, the consumer is more likely to take more time to examine the available options in deciding whether the good will even be purchased at all. Commodities that are "bulky" (that is, difficult to deliver by traditional mail) or services where personal contact is critical (such as haircuts) are less suitable (or unsuitable) for delivery over the Internet. If a service is information-based, insurance, banking and shares for instance, transactions can be easily performed over the Internet. Among service-based organisations, those that currently receive orders via facsimile should see great potential in the Internet.

Table Two extends Table One to examine some practical examples. It matches the suitability of different levels of facilitation to a good’s inherent characteristics. In applying the table to its own goods, an organisation would determine the characteristics of their goods and then work down the appropriate column to see how each level of facilitation would apply.
<table>
<thead>
<tr>
<th>Classification of Goods:</th>
<th>Tangible Goods</th>
<th>Intangible Goods</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Single Use</td>
<td>Durable Use</td>
</tr>
<tr>
<td></td>
<td>Perishable</td>
<td>Non Perishable</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk, Petrol</td>
<td>Disposable camera, Matches</td>
<td>Car, Cutlery</td>
</tr>
<tr>
<td>Consumer likely to purchase regularly as needed - time is vital</td>
<td>Consumer more likely to 'surf' for various options</td>
<td>Consumer even more likely to 'surf' for various options</td>
</tr>
<tr>
<td>Comment:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product Possibly Likely Likely Likely Likely Likely</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information about the business Possibly Likely Likely Likely Likely Likely</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAQ, product directions Possibly Likely Likely Likely Likely Likely</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ordering Unlikely Possibly Possibly Possibly Possibly Likely</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Payment Unlikely Possibly Possibly Possibly Possibly Likely</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct goods download No No No Possibly Possibly Possibly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gathering personal data Possibly Possibly Possibly Possibly Possibly Possibly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequent Purchaser Incentives Possibly Unlikely Unlikely Possibly Possibly Unlikely</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Levels of Sites, Internet Features and the Classification of Consumer Goods
FURTHER OBSERVATIONS

A number of important observations are derived from Table Two.

Implementation of Electronic Brochure Web Sites

Most organisations that wish to interact with consumers can benefit in some way from introducing the basic electronic brochure web site. A quick examination of Table Two and any number of retail corporate web sites reveals this.

Can the Goods be Downloaded?

In Table Two, the likelihood of intangible goods being downloaded over the Internet is listed as 'possibly', because not all services can be downloaded over the Internet. The main advantage of direct goods download is differentiation by time. The authors contend that this feature should not be introduced without also having online ordering and payment. What is the advantage that is gained by consumers from being able to directly download a good if they are delayed from getting the good by the process of placing the order or making the payment?

What is Convenient for the Consumer?

In Table Two, the likelihood of Tangible, Single Use, Perishable goods being ordered and paid for over the Internet is listed as being 'unlikely'. This is because a consumer is likely to go out and purchase the goods without looking for alternatives. Where goods are Intangible, and Durable (a category introduced to extend the traditional classification), the likelihood of consumers ordering and paying for the goods over the Internet increases. For other categories, the attractiveness of ordering and paying over the Internet is differentiation by time. If a consumer needs to be present (at a retail store or otherwise) to receive and/or use the good, the attractiveness of immediate payment is significantly reduced.

Can the Good be Individually Customised?

There are many ways in which a good can be customised to an individual. The level that a good can be personalised would influence whether an organisation would incorporate the (somewhat expensive) feature of gathering personal data about consumers on its web site. For instance, an online supermarket that sold milk as one of its goods could incorporate added value from such a feature. It could store away regular customers’ standard orders and frequency of orders, making it easier for those customers to order, pay for and receive their weekly groceries. The gathering of personal data enables an organisation to build up a profile of the consumer.

Will Consumers be Purchasing Frequently?

‘Frequent purchaser incentives’ are mainly targeted towards generating customers who will purchase from the organisation on a regular basis. The provision of frequent purchaser incentives is to provide consumers with the motivation to return to purchase more items. This is usually more effective where a consumer is likely to make regular purchases in a short time (more likely with single use items).
DEVELOPING THE INITIAL DECISION CHART

An important component of the initial decision chart (refer Figure Two) is the decision process to be followed when organisations decide upon an appropriate level of web site facilitation.

Premises

The initial decision chart is based on the following premises:

An extended version of economic theory concerning the properties of a consumer good is a sound basis upon which to commence the process.

Most organisations that wish to establish a web site would benefit from at least establishing a site with electronic brochure features as a minimum.

It is best to implement ordering and payment facilities where the good can be sent by mail, delivered or directly downloaded over the Internet.

There are some situations where it may be useful to implement an ordering facility without payment facility.

It is best to implement the feature of gathering personal data where the good can be customised in some way towards the individual.

It is best to implement a frequent purchaser incentive scheme with single use goods where the consumer is likely to order and purchase frequently over the internet.

Features of the Initial Decision Chart

In the chart, the electronic brochure (EB) option is automatically included, as it would be adopted by most organisations that create a web site. The method of delivery is considered, as well as the extent to which the good can be 'personalised' to the individual consumer. The extent to which the good can be customised to the individual consumer is described at three levels: None, Some and Individual. The chart also takes into account situations where an organisation may implement an ordering facility without a payment facility.

The chart provides guidelines for an organisation to consider, serving the purpose of identifying that the feature may be useful. The organisation will need to decide if the particular feature is desirable. The organisation should also be aware that consumers may have different requirements. The chart operates by providing a classification scheme that firms can examine in relation to their goods. The 'classification path' that they follow leads to the suggested internet features. The internet features provide added value for the customer as explained in the examples that follow.

Application of the Initial Decision Chart

The intended use of the initial decision chart can be illustrated with the following examples of consumer goods.

Hairdresser

The core business of a hairdresser cannot be carried out over the Internet. Usually, a haircut is given at a salon.

Assuming that the organisation wishes to have a web site presence, implement the Electronic Brochure. This would include information about the firm, the types of services offered and so forth.

Can the goods be directly downloaded? No.
Can the goods be delivered to the customer? No (in our case).
Do appointments need to be made? Usually. In this instance, the organisation could consider implementing an Ordering facility. Will this provide a competitive edge relative to the cost? The firm would have to consider that.

To what level can the good be customised? To the Individual. The organisation may consider implementing Gathering Personal Data to record individual preferences for styling. They may even make available pictures of previous styles that the customer has had at the salon.

**Figure Two: Initial Decision Chart on the Use of the Internet to Add Value to Goods**

The business needs to assess whether these extra features would be worth the cost of implementing them. Do they have the types of customers that would take advantage of the extra features?
Supermarket

In this instance the assumption is that the service provided by the supermarket is the gathering of a variety of goods (such as food and drinks) into a single location where the customer can gather them in one outing.

Implement Electronic Brochure.
Can the goods be directly downloaded? No.
Can the goods be delivered to the customer? Yes. Consider implementing Ordering and Purchasing. This would be expensive, but the value is provided for the customer that finds the trip to the supermarket an inconvenience. Some supermarkets that currently have an internet presence will deliver to home, work or other locations at a time specified by the customer. This strategy may attract new customers.
Is the good single use and perishable? Some will be and others will not be. The customer's order is likely to be modified (at least in some small way) each time an order is placed. Some of the items will be perishable and the customer will need a regular order to be filled. The organisation may consider a Frequent Purchaser Incentive Scheme to encourage customers to return repeatedly.
To what level can the good be customised? To the Individual. The organisation may Gather Personal Data to record customers' individual preferences so that the regular order can be easily modified by the customer, rather than having to re-enter the whole order.

For some customers a trip to the supermarket may also provide a chance for social interaction. These people would be unlikely to be interested in such a system.

Clothing Manufacturer

The logic presented here could be used for a variety of clothing manufacturers that sell their goods through retail outlets.

Implement Electronic Brochure.
Can the goods be directly downloaded? No.
Can the goods be delivered to the customer? Yes. Consider implementing Ordering and Purchasing.
Is the good single use and perishable? No.
To what level can the good be customised? To the Individual. Consider using Gathering Personal Data to store individual sizes and style preferences.

CONCLUSION

The decision chart presented in this paper should prove useful in assisting firms that wish to add value to their goods by using the Internet. It operates by providing a classification scheme that firms can examine in relation to their goods. The 'classification path' that they follow leads to the suggested Internet features which provide added value for the consumer. Practical examples of how the decision chart may be used for a variety of goods were presented.

The decision chart should prove useful because it identifies and links together a number of important determinants of how, and to what degree, the internet can be used to add value to a consumer good.
REFERENCES


Key Knowledge Matrix – A Tool for Guiding an Intranet Based Knowledge Management System

Craig Valli

School Of Management Information Systems
Edith Cowan University, Australia
E-mail: c.valli@ecu.edu.au

ABSTRACT

Knowledge management systems (KMS) centred around information technologies have to a large degree been ineffective in helping manage knowledge. KMS’s have typically had top-down development methodologies which have proved organisationally and individually constrictive to be effective in the management of knowledge. They have also tended to focus on process rather than practice and have failed to deliver. The systems have also suffered as a result of “knowledge promiscuity” in that very little attention has been paid to what information and knowledge is core and hence warrants entrapment in the system.

A modern, media rich Intranet has great potential to overcome some of the problems of past KMS’s. However, an eclectic, adaptive implementation and maintenance framework must be adopted to suit the individual knowledge needs of a particular organisation.

A review of knowledge management frameworks and implementation literature will be undertaken in this paper. Key determining factors for the effective management of knowledge will be identified from the literature. These factors will then be used to develop an overarching implementation framework. This meta-framework will be bottom-up in design and will drive the factors of an Intranet implementation from a knowledge-based perspective.

Keywords: Knowledge, Intranet, knowledge management, knowledge management framework

INTRODUCTION

Literature is indicating that there is movement toward a new form of economy often described as a knowledge economy. So companies and individuals who wish to remain successful might have to find ways of leveraging advantage in this new knowledge economy (Blumentritt & Johnston, 1999; Fryer, 1999; Kim & Mauborgne, 1999; Pitt & Clarke, 1999; Ruggles, 1998; Teece, 1998).

The movement of “knowledge” to centre stage is now creating new challenges for organisations. No longer is it just tangible products, processes, prices and people from which business profits, but also knowledge. The literature is becoming dotted with explanations as to what knowledge is (Collins, 1993), how to create it (Bajaria, 2000; Krogh, 1998) and how to manage or capture it (Brown & Duguid, 2000; Daniels, Axelsen, Tucek, & Sharma, 1999; Zack, 1999b). However, very few if any provide a suitable framework for the effective implementation of knowledge management and suitable supporting systems.
This paper will propose a framework that is intended for the knowledge management practitioner to effect a suitable, working, integrated system for the effective management of knowledge within an organisation using Intranet and its supporting technologies as the conduit.

**STRATEGY FIRST**

Before we can start managing knowledge we have to have an understanding within our own context as to what knowledge is Blumentritt & Johnston, (1999) state that “Knowledge requires the context of an intelligent medium”. This intelligent medium of course is normally the organisation that processes this knowledge. Therefore, any attempt to manage knowledge should be tied closely to the organisation and its strategy due to its highly contextual nature. Zack, (1999a) makes the point that while many organisations can see the need to effectively manage knowledge, very few if any are effectively doing so and also seem to lack integration of knowledge management with the organisation’s overall business strategy.

To separate knowledge management from the total organisational strategy, would be replicating many of the errors and faults found in the area of information management when it is treated in isolation from corporate and organisational strategy. The proposed framework suggests that knowledge strategy is the overriding or paramount feature and works with what the other necessary organisational components of the organisational strategy namely business drivers, organisational resources – including human and physical, technical and financial drivers must achieve in order to fulfil the knowledge strategy.

![Figure 1: Knowledge Strategy as Key Driver](image)

Due to the extensive use of the Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis in information systems and other business areas (Zack, 1999a) uses a modified SWOT analysis to develop knowledge strategy. The SWOT analysis allows an organisation to identify opportunities for leveraging knowledge to produce and maintain competitive advantage. This technique would be used in this framework to identify the knowledge that the organisation sees as contributing to strategic and competitive advantage. Then having identified these opportunities some cleansing and classification will occur. This classification should occur with all of the key stakeholders involved in the production and use of the knowledge within the organisation.

(Zack, 1999a), having identified the key knowledge through the use of the SWOT, then classifies knowledge as either core, advanced, or innovative.

**Core** - the minimum knowledge required just play the game, does not provide sustainable advantage but does present basic barriers to entry.

**Advanced** - enables the firm to be competitively viable. Allows the knowledge to be differentiated even though the firm may contain the same core generic knowledge is other competing firms.

**Innovative** - is that knowledge that enables the firm to be leaders of industry and competitors and to allow significant differentiation from its competitors.
Blumentritt & Johnston, 1999 creates a framework based around knowledge classified as codified, common, social and embodied.

**Codified knowledge**—is essentially equivalent to information and is readily transferable.

**Common Knowledge**—knowledge accepted as standard, learned through working in a particular context

**Social knowledge**—Deals with knowledge and relationships and cultural issues.

**Embodied knowledge**—tacit knowledge that a person has accumulated during their lifetime. Strongly connected to the individual.

For the purposes of this implementation framework I will adopt the Zack (1999) method of initially classifying data that is internal and external to the organisation. Extending the Zack (1999) framework, as in Figure 2, allows us to identify knowledge and attempt to determine its overall strategic value to the organisation.

![Figure 2: Strategic Value of Knowledge](image)

The Next step is the application of the (Blumentritt & Johnston, 1999) methods of classifying knowledge to further filter the knowledge types within an organisation. This would result in the ability to produce a matrix of knowledge views which I will term the Key Knowledge Matrix (KKM) based on the identified knowledge types according to the (Zack, 1999a) and (Blumentritt & Johnston, 1999) frameworks. An example is given in Table 1 below of a Pizza shop processing an order for a pizza

<table>
<thead>
<tr>
<th>Knowledge</th>
<th>Strategic Value</th>
<th>Zack</th>
<th>Blumentritt</th>
</tr>
</thead>
<tbody>
<tr>
<td>How to use the phone system</td>
<td>Low</td>
<td>Core</td>
<td>Codified</td>
</tr>
<tr>
<td>How to effectively cook a pizza using the “special oven”</td>
<td>Low</td>
<td>Advanced</td>
<td>Common Knowledge</td>
</tr>
<tr>
<td>The recipe for the secret sauce</td>
<td>High</td>
<td>Innovation</td>
<td>Embodied</td>
</tr>
</tbody>
</table>

Table 1: Sample Key Knowledge Matrix

This production of a Key Knowledge Matrix (KKM) using the above table as a the guide should then allow us along with the identified knowledge strategy to select viable and codifiable knowledge to entrap, encode and express in our knowledge management system. By attempting to classify each particular item according to the three examining frameworks it should allow for extensive examination of the attributes and potential worth of that knowledge to the organisation.

Not all knowledge is codifiable or collectable, as it is tacit in nature and therefore often difficult to codify (Zack, 1999b). It is also sometimes desirable that knowledge should not be codified as its increased ability to be readily transmitted and transferred to third parties could diminish any strategic competitive advantage that is gained by possession of that knowledge.

The KKM allows an organisation to use several lenses to view and classify key knowledge within the organisation and make a balanced judgement based on determinants other than its potential for simple codification. The KKM also identifies knowledge areas that need development and growth to further benefit the organisation for instance to take a knowledge item and move it from being low strategic, innovative value to one
that is his in strategic value and innovative. The KKM should become a focal point and de-facto mechanism that refines, reviews and validates the knowledge for the organisation as a whole (Brown & Duguid, 2000; McDermott, 1999) through this process of balance and eclectic view.

One of the other ideas behind this framework is to avoid “knowledge promiscuity” that exists in other knowledge management systems and frameworks. Knowledge promiscuity is best described as the indiscriminate collection of information for no other reason other than it may be of some value, someday, somehow, somewhere. (Brown & Duguid, 2000) see the need for a process of refinement:

"Yet even when individuals fill databases with their own ideas of what’s useful, they aren’t much help either. Often what one person thinks useful others find flaky, idiosyncratic, incoherent, redundant, or just plain stupid. The more a database contains everyone’s favorite idea, the more unusable it becomes."

By classifying, cleansing and gathering knowledge that is aligned and relevant to achieving the outcomes of the overall knowledge strategy the organisation is effectively scouring the knowledge mines and making the knowledge nuggets filter through.

**SYSTEM OPENNESS – KNOWLEDGE OPENNESS**

Information technology has long been seen as the transforming “silver bullet” (Lynne & Marcus, 1997) and appears to have had the same affections when used for knowledge management (McDermott, 1999). This could largely be due to the fact that the systems that were predominantly used lacked anything more than digitisation of the written word and were essentially textual in nature. A modern, media rich Intranet that uses open connectivity and application standards plus a variety of media formats should enable a wider codification and entrapment of knowledge. This has not been possible with traditional information systems and architectures due to their often closed and proprietary nature.

Knowledge that was hard to codify using traditional written text and database systems can now be encoded using technologies such as streaming sound and video. This enables a modern Intranet to store information that is more tacit and contextual in nature than with conventional text based systems (Roberts, 2000). For example the procedure to assemble a particular organisational artefact can be readily demonstrated using a video-based approach. But the same codification using text-based systems is nearly impossible to codify and could be prohibitively expensive in terms of actual production costs.

Also the translation from what actually should physically occur such as colour, tone, smell etc into text or language often results in a loss of the tacitness – e.g. nuance and richness associated with it. The use of media rich technologies such as video and streaming audio can go some way in alleviating some of these problems. For example when tempering tool steel, the steel has to be heated to what is termed a cherry red colour. Simple enough, but as everyone’s concept of cherry red can be different would this knowledge not be better transferred through the use of video or still colour images than the simple text description cherry red.

The use of an Intranet offers a wide range of tools and communication media. If properly deployed an Intranet can enable a seamless integration with legacy systems which (Davenport, DeLong, & Beers, 1998) highlighted as a success factor in knowledge management systems. These systems should also be common and pervasive for computation and communication (Davenport et al., 1998) within the organisation. In the case of modern networked desktop PC, whose most popular operating system is Microsoft Windows which contains a bundled Internet Web Browser as part of the software, the web browser is about as pervasive as it gets.

**MATCHING THE MATRIX TO THE MEDIUM**

Having produced the Key Knowledge Matrix (KKM) the next step is to match the KKM with appropriate supporting technologies for the codification of this knowledge. Where possible, as many ways of codifying and storing this information as is practicable should be undertaken. (Davenport et al., 1998) states “Successful knowledge managers recognise that knowledge is transferred through multiple channels that reinforce one another”. People acquire and process information and knowledge in a variety of ways and have a variety of learning orientations and cognitive styles. This diversity of learning and cognitive styles is recognised by offering the information and knowledge in as many different signal forms as possible. By offering the knowledge
and information in a variety of ways in a modern, media rich Intranet the chance of effective transference of knowledge should correspondingly improve.

By offering a multitude of knowledge and learning options you are also catering for the many levels of understanding and skill that would exist within an organisational context. For example something that may seem simple and routine to one highly skilled person may be highly difficult for one lesser skilled or novice person within the organisation to accomplish. Hence as a result a higher skilled person may simply need to read a FAQ posting to extract the required knowledge, whereas the novice may require higher detail and possibly be aided by the use of say an on-line video demonstration of the technique.

Identification, codification and storage of knowledge are vital parts of a knowledge management system but equally important is a review and retirement schedule. Knowledge eventually dates and either needs review or retirement from the knowledge base – in the same way that a traditional librarian culls a collection the same principles must be applied to a knowledge management system. Knowledge codified and stored should have a review procedure built-in to remove redundant or irrelevant data.

Organisational aspects of the Matrix

The need for project champions is well documented throughout the regular IS literature (Beath, 1991; Edwards, 1996; Pinto & Slevin, 1989) and appears in some of the knowledge management literature (Davenport et al., 1998). For any knowledge management system to survive there must be a driving junta or at least knowledge knight. The introduction of a knowledge management system has far reaching organisational aspects that affect how people work and share knowledge and for a lot of organisational contexts knowledge redistribution can produce some quirky behaviours (Brown, 1994; Davenport, Eccles, & Prusak, 1992; Pfeffer, 1981). Hence the need for the “project champion” and at least recognition from the organisational hierarchy.

Where possible some of these effects should be identified through an internal SWOT analysis and be documented. The experiences (Robey, 1979; Robey, Smith, & Vijaysarathy, 1993; Szajna & Scamell, 1993) gained from implementation of systems indicate the need to maintain a positive, proactive posture to maximise project success. Proceeding formal documentation the results of the SWOT should be analysed and procedures and policies taken to maximise positive outcomes and minimise the potential negative effects.

A lot of previous knowledge management systems have suffered from a top down, regimented, non-consultative approach. The KMM is designed to be a consultative tool that also draws from existing communities of practice (Storck & Hill, 2000; Wenger & Snyder, 2000) within an organisation. This allows the key users of the knowledge to be part of the knowledge arbitrage as it were and should lead to knowledge that is selected to be at least relevant and required (Brown & Duguid, 2000).

Financial implications

There is little point in pursuing a knowledge management strategy when there is no financial backing of the project beyond the initial project. This framework is not concerned overly with benefits realisation, or other benefits measures methodologies and techniques. It is primarily involved with the ability of an organisation to sustain the knowledge management strategy.

Implementation of the knowledge management strategy may require the acquisition and usage of extra resources beyond what an organisation already utilises in their day-to-day operations. These sorts of resources include physical goods such as servers, hardware and software and the often forgotten human resource. A solid financial model and sound analysis of these financial requirements should be undertaken before the decision is made to move to implement the knowledge management system.

Many of the financial measures will be salaries, wages and equipment and the “figures” alone will seem to be revenue negative. However, for a balanced financial picture some cost benefit analysis and evaluation of intangible benefits and opportunity costs of not pursuing the strategy should be included in the analysis.

There may be some flow on effects from the organisational implementation SWOT in terms of rewards for organisation members.
Business Drivers

The need to move to a notion of knowledge based business is quite simply one of remaining competitive in the evolving information or knowledge economy (Blumentritt & Johnston, 1999; Fryer, 1999; Kim & Mauborgne, 1999; Pitt & Clarke, 1999; Ruggles, 1998; Teece, 1998). However, the type of business to a large degree will also determine the strength and completeness of the knowledge strategy needed. If your business is simply the manufacture of a generic raw product or provision of a generic labour or service then the amount of knowledge management required will differ from that of a leading edge or entropic profession such as IT. For example we will use the building of brick wall i.e bricklaying principles to a large degree have not changed much from the time of the Pharaoh's – however the engineering, architecture and underlying skills and technologies associated with brick laying have.

Business drivers and market forces will also affect to a large degree the “worth” of your knowledge and it is important that the (Zack, 1999a) use of the SWOT scan of the external and internal environments be used. A recent example is the Y2K phenomenon, COBOL was long buried as a computer language then along came Y2K and the value of that knowledge dramatically increased prior to Y2K rollover. But now once again the dust would be settling on that COBOL code manual.

Knowledge like most things degrades as a result of business changes. This resultant degradation changes the strategic value of the knowledge in that it progress from being Innovative to Core knowledge and as such will take on a higher operational importance within the business.
THREADING IT ALL TOGETHER

The previous parts of the paper addressed some of the key issues and concepts that the Key Knowledge Matrix (KKM) should address using the Intranet as the delivery tool. The implementation of the KKM is seen as an interactive and iterative process that is constantly evolving.

The following is an outline for the KKM implementation process

Knowledge SWOT – this involves the use of a SWOT of the external and internal knowledge sources to try and determine the types of knowledge that the organisation processes.

Knowledge Classification – this involves the use of the KKM to classify the indemnified knowledge that is used within your organisational context. This matrix should be used as a tool that provides a multi-view framework for the identification of key knowledge assets and deficiencies within the organisation. The matrix should be used as a consultative tool led by project champions that involve existing communities of practice and practitioners within the organisational context.

Matrix and Media – this is where identified knowledge sources are matched with appropriate mediums for effective delivery. This should be across a wide range of alternatives utilising appropriate Intranet technologies such as text, audio, video, graphics, interactive chat, integration with legacy systems, etc.

Organisational Oversight – identification of organisational impacts of the new knowledge strategy should be taken into account. The possible effects and benefits should be mapped and identified as much as practicable in an effort to maximise benefits and minimise downside.

Financial Focus – having identified the knowledge and the method of delivery financial feasibility has to be determined. This is done by adequately resourcing the initiative and the full production of cost and delivery schedule. Incorporation of benefits management will be largely determined by the organisational focus. Due to the ubiquitous nature of knowledge as a resource intangible benefits will have to be balanced off against hard financial measures to justify the financial investment.

Deployment – Assuming that there is general agreement to go ahead then deployment should occur.

After an appropriate amount of time, depending on the complexity of the whole deployment process, the KKM should be revisited, re-evaluated, redefined and redeployed. This is to ensure that the overarching knowledge strategy is aligned with strategic business direction and key strategic drivers for the organisation. By doing this you should lessen the chance of strategic drift from a business and knowledge perspective.

CONCLUSION AND FUTURE DIRECTIONS

By using an iterative, consultative process based around the eclectic Key Knowledge Matrix (KKM) that promotes the active identification of what types of knowledge an organisation possesses, requires and retires it is hoped that effective knowledge management will start to occur. To promote one singular view of knowledge, its structure, its interpretation and its implementation as the “right one” is simplistic and evokes visions of Lang’s Metropolis, Orwell’s 1984 or Huxley’s – Brave New World. People acquire, store, retrieve and process knowledge and information in varied ways and as such the knowledge management strategy and a resultant system should be reflective of this.

The outlined process and KKM outline here is going to be piloted as part of an action research project in an organisation of 12 staff that is the communications and knowledge hub for its some 6500 members. They currently have no formal knowledge strategy, Intranet implementation or system other than traditional documentation and filing repositories which they readily admit need major revision and review. They have large amounts of explicit and tacit information that need effective management from internal and external perspectives. This will hopefully deliver some invaluable feedback on knowledge management strategy and the role that a modern Intranet can play in effecting one.
REFERENCES


Authentic Assessment for Multimedia-Centric e-Business

Ken Ireland1, Pina Tarricone2 and Joe Luca3

1 School of Communications and Multimedia
Edith Cowan University
E-Mail: k.ireland@ecu.edu.au

2 School of Communications and Multimedia
Edith Cowan University
E-Mail: g.tarricone@ecu.edu.au

3 School of Communications and Multimedia
Edith Cowan University
E-Mail: j.luca@cowan.edu.au

ABSTRACT

This paper outlines the rationale and course design strategy used for creating an E-Business Planning course, developed for final year multimedia students, who have no previous instruction in business planning concepts. The pedagogical underpinnings of the course is based on authentic assessment, which is used to promote motivation and interest for a group of students who have no real interest in business and costing principles.

This is the third evolutionary development of the unit. The revised design criteria for the unit outline now reflect the pedagogy needed to satisfy the changing requirements demanded by multimedia-centric e-business, as promoted by industry and government.

Keywords: Electronic Commerce, Authentic Assessment, Higher Education

INTRODUCTION

"As we enter the third millennium we experience one of the most important changes in our lives – the move to an Internet-based society. Almost everything will be changed at home, in school, at work, in the government—even in our leisure activities. Some changes are already here and they are spreading around the globe. Others are just beginning. One of the most significant changes is in the manner we conduct business especially in how we manage the marketplace and commerce."

As reflected by Turban et al. (2000), the exponential increase of Internet usage is demanding that businesses update their skills and re-engineer their products and services to meet new competitive demands in both local and global markets. Training is needed to support these changes that require equipping a wide range of business operators with new skills in business planning and information literacy. However, these demands are raising critical issues for educators. What disciplines should offer these courses – computer science, multimedia, business, engineering, others? What teaching and learning strategies should be used to motivate students to learn content which is “outside” their discipline area eg computer science students learning about business planning? How can tertiary institutions keep these courses up-to-date with technology and business needs?
In Australia, the government is actively trying to promote the uptake of E-commerce business planning. The Department of Communications, Information Technology and Arts (1999) has identified that the Federal government must target existing barriers for the development of E-commerce and promote the integration of E-commerce into business. Otherwise, business and the economy at large will suffer long-term consequences. This is supported by the Department of Industry and Tourism (1998), who contend that E-commerce has the potential to transform the economy more rapidly than the industrial revolution! These predictions and impending changes have serious training ramifications. How can large numbers of business operators be quickly trained in on-line technology? How can E-commerce strategies be quickly implemented by business to take advantage of this new revolution?

In order to meet these changes in a timely manner, training and skilling of both the existing work force, and of new students entering the business environment is required. University courses spanning over three years duration will not provide the body of knowledge or skills needed by Australian business to compete in this rapidly changing marketplace. Graduating students need timely courses to bring them up-to-date with changes in technology and provide them with skills to manage electronic commerce, business practices and online marketing processes. Training and development courses also need to provide ongoing collaboration and mentoring with industry to ensure the knowledge acquired is current and relevant (Mitchell, 2000).

CONTEXT & BACKGROUND

The unit IMM 3329/4329 “Multimedia Business Solutions” is a final year, final semester unit taken by both under and post-graduate students in the Multimedia course at Edith Cowan University. The unit is intended to develop student expertise and knowledge about E-commerce business planning, and how students can effectively use this knowledge to create more business centred web sites.

In September 1999, a group of ninety, second year multimedia degree students from Edith Cowan University completed a two-week intensive E-commerce business-planning course. They had no previous instruction in business planning and minimal understanding of E-commerce issues. Participants were required to develop an E-commerce business plan, which could be sustained economically by a business to sell products in an on-line environment. The course was subsidised by the Office of Information and Communications (OIC), which is part of the Department of Commerce of Trade, a Government department in Western Australia. Dow Digital (an E-commerce and on-line services consultancy and development company) developed the course and was subsidised to run it at Edith Cowan with a view of evaluating its effectiveness for university graduates in Australia, as well as how it could be implemented in third world countries. A questionnaire was designed to elicit student and industry views on the value of the course (Luca & McLoughlin, 2000). From feedback gained from this study, a number of conclusions were made:

- a two week intensive course was too short;
- the course is better suited to final year, final semester students;
- teams should be involved in developing more authentic business plans;
- team size should be no greater than four; and
- students needed more help on creating budgets using spreadsheets.

On the basis of this feedback, a full semester course was developed and implemented for final year, final semester multimedia students. At the end of this course (Semester 2, 2000), students were interviewed and questionnaires given to all participants in an attempt to evaluate the course. There was unanimous agreement that the course provided information and ideas that would help them gain employment, and also generate ideas for their own businesses. The main criticism of course was focused on the lack of support for business-planning and accounting concepts coached in authentic or “real” activities.
AUTHENTIC ASSESSMENT

Authentic activities based on constructivist principles are essentially real contexts and situations that promote problem solving and higher order thinking skills. Authentic activities are real world tasks that provide students with opportunities to develop the knowledge and skills needed for specific contexts, even specific jobs and roles. Barab et al. (2000a), Land & Hannafin (2000, p. 13) explain that "...learning occurs naturally as a consequence of the learner recognizing knowledge's practical utility as well as the need to use it in an attempt to interpret, analyse, and solve real-world problems."

Immersing students in real world contexts such as authentic tasks promotes the development of workplace readiness skills. Students expect more from their university courses than in the past. These expectations include developing real skills and knowledge that can help them gain employment in the industry of their choice. The course they choose at university is essentially the vehicle that will enable them to gain employment. Students also expect that what they actually learn at university reflects the real world. The real world being the knowledge and skills gained at university reflects the expectations of employers and provides students with highly specific industry skills. Truly authentic activities enable students to gain the necessary employable attributes and the ability to transfer their learning to real world problems. Traditional pedagogy generally only provides students with isolated concepts delivered by didactic teaching practices. In traditional pedagogy, learning activities are not based on immersing the content into an authentic real world context, but rely upon direct delivery methods such as lectures to impart content knowledge, which is generally isolated from reality.

What may be an authentic activity to one student may not necessarily be authentic to another. Petraglia (1998) explains that "the task of balancing a cheque book, for instance, may be an authentic task from the perspective of a 21-year-old but we would question its authenticity from the perspective of a 5-year-old. But more to the point, even among 21-year-olds, for whom we believe the task should be authentic, there are some who will find any given lesson in personal finance irrelevant, inaccurate, or otherwise inappropriate."

The effectiveness of authentic activities, whether they are learning designs such as problem-based learning, case-based learning, inquiry-based learning or project-based learning environments depends upon the motivation, student engagement in the activity and successful delivery. Teachers may consider just the use of any of the above learning designs as essentially authentic but the context and relevance of the activity, especially to the students, determines its authenticity. The student may not necessarily perceive the teacher's perception of authenticity in the same way and what the student perceives to be authentic may not be authentic to the teacher (Petraglia, 1998, Barab & Duffy, 2000a).

Barab et al. (2000b) support this by explaining that authenticity relies on learners perceptions of the practicality of the learning environment they are immersed in and their perceived value of these activities relative to their goals and the real-world. Learner's perceptions of the real world are crucial in determining the relevance and therefore the authenticity of the learning task. Authenticity is then reliant on the dynamic interactions among the various components of learning environment – the task, the learner and the expert.

For students to be able to cope with authentic activities it is necessary that they have developed essential knowledge and skills that they can apply to the activity and which forms a basis upon which they can build additional higher order skills whilst immersed in a real life context. Perreault (1999) explains that novices can still be given authentic activities but the activities can be limited to exercises and discussions that used realistic examples. Using realistic examples during student's development of basic essential knowledge and skills helps them become aware of realistic applications of their knowledge. Petraglia (1998) believes that the essential element for the success of authentic activities is the relevance to the learner. Engaging and stimulating student interest is essentially the importance and attractiveness of the motivational strength of authentic activities. Authentic activities are only a powerful engager if students deem that the activity holds relevance and provides knowledge and transferable skills to help in the pursuit of employment and career opportunities.
If students are motivated to gain as many employable skills and the knowledge to be competitive in the job market then authentic activities would be an effective pedagogy to be adopted for this particular university unit - IMM 3329/4329 Multimedia Business Solutions. The focus of the unit is to provide students with real life opportunities to develop expertise and knowledge in e-commerce business planning to effectively produce functional business web sites for real clients.

In design learning activities for the unit a fundamental question was asked - How and what types of learning activities do we create that will motivate students who are not really interested in business and accounting type concepts? Essentially students enrolled in this unit are multimedia majors who are mainly interested in creating effective multimedia, as individuals and in cooperative and collaborative teams. Business and accounting concepts were generally not considered by students as part of the knowledge and skills they would need to find employment in multimedia. Providing students with authentic activity that immerses them in designing e-commerce web sites and developing effective business plans within a project-based learning design was seen as solution. Teaching students costing concepts and how to prepare a business plan were seen as the necessary scaffolding they would need to effectively immerse them in the project and to help them see the relevance of these concepts to the real world of e-commerce. Teaching of these concepts and skills, in the context of an authentic project would provide a real context to the concepts, which generally are taught using traditional didactic pedagogy. Students would then be able to see the relevant of these costing concepts and business planning, in meeting the needs of their real clients.

Essentially we felt project-based learning would provide an environment that would engage students in the process of designing and creating e-commerce business plans to meet client needs. Project-based learning lends itself to cooperative learning, enabling students to discuss, explore and test ideas/concepts supported by a team environment. Project-based learning environments are considered authentic in nature and provide a learning environment that stimulates and encourages students to construct their own knowledge and pursue their own interests resulting in the creation of realistic products (Moursand, 1998).

**Characteristics of project-based learning include** (http://guzdial.cc.gatech.edu/repp/draft.html):

- **Integrative** - project-based learning draws upon a variety of knowledge and skills and does not necessarily focus solely on a particular limited piece of content.
- **Authentic** - project-based learning is an authentic activity that can relate to a real context and in this case real clients.
- **Product and Process** - project-based learning requires students to apply their own investigative, planning, designing, evaluation and production strategies to successfully satisfy their interests and create a real product.
- **Collaborative and co-operative** - students work in teams calling on a number of skills including negotiation, communication and social skills.

Using an authentic activity such as project-based learning enables us to incorporate all of the essential components of an integrated, real life client focussed task.

**COURSE DESIGN OVERVIEW**

How best to implement courses like these to promote motivation for students who are not really interested in business and accounting type concepts, is not an unusual question to ask in the changing world of multi-skilling and cross-skilling needed today. This generic problem of an educational need that does not "fit in the box" requires four important facets to be addressed by the university teaching and learning planners, when looking at Multimedia e-Business Solutions:

- A pedagogical framework and learning design that achieves a high level of motivation of the students.
- An authentic assessment using real-life examples and assignments, and dynamic interaction with industry practitioners.
- An emphasis on digging for good feedback and solid facts derived from quantitative web metrics.
- An understanding of the need for integration of the front-end web design with, for example, ERPs and CRMs, and all the other components of e-business.

A good IT project manager, does not need to be a top-gun programmer, but does need to have a respectable overview of the spectrum of disciplines that make up the intellectual horsepower of his IT project team. In the same way, a successful multimedia graduate needs to be not only aware of the changes in multimedia-centric business technology, but also be provided with skills to manage electronic commerce, business practices and
online marketing processes, without necessarily being a certified practising accountant. The model we shall be using in semester 2, 2001 is based on the following course design criteria:

Each weekly lecture includes a real world business case that provides an authentic exemplar of the aspect of e-business covered in the lecture material;
A discussion session at the end of each lecture reviews whether the relevant e-business issues were resolved in the real world business case presented, and importantly, how those issues were resolved in that business case;
Each weekly lecture is followed by a 2 hour laboratory tutorial, tutored by full time e-business professionals from industry;
The laboratory tutorial exercises utilise real world e-business examples specifically selected to illustrate key concepts, and in particular, to illustrate the processes (as per Napier et al, 2001) involved with planning, starting, and marketing a new e-business;
The weekly lectures include contextual guest lectures from visiting industry professionals;
The lecture and laboratory series include supplementary and optional case studies to challenge and motivate the students into widening their on-line research activities;

The learning outcomes include specific goals such as:
understanding different e-business models (Kalakota & Robinson, 2001);
exploiting e-business opportunities (Plant, 2000);
developing an e-business plan (Napier et al, 2001);
developing guidelines for an e-business start up (Napier et al, 2001);
understanding management issues such as HR, operating and capital costs of the business (Plant, 2000);
identifying risk management and security issues in e-business (Kalakota & Robinson, 2001);
understanding the importance of web design and the associated costs (Buytendijk & Janowski, 2001); and
integrating the web site “front end” to the enterprise “back end” planning eg ERPs, CRMs, purchasing, invoicing, and credit and debit control issues (Napier et al, 2001).

The students to work in project teams of 4 to produce a real business plan for a real client, as a project for formal presentation to industry in a competitive environment with MIS students and themselves, towards the end of the semester;
Presentation night will have a few hundred people. This event will be facilitated by a $10,000 grant from the Department of Commerce of Trade to promote the competition;
10 teams will be selected for the final presentations from about 35 teams (20 teams from Multimedia Business Solutions and approximately 15 teams from Management Information Systems);
Sponsors have been selected to give the project team with the best e-business plan a prize;

This set of course design criteria will provide an authentic assessment environment for e-business planning for a multimedia business solution.
CONCLUSION

The move towards on-line commerce, entertainment and education is spreading rapidly with a decreasing supply of skilled operators who understand the business and technological aspects of this new paradigm. Government, industry and educational institutions must work together to keep up with these changes and add value to courses, in which final year students will be motivated to achieve through authentic learning designs and assessment.

At Edith Cowan University, we have adopted these principles to create an authentic learning environment that meets the needs of students, industry, and government. The unit outline developed includes learning outcomes that reflect this strategy by incorporating real world activities with an e-business planning focus. A successful multimedia graduate will be not only be aware of the changes in multimedia-centric business technology, but also be provided with skills to manage electronic commerce, business practices and online marketing processes, without necessarily being a certified practising accountant.
REFERENCES


The Design, Development and Implementation of An E-commerce System for Procuring Materials In Construction

Stephen Kong¹, Heng Li¹, Peter E.D. Love² and Matthew Warren³

¹Department of Building & Real Estate
Hong Kong Polytechnic University
E-mail: bshengli@polyu.edu.hk

²Schools of MIS
Edith Cowan University, Australia
E-mail: p.love@ecu.edu.au

³School of Computing
Deakin University, Australia
E-mail: m.warren@deakin.edu.au

ABSTRACT

This paper presents an E-commerce system that is being used for construction material procurement. The paper identifies the limitations relating to information retrieving, recording and sharing in the traditional material procurement process. E-commerce applications that can improve the efficiency and effectiveness of the material procurement process in construction are then identified and described. Finally, the design and implementation of an E-commerce system for construction material procurement for trading construction materials in China is presented and discussed.

Keywords: E-commerce, Web, electronic catalog, bidding system, material procurement

INTRODUCTION

The value of materials that are required to be purchased and used for any construction contract make up a large proportion of a project’s total contract sum. Typically, materials account for 40% to 45% of the cost of all construction work (Andrew et al., 1998). Maintaining an efficient and effective material procurement system as well as procuring materials at the right price, quality and time are essential for contractors remain competitive in today’s environment. The emergence of Internet technology has enabled information to be shared and exchanged through a common global network in an efficient and relatively low cost environment. Many companies are now conducting their business using a Web-based E-commerce system. In fact, it is has been suggested that E-commerce can provide a win-win situation for both suppliers and buyers, as E-commerce can provide an expanded marketplace within which buyers and suppliers can communicate directly with each other (Cheng et al., 2001). Online construction trading markets are not limited by the physical limitations of store spaces and can carry a much larger variety of products, which can range in style and size. At the same time, buyers can search through a wide range of products with low transaction costs at any time convenient to them. More importantly, direct communication between buyers and suppliers will eliminate the multiple middlemen that often exist between suppliers and buyers. Consequently, products can be purchased at lower prices and delivered quicker to the purchaser (Bakos, 1991).
This paper presents an E-commerce system that is being used for construction material procurement. The paper identifies some problems relating to information retrieval, recording and sharing in the traditional material procurement process. E-commerce applications that can improve the efficiency and effectiveness of the material procurement process in construction are then identified and described. Finally, the design and implementation of an E-commerce system for construction material procurement for trading construction materials in China is presented and discussed.

THE TRADITIONAL CONSTRUCTION MATERIAL PROCUREMENT PROCESS

In a traditional contractual environment, the contractors' procurement of materials commences at the tender stage when the design of the project is finished. The main concerns of material procurement are the provision of the right materials at the right time, in the right place and to an agreed budget such that progress on site is uninterrupted (Canter, 1993). Figure 1 depicts the activities and their sequence in a typical material procurement process. After receiving the tender documents, contractors invariably start estimating and send out enquires to their selected suppliers. When quotes are received from suppliers, contractors will select the best quotes and complete the tender documents. If contract is awarded in the later stage, the purchasing function will re-confirm the validity of the supplier's original quote or negotiate a revised price for materials. Once a suitable supplier has been selected, the next step in the purchasing process is to raise and issue a purchase order to the supplier, which will constitute a legal contract when the supplier accepts or acknowledges receipt of the order. In effect the order becomes a written commitment to accept and pay for goods under an agreed set of terms and conditions. Orders will be tracked until materials are received and checked on site.

![Figure 1: Typical material purchasing sequence](image)

Tender Stage

- Tender Receipt
- Estimating
- Look for Suitable Materials
- Send Out Enquires to Suppliers
- Quotes Received
- Analyses
- Selection of Best Quotes
- Tender Prepared and Submitted

Post-contract Stage

- Contract Awarded
- Re-enquiry and Negotiation
- Supplier Selection
- Order Placed
- Progress Measured
- Records Kept

Figure 1: Typical material purchasing sequence
Information Flow in the Material Procurement Process

From the requisition of quotations at the tender stage to the actual receipt of materials and signing invoices, different paper-based documents are produced, copied, passed and referenced by different groups of participants in the traditional material procurement process. During the tender stage the estimating teams of contractors obtain construction materials information from physical catalogs of suppliers. Based on these catalogs they compare and select suppliers and send enquiries to and receive quotations from the selected suppliers. Figure 2 shows a typical paper-based document system of a purchasing function during the post-contract stage of a project (Calvert, 1995). In this paper-based document system, the site office prepares two copies for the requisition of materials. One copy is sent to the buying department and one copy is filed. The buying department then prepares four copies of the purchase order. One copy is sent to the selected supplier and the site office, the accounts department and the buying department keep the remaining copies for their records. The site office will receive an advice note and invoice issued by the supplier when materials arrive on site. The invoice will be compared with the purchase order by the buying department and after confirmation, be passed to the accounts department to issue payment.

Figure 2: Paperwork required in the purchasing system

Limitations of Traditional Material Procurement Process

It is proffered that the traditional material procurement process has the following limitations. First, this process has specific business hours and can only work with suppliers within a defined geographical region. In addition, the traditional process can only collect limited amount of information about the suppliers and their products through the collection of physical catalogs. Physical catalogs are cumbersome to use, and require large storage areas. They also become dated very quickly, and make searching and comparison of prices and quality a nebulous task. These disadvantages make it increasingly difficult for contractors to stay abreast of market conditions and thus select the most suitable materials and suppliers for a given project. Additionally, the paper-based transaction system that is commonly used within the realm of the traditional process of material procurement is time-consuming (and thus non-value adding). As mentioned above, copies of different documents are produced manually and are used by different parties in the material procurement process. The probability of error increases as information is transcribed from one document to another. Although paper documents can be re-typed into a computer-based environment, data entry of document...
information requires multiple transcriptions of the information. Consequently, such process can result in the introduction of additional errors to the system. Furthermore, the paper-based system is also dependent on ensuring that all appropriate departments obtain copies of the documents necessary to do their job. If a small percentage of those documents are lost or misplaced, there can be gaps in the system and orders may go unfulfilled.

**E-COMMERCE APPLICATIONS**

E-commerce refers to business activities involving consumers, manufacturers, service providers, and intermediaries using computer network. Electronic data interchange (EDI) has been used to forge automated linkages between the buyers and suppliers to transmit orders, receipts, and payments electronically. Studies have shown that using EDI for linking with so called ‘channel partners’ can help reduce processing, cycle-time, improve accuracy, and create strategic value (Mukhopadhyay, 1998). However, EDI requires the support of private lines or value-adding networks (VANs) and relies on software that can incorporate varying formats, which limits its coverage. Moreover, EDI requires significant investment to facilitate trading among business partners, especially when contractors have to deal with a large number of suppliers, which are invariably different for each project. The costs associated with EDI can be further exacerbated when sources of construction materials are geographically remote.

Web technology can be used to overcome the system incompatibility problem of EDI by encapsulating enterprise systems as object components, made accessible by standardized interfaces, and standardised protocol for transmitting documents between these components through the Internet (Gek, 2000). The Internet provides a transparent means of communication between the buyers and suppliers. Users only need to know the address of the other party. Even though the Internet is a complicated network of switches, communication lines, software, and equipment, it is of no concern to users. The key to this simplicity is the separation of the various user organizations into islands with their own Internet networks connected to the islands by a common protocol (Andreoli et al., 1997). The standardization of network communication technology has significantly reduced the cost for installing a Web site and the unit cost for information transmission also becomes virtually negligible. Web technology thus enables contractors and suppliers to trade construction materials online easily with low transaction cost and to eliminate errors existed in the paper-based document system.

E-commerce as a proliferated business practice has at least four types on the Internet: off-line order off-line delivery; on-line order off-line delivery; on-line order on-line delivery and off-line order on-line delivery (Liang and Huang, 2000). For the off-line order, off-line delivery type, information is available from the Internet, but both ordering and delivery are executed off-line. The on-line order, off-line delivery type of E-commerce system provides on-line information for products and also allows users to make orders on-line. Once ordered, the product will be delivered off-line. In a on-line order, on-line delivery E-commerce system, information for the products is provided on-line, and users can order the products in the system. Once ordered, the products or services will be delivered to the customer on-line. The off-line order, on-line delivery type of E-commerce requires customers to make orders in the traditional way, but the products or services is delivered through the Internet.

Among these four types of business practice, off-line order off-line delivery and the on-line order off-line delivery types are applicable in developing E-commerce systems for construction material exchanges. However, as the off-line order off-line delivery type only makes available information related to material and suppliers on the Internet, both ordering and delivery are executed off-line. This type of E-commerce cannot overcome all the problems that exist in the traditional material procurement process. It would appear however that the on-line order off-line delivery type, however, is more useful, as this type of E-commerce system makes both product information and ordering through the Internet available. Once the user completes the ordering, the ordered products will be delivered off-line to the user. The on-line order off-line delivery type is selected as the basis for developing our E-commerce system for supporting construction material procurement process, as this type can improve
the efficiency of information transfer during the ordering procedure in which all parties can communicate and share information via the Internet.

In most construction material trading circumstances, there are three major players: buyers, suppliers and agents (brokers). Buyers are customers who purchase certain materials and products. Suppliers are products and/or services providers. Agents are intermediaries who help the buyers and suppliers to complete a transaction. The buyer and supplier must exist in any trading, while the agent exists only in certain trading situations. A good E-commerce system should support various trade situations. In the next section of the paper, some major trading situations are discussed, which is followed by a description of an E-commerce system designed for construction material trading.

TRADING SITUATIONS AND SYSTEM DESIGN

By discussing with professionals involved in construction material procurement, the authors have identified the following four trading situations frequently encountered in construction material trading. The four trading situations are bargaining, bidding, auction and contract.

Bargaining is a trade situation in which the buyer negotiates with the supplier until an acceptable deal is reached. Usually, the buyer finds a supplier, examines product price and other terms, and negotiates in order to obtain a better deal. If the deal fails, the buyer finds another supplier to bargain again until the buyer is satisfied with the deal.

Bidding is a trading situation that involves a buyer and many potential suppliers. The buyer compares the received bids and chooses the best one. A typical bidding process includes the following steps: the buyer firstly calls for bidding after determining the specification amount and base price; bidders then submit their bids; the buyer chooses the best bid; at last the buyer pays for and the winner delivers the products and/or services.

Auction is a trilateral trading situation that involves a supplier, many potential buyers and an agent who handles the auction. The buyers bid sequentially to compete for the object to be sold. A typical auction process includes the:

- supplier determines the bottom price of the object to be sold;
- agent announces the object and calls for an auction;
- potential buyers assess the value and bid for the object sequentially;
- agent chooses the buyer who offered the highest price which is also higher than the bottom price; and
- winner pays and the supplier delivers the object. Commission fees are paid to the agent.

Contract is a trading situation in which both buyers and suppliers are constrained by a set of mutually agreed rules. If there is no contract, then both sides need to negotiate for an agreement. If a contract already exists, then ensuring accurate implementation of individual orders under the regulation of the contract becomes the primary concern. A typical trading process under contract often includes the:

- buyer informs he supplier to deliver certain products or services,
- supplier confirms the request, and
- buyer pays and the supplier delivers the products and services according to the contract terms.
An E-commerce system for assisting product procurement creates electronic links between suppliers, buyers and agents (Sirinivasan, 1994; Wang and Seidmann, 1995; Choudhury and Konsynski, 1998). These links can be organized in different ways. As shown in Figure 3, buyers and suppliers can either form direct connections without any intermediary (a), with intermediaries (b), or acquire the products through electronic markets (c) (Strader and Shaw, 1997). These three types of connections allow product information of suppliers and the request for product by buyers to be accessed through a network, which provides a platform for buying and selling of products electronically.

![Figure 3: Three types of buyer-supplier communication structure](image)

From Figure 3, it can be seen that type (a) provides direct linkage between suppliers and buyers, which supports bargaining and bidding trading situations, but it is difficult to support other trading situations. Type (b) allows buyers to search and compare more products from the intermediary's platform and facilitates trading situations such as auctions and contracts based trading, but the intermediary becomes an unavoidable part of the supply chain which makes it inconvenient to have direct communications between buyers and suppliers. Therefore, type (b) cannot support bargaining and bidding trading situations. The electronic market in type (c) provides a platform for the suppliers to put their product information online. Buyers can easily search and compare products of a pool of suppliers, and to contact suppliers directly. If necessary, buyers can also invite the agents to undertake certain tasks required in order to complete a transaction. Thus, type (c) has the most flexibility and functionality to support all the four trading situations encountered in construction material trading. The E-commerce business model presented in this paper is therefore based on the type (c). To facilitate the four trading situations, the E-commerce system presented has the following modules: E-catalogs, bidding, requisition quotation, and order, as shown in Figure 4. Each of the module functions within the E-commerce system will now be discussed.

![Figure 4: An E-commerce system for construction material procurement](image)
E-catalog Module

The E-catalog module provides an interface for suppliers to advertise their product information into a classified material catalog. The product information includes the price, units, photos, brand names, quality standard and other relevant details so as to allow the buyers to make judgments on the suitability of the products. Information on suppliers such as the company name, address, telephone, email and service details should also be provided. The searching function of the E-catalog allows buyers to specify searching criteria such as a price range, categories and keywords so that the desired materials and products can be found quickly. Also, retrieved results will be presented in a way that enables comparisons to be made.

Bidding Module

The bidding module allows buyers to specify materials they want to buy when they cannot find suitable materials from the E-catalog. Suppliers can view buyers’ requests for materials on-line and to bid for the request. Messages are sent to the buyers instantly to inform them of the responses from suppliers. A buyer can accept a bid on-line and this will constitute an order from the buyer to a supplier. The buyer and supplier can then use the order module to follow up the order.

Requisition Module

The requisition module allows buyers to send requisitions to suppliers after suitable materials have been identified from the E-catalog. Although the unit price of each material is stated in the system, suppliers may give discounts to buyers according to the amount of purchases, payment methods and their relationships with buyers. Supplier can view the requisition on-line and then use the quotation module to reply to the buyer.

Quotation Module

The quotation module allows suppliers to send quotations to buyers after receiving requisitions. Buyers will receive notice of the quotations and be able to view the quotation details on-line. They can then use the order module to raise orders.

Order Module

The order module allows buyers to send orders to suppliers. The buyer can use the order module in three cases: 1) once suitable materials are identified from the E-catalog the buyer wants to make a direct order, 2) the buyer receives a quotation from the supplier, and 3) the buyer accepts a bid from the supplier. Both the buyer and the supplier can use the order module to proceed with the transaction.

The above modules are the main modules of an E-commerce system developed to facilitate construction materials trading. The E-commerce system has been implemented using ASP as the Web programming language and Oracle as the database for storing data and information on a server. The implementation of the E-commerce system is described in the following section.

IMPLEMENTATION OF THE E-COMMERCE SYSTEM

The Web address of the E-commerce system is http://bsnt42.bre.polyu.edu.hk. The E-commerce system is called COME, which is the abbreviation of “COnstruction Materials Exchange”. The COME system adopts an on-line order off-line delivery model of operation. It is a trading model that is based on the type (c) of the buyer-supplier communication structure, as illustrated in Figure 3. The COME system has five main modules, as indicated in Figure 4, which enable buyers and suppliers to execute the four trading situations previously described. To cope with unexpected trading situations, the system also provides additional services such as building up user profiles, tracking the trading process,
and learning the trading experiences. In order to explore the usefulness of the system, the research team worked closely with a commercial firm by which a professional version of the COME system has been developed and is located at http://www.VHcome.com.

**Business Model of COME**

In designing and implementing the COME system, it is assumed that most suppliers would be from China, whereas buyers can be from anywhere in the world. The reasons for making such assumptions include that firstly over 90% of the construction materials used in Hong Kong are from China and contractors in Hong Kong have expressed the need of an E-commerce system to expedite the trading process. Secondly, most material producers and suppliers in China have no proper channel to contact buyers from outside of China. The E-commerce system developed is therefore intended to provide a platform for suppliers in China to advertise their products so that trading activities with buyers from anywhere in the world can be conducted on-line.

In the current legal and business environment, exporting goods and products out of China involves preparing considerable amounts of paperwork required by various governmental bodies, buyers who do not have sufficient knowledge of the statutory regulations and business culture in China will have difficulties to fulfill the paperwork. To solve this problem, the E-commerce system has not only the buyers and suppliers as two major user groups, but also the agents who can be the brokers in negotiations and auctions, and also carry out all other duties required by the buyers and the suppliers. These duties include the search of suppliers’ information, the preparation of all paperwork required in executing the trading transaction and shipping the products and materials to the buyers. This is because the agents are familiar with the business environment and regulations in China. Without them, it is very difficult if not impossible to sort out all the paperwork involved in exporting commodities from China. On the other hand, without agents, buyers from outside of China will find that it is very troublesome and expensive to conduct negotiations with suppliers in China. The agents can therefore be very helpful to these buyers. The business model of COME is illustrated in Figure 5. This figure summarizes the roles and functions of the three major parties in the COME system: buyers, suppliers, and agents.
The E-catalog in the COME system contains over two thousands categories of construction materials classified into seventeen trees with a maximum of four levels of information. With this structure, the search for product information commences at a general level. If more specific information is required, then the searching process will lead to the next level of information. A Geographic Information System (GIS) is provided to assist the search of material information in specific geographic regions of China. By using the GIS system, the buyers can define the searching areas by selecting the cities on the map or by specifying a circular area with a given central point and its radius. The system will then find all suitable material information within the area together with the associated costs for transporting the material and/or products from the suppliers to the buyers.

Functions provided for buyers also include sending requests for materials and accepting bids from suppliers, selecting agents to complete orders and purchasing contact information of suppliers. Readers should note that the buyers do not know who the supplier is when they find materials from the E-catalog. Buyers have to choose to purchase the contact information of suppliers so that they can contact the suppliers directly, or to select an agent to complete the order for them.

The suppliers can use the COME system for the following purposes: adding and maintaining materials and company information in the E-catalog, reviewing the current market situation in terms of material prices and buyers’ requests, and bidding for buyers’ requests. Functions provided for the agents include managing buyers’ order, and bidding for buyers’ request. Some screen captures of the COME system interfaces are shown in Figure 6.

Figure 6: Interfaces of COME system
Current Status of COME

Currently the professional version of the E-commerce system has over two thousand registered buyers, twenty-nine thousands registered suppliers and one thousand agents registered in the COME system. Experiments are being conducted to compare the time and costs required to procure construction materials in the traditional way and through the E-commerce system. Users opinions about the effectiveness of the COME system will also be collected and analyzed.

The next stage of development will incorporate features such as intelligent agents and data mining techniques into the E-commerce environment. Intelligent agents are software entities that possess internal knowledge to perform certain tasks intelligently. The use of intelligent agents in an E-commerce system can support the users at three different levels (Liang and Huang, 2000): market level, transaction level and activity level.

At the market level, intelligent agents can assist the users (buyers and suppliers) to select a proper trade type for their business deal. Intelligent agents at the transaction level ensure that the selected trading type is executed properly. At the activity level, intelligent agents can perform a specific task in the users' decision making process. Data mining technique is used to distill knowledge from raw data. The application of data mining techniques will enable us to generalize useful knowledge and information such as the profiles of the users, the most frequently used searching patterns, and the general patterns in delivery, payment and other issues. These types of information will be extremely useful not only to the users, but also to the system administrator responsible for maintaining the operation of the E-commerce system.

CONCLUSION

This paper identified the limitations of the traditional construction material procurement method and identifies those areas of E-commerce applications that may help to solve the problems. Models of trading situations, as well as the typical types of communication structures used in E-commerce development are discussed. A design and implementation of an E-commerce application for construction material procurement is presented. The E-commerce system has been upgraded to a professional version, which is now used by suppliers in China and buyers in Hong Kong. As the next stage of the research project, useful features such as the intelligent agents and data mining techniques will be incorporated into the E-commerce to further enhance its capacity. The contribution of this research lies at the identification of the trading situations and types involved in construction material procurement process. These trading situations and types provide essential guidelines for developing a business model for an E-commerce system. The design and implementation of the E-commerce system serve as an initial step towards evaluating the practicality and usefulness of the application of E-commerce in supporting construction material procurement.

ACKNOWLEDGEMENT

A Hong Kong Polytechnic University Postgraduate Studentship awarded to the first author has sponsored the research work. Support from the commercial firm is also gratefully appreciated.
REFERENCES


The Development of Information Technology Architectures (ITAs) and their Contribution to Organisational Responsiveness

J. Steve Fall

School of Management Information Systems
Edith Cowan University
Perth, Western Australia
Email: s.fall@ecu.edu.au

ABSTRACT

Throughout the 1990s MIS executives consistently reported that building a responsive IT infrastructure was their number one key concern. The importance of information technology architectures, and the problems associated with the lack of them, is widely reported in the practitioner literature and surveys. Recent reports indicate that the problem of integrating legacy business applications into an e-Business (e-B) system, is the major impediment to more wide-scale use of e-B.

Nick Price, Chief IT Architect of the Dairy Farm Group, sums up the organisational importance of an appropriate ITA as follows.

'The value of the technical architecture I think is immense. You just have to look back at the investment decisions that have been made in our, or any, organisation. Hindsight is always easy, but I can tell you we have spent many millions of dollars over the last three years on technologies that were simply incorrect at the time or have been proved incorrect today, because the people who made those decisions did not have an understanding of how those technologies related to the business... Frankly we could have developed 5 or 10 technical architectures for the same cost.

The value of a technical architecture is immeasurable, and the cost by comparison, I believe, is almost trivial. It is so significantly valuable to the organisation that I cannot conceive in the modern age of any organisation going forward without a technical architecture'.

Video accompanying (Price, 1998)

However, despite the obvious importance of ITAs to the IS practitioner community, the academic IS literature in this area is scant.

This paper first attempts to outline what ITAs are and how they contribute to organisational responsiveness and agility. It goes on to describe, by reference to a specific ITA planning and implementation process - The Open Group's Architectural Framework or 'TOGAF' - how an enterprise could go about creating and implementing an organisationally appropriate ITA.
INTRODUCTION

The Purpose of this Study

The primary motivation for this preliminary study arose from a practitioner’s request for sources of information on the design and implementation of ITAs. That request resulted in the formulation of the following questions.

What is an ITA?
What is the role and importance of an ITA?
What sources of information are available on the design and implementation of ITAs?
What might an organisation need to do to design and implement an ITA?

The Methodology Used in this Study

The first activity in the study was to carry out an academic literature search. The main tool used for this was ProQuest’s on-line database (ABI/INFORM) of refereed journal articles. The second activity was to carry out a practitioner ‘literature’ search. The main tools used for this were web search engines. The information resulting from these searches was supplemented by information obtained from a number of textbooks and the author’s own ‘tacit’ knowledge. The final activity was to analyse and interpret the material obtained from the earlier stages. The general research techniques and paradigm used for this study can be loosely mapped to Tesch's 'hermeneutic interpretation' (Tesch, 1990) within Burrel and Morgan's 'Interpretive' paradigm (Burrel, 1979).

Contents of this Paper

The remainder of this paper consists of four main parts. The first part starts by examining the role and importance of ITAs. The second part, elaborates upon the meaning of the term ITA by means of a city planning analogy. The third part, outlines The Open Group’s Architectural Framework (TOGAF). This part of the paper, together with the Appendix, provides an answer to the research question ‘What sources of information are available on the design and implementation of ITAs?’. It also provides a partial answer to the question ‘What might an organisation need to do to design and implement an ITA?’ The last part of the body of the paper contains the ‘Conclusion & Further Research Questions’.

THE ROLE AND IMPORTANCE OF IT ARCHITECTURES (ITAS)

The Role of IT Architectures in Business and IS Planning

Despite the increasing speed and discontinuous nature of business change that has taken place in the last decade many academics and practitioners still believe that some form of business planning is still necessary. Many would also argue that new developments in IT often present companies with the opportunity to obtain competitive and strategic advantage and, therefore, IS and IT factors need to be incorporated into organisations’ business strategy planning exercises. Jack Callon expresses these views as follows.

'.........because of the pace you have no choice – an organisation must do an effective planning job or get lost in the maze of increasing complexity. .........If information systems are to be an integral part of the implementation, then they need to be addressed at the same high level, at least in terms of the role they will play'.

(Callon, 1996, pps. 284 – 287)
The strategic planning process model shown below in Figure 1 provides a framework that can be used to both develop effective business strategies and the necessary IS to support them. It also provides a structure that allows new IT opportunities to be identified and fed into the business planning process in a way that can make major changes, or impacts, upon the final outcomes of the process.

Figure 1: The IS/IT impact framework
(Adapted from Callon, 1996)

We can 'see' from the Callon model that an IT architecture (ITA) is the technical foundation for an effective IT strategy and that an IS architecture is the foundation for an effective IS strategy which in turn provide the IS foundation of any successful modern business strategy. Unfortunately, the diagrammatic model doesn't tell us what an 'architecture' actually is!

However, the Open Group provides the following definition:

'an architecture is a formal description of an information technology (IT) system, organized in a way that supports reasoning about the structural properties of the system. It defines the components or building blocks that make up the overall information system, and provides a plan from which products can be procured, and systems developed, that will work together to implement the overall system. It thus enables you to manage your overall IT investment in a way that meets the needs of your business'.

(TheOpenGroup, 2000)

Later in this paper we use a city planning analogy to further illustrate the meaning of ITA. For now, it suffices to say that the well-architected computer system is like a well-planned city where districts, buildings, and services function well together to serve the needs of the inhabitants. Whereas a poorly-architected system is more like an unplanned urban sprawl.
The Importance of IT Architectures in IS Management and Research

Since the start of the open systems movement in the 1970s many organisations' ITAs have become increasingly dynamic. Today, the widespread adoption of open, but rapidly changing, Internet technology is the most visible manifestations of this. However, the benefits of open systems do not come without problems. One of the main problems is managerial complexity. Nezlek et al. describe this as follows.

'...The emergence of the Internet and the Web offer unprecedented opportunities as well as challenging management problems. In the midst of an ever-increasing set of technology choices, IS managers must still confront fundamental questions regarding the nature of underlying technology infrastructures and the application of rapidly shifting technologies to business decision-making...'

(Nezlek, 1999, p. 1)

The importance of ITAs, and the problems associated with the lack of them, is widely reported in the practitioner literature and surveys. According to Laartz et al. 'Stories about companies that stumbled because their IT architectures couldn't accommodate rapid and drastic change are legion'. (Laartz, 2000) (p. 119). The Delphi Group's survey of businesses in the e-B arena reports that the respondents cited technology issues, particularly the problem of integrating legacy business applications into an e-B system, as the major impediment to more wide-scale use of e-B. (The Delphi Group, 2000)

The results of a number of surveys of IS executives' key concerns have been published in academic journals in the United States since 1980 (Ball, 1982). Similar studies have been replicated in Hong Kong, Australia, Europe and Asia. These surveys usually cover CIOs who are asked to rank a list of 20-30 IS management issues in terms of importance over the coming three to five years.

Three of the issues that always occur in these survey questionnaires can be regarded as being concerned with ITAs. Of these 'Building a Responsive IT Infrastructure' is probably most closely aligned to ITAs. Table 1, below, shows the ranking of these ITA issues in four surveys carried out between 1989 and 1999. The surveys include one carried out in the US in 1989 (Niederman, 1991), another carried out in the US in 1994 (Brancheau, 1996), one carried out in Australia in 1996 (Pervan, 1998), and one carried out in Hong Kong in 1999 (Ma, 2000).

Table 1: Ranking of ITA issues in Critical Issues of IS Management Surveys (1989-1999)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Building a Responsive IT Infrastructure</td>
<td>14</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>2=</td>
</tr>
<tr>
<td>Making Effective Use of the Data Resource</td>
<td>21</td>
<td>2</td>
<td>7</td>
<td>3</td>
<td>2=</td>
</tr>
<tr>
<td>Developing &amp; Implementing an Information Architecture</td>
<td>20</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>7</td>
</tr>
</tbody>
</table>

It is clear, from the above table, that CIOs have consistently regarded ITA issues as critical management issues for the last decade - particularly since the 1994 survey. The Australian study (Pervan, 1998), also provides data on CEOs ranking of the issues - they ranked 'Building a Responsive IT Infrastructure' second out of a total of 31 issues. There is a significant (at the .01 level) positive correlation (0.65) between the CIOs' and the CEOs' rankings in this study.

The 'Lit Rank' (literature ranking) column values were obtained from Palvia et al.'s research (Palvia, 1999). Their research analysed academic publications, published between 1989 and 1991 and compared the ranking of the number of articles published, relevant to each of the critical issues, with the critical issue ranking obtained from the 1989 CIO survey (Niederman, 1991). It is disappointing, to note that many of these important issues get relatively little coverage in the academic literature.
In the following section we use a city planning analogy to further illustrate the meaning of ITA.

A CITY PLANNING ANALOGY

The Need for a Process to Create Architectures

Due to continuous changes in business requirements many organisation's legacy applications are now so unfit for current needs that major chunks of them need to be replaced. At the same time, their IT departments are continually being asked to add new functions to meet completely new business requirements. They are also asked to integrate the previously independent, and often logically and technically incompatible systems of different business units and newly acquired subsidiaries. For organisations active in the e-B space the IT function is now required to 'automate and webify the entire value chain, linking supply chain partners and customers under a single automated system'. (The Delphi Group, 2000) (p. 1)

In their article, 'The Paris guide to IT architecture' Lartz et al. suggest that this situation is analogous to that faced by city planners. They go on point out that:

'City planners try to preserve viable old assets, to replace outmoded assets, and to add new assets—all in the context of an infrastructure linking them coherently. IT developers have a good deal to learn from that approach'. (Laartz, 2000, pps.118-119)

The noun 'architecture' conjures up to some visions of design drawings, product standards, and vendor specifications. To others, in the IT world, it conjures up visions of an enterprise-wide client-server network, SAP R/3 (4.6), particular 'platforms', and so on. None of these are architectures. More important, however, is the fact that organisations do not just need a static ITA - they need a dynamic architectural process. The city planning analogy encapsulates this idea as do Price and McClelland when they say that the charter for their (The Dairy Farm Group) technical architecture group is:

'To conceive, design, populate, publish and continually improve a Technical Architecture for the Dairy Farm Group'

(Price, 1998, Slide 18)

Their simple statement conveys the dynamic nature of the process by the inclusion of 'continually improve'. It also conveys the very important point that 'paper' designs need to be populated - or implemented.

The purpose of the architectural process is to create an architecture that meets the business requirements of the organisation and then to implement that architecture using the most appropriate technology. Today, business requirements change quickly and technology, particularly in the e-business arena, changes even more quickly. Clearly, the architectural process used to align the two needs to be dynamic. The challenge facing organisations is to create an ITA planning and implementation process (ITAPIP) that can provide flexible ITAs that can accommodate the replacement of obsolete components without having to obsolete the architecture itself. These components may be chunks of applications code, chunks of systems software (e.g. operating systems), or chunks of hardware and so on. An effective ITA should allow the organisation to preserve and renovate those old IT assets that are still viable while replacing obsolete ones and adding new ones in an orderly manner. In order to make this feasible the ITA also needs to provide a good service infrastructure that connects the different assets into a coherent whole.
City Planning as an ITAPIP Analogue

Laartz et al.'s city planning analogy is particularly useful because it encapsulates three concepts that are central to the ITAPI process. These are 'building-blocks', 'services' and 'interfaces'. The analogy also puts in clearer focus the need for long-term planning and governance.

The Building-block Concept: Laartz et al. point out that most cities have building zone regulations that designate particular areas to particular uses. Many organisations have existing ITAs that are more analogous to Bangkok than Paris. Their ITAs appear to be tangled and chaotic and show little evidence that any form of organised planning has been applied. One of the first stages of coherent IT planning, in this type of situation, will be to try to create a logical model of the building blocks we already have, and might want to re-use, as well as candidate building blocks we may need in the future. In a well-designed architecture although building blocks have discreet functions they should share common data and processes in order to prevent redundancy and its resultant inconsistency.

The Need for Standard Services: Laartz et al. point out that:

'To offer neighborhoods standard services such as power and water, a city needs a stable infrastructure. The infrastructure must serve prospective as well as existing needs ....'

(Laartz, 2000, p. 122)

The need for the standardisation of data management services is now fairly well accepted in many organisations. However, many other types of service, (such as security services, location and directory services, and network services) are becoming increasingly important in the world of e-B. The inclusion of service building blocks in an ITA has the benefit of preventing redundancy and its resultant inconsistency.

The need for Standard and Stable APis: Laartz et al. go on to say:

'...The infrastructure must...have uniform interfaces—including the same types of outlets, plugs, and voltages—so that business can be carried out not just among neighbourhoods but across an entire country'.

(Laartz, 2000, pps. 122-123)

In the past the interfaces between physical building blocks, such as applications programs, were hand crafted by programmers. This approach gives rise to two major problems. First, every time a programmer alters the code of an application he may introduce new errors into it - the stability problem. Second, when we need to upgrade an application package we find out that we cannot just patch our hand crafted interface code into the new version of the package because the new version is obviously not exactly the same as the old version - the package version migration problem.

These problems can be solved if we put a rule into our architecture that says we will only populate our ITA with software, including software service modules, that uses open standard and widely used APis. This is equivalent to using the 'same types of outlets, plugs, and voltages' in the Laartz et al. analogy.

The future role of web services and interfaces in e-business: Laartz's reference to '...across an entire country' is particularly important in the e-business (eB) arena. 'Web' services are so called because the company that provides the service implements it on a web server and makes it available to prospective users (usually the prospective user's computer application) via open APis. Web services can include both traditional business services, such as the provision of goods and services, and IT services such as the use of a remote routine (via a remote procedure call) to convert from USD to DEM at today's exchange rate. Most of today's eB applications can only transact Internet-based business with global trading partners who already have knowledge of one another - including the nature of each other's web services AND how to interface to each other's web services or computer applications.

Future eB applications, particularly automated business-to-business applications will require some type of electronic 'yellow pages' system that allows our computer system to locate the web services we require TOGETHER with the technical details of how these services can be requested or provided. Architecturally this web services directory would become an additional layer on top of existing cross-platform interoperability standards and APis.

In fact such a web services directory layer is a core component of both the proposed ebXML and the Universal Description, Discovery and Integration (UDDI) project. Both these projects are centered on a proposed 'yellow
pages' architectural layer that allows the potential user (usually the prospective user's computer application) of a web service to use this layer to discover, deploy and execute the service.

Note: the ebXML project was initiated by UN/CEFACT and OASIS (Organization for the Advancement of Structured Information Standards) in September 1999 and the UDDI project was started in September 2000 by IBM, Ariba and Microsoft.

The Need for Long-term Planning and Governance: The analogy captures another important similarity between ITAs in the business world and city plans in the civic world - i.e. politics plays an important role in the success or failure of both. In order to succeed, the ITA must reflect the needs of the organisation and senior management must be persuaded that it does so. An ITA imposed without appropriate political backing is bound to fail. In short, an ITA once produced must be followed, or it is useless.

Formal IT governance practices are therefore required. The purposes of these practices is to ensure that the senior management of the organisation retains control of, and responsibility for, all aspects of the IT operation and not just the ITA. However, the overall IT governance strategy must include an ITA compliance strategy backed up by specific measures - such as involving the ITA team in product procurement.

A BRIEF TAXONOMY OF ARCHITECTURES & THEIR INTERELATIONSHIPS

So far we have only discussed ITAs. However, toward the start of this paper Fig 1., 'The IS/IT impact framework', included an IS architecture as well as an ITA. For the purposes of this paper we will assume that together they form the 'Enterprise Architecture'. We will further assume that the IS architecture can be subdivided into the following three components.

The business (or business process) architecture that defines the business strategy, governance, organisation, and key business processes.

The application (systems) architecture that provides a blueprint for the individual application systems to be deployed, their interactions, and their relationships to the core business processes of the organisation.

The information (or data) architecture that describes the structure of the organisation's logical and physical data assets and data management resources.
It is important to realise that these three types of architecture are closely related. In particular the following points need to be born in mind.

The ITA must closely reflect the business goals of the organisation.

The ITA is closely related to the applications architecture because it is the applications that will directly use the services it provides.

Additionally, the ITA will typically need to support the integration of different application architectures that may have been developed independently of one another.

The ITA will need to be able to support the storage and access requirements of the data architecture as well as provide required infrastructural services—such as directory services. Conversely, the ITA will generate new data requirements of its own which must be provided for by the data architecture.

**AN EXAMPLE OF AN ITAPIP (TOGAF)**

Nezlek et al.'s definition of 'enterprise computing architecture' is rather different to our definition of enterprise architecture. They say that *The term "enterprise computing architecture" is used to describe the set of computing platforms and the data networking facilities to support an organisation's information needs* (Nezlek, 1999) (p. 82). Their definition of enterprise computing architecture, is in fact, much closer to our definition of an ITA.

Nezlek et al. go on to say:

'Despite this (organisational reliance on IT), effective strategies for specifying an enterprise computing architecture are still lacking'.

(Nezlek, 1999) (p.1)

The results of recent searches of several online databases of academic journal articles, carried out by the author of this paper, add some support this claim. However, the fact that academic journals do not contain any 'effective strategies for specifying an enterprise computing architecture' does not mean that such strategies are not widely published elsewhere. The Appendix to this paper contains brief details of six such 'strategies'. In this paper we will refer to such strategies as 'ITA Planning & Implementation Process (ITAPIP) Frameworks'.

In this section of this paper we will examine one of these ITAPIP Frameworks - The Open Group Architectural Framework (TOGAF)

**What is TOGAF?**

TOGAF is a tool for defining an ITA. It is described in a collection of electronic documents and online databases published by The Open Group and available on its public web server (TheOpenGroup, 2000). The development of TOGAF started in 1995 and was originally based on the Technical Architecture Framework for Information Management (TAFIM), developed by the US Department of Defense.
TOGAF consists of two main parts:

The Architecture Development Method (ADM), which explains how to derive an organisation-specific IT architecture that addresses business requirements.

The Foundation Architecture is an architecture of generic services and functions that provides a generic foundation on which more specific architectures and architectural components can be built and includes:

- the Technical Reference Model (TRM) which provides a model and taxonomy of generic services; and
- The Standards Information Base (SIB), a database of open industry standards that can be used to define the particular services and other components of an organisation-specific architecture.

The ADM first provides a method of obtaining information about the benefits and constraints of the existing implementation, together with requirements for change. It then provides a way of combining these two to create a 'target architecture' (or set of architectures). The SIB can then be used to define the specific services and components required in the products that will need to be purchased in order to implement the developed target architecture.

The TOGAF Architecture Development Method (ADM)

The TOGAF phases are iterative, both within each phase and among phases. Throughout the phases of the cycle there needs to be frequent validation of the results against the original business requirements and constraints. Each phase of the cycle is further divided into steps. The seven phases of the cycle, the continuous validation against business requirement, and the sub-division of phases into steps is shown below, in diagrammatic form, in Figure 2. Note that only one of the phases, phase C, of the cycle has been shown in sub-divided form in the figure. This has been done because although the ADM covers the complete architecture life-cycle the focus of TOGAF is primarily on phase C, the creation of the 'Target Architecture'.

Figure 2: Phases in the TOGAF Architecture Development Method (ADM)
Source (TheOpenGroup, 2000)
The TOGAF Foundation Architecture

As explained earlier the **Foundation Architecture** a generic architecture. This generic architecture is used as a template in Phase C from which a specific target architecture (our ITA), that meets the business requirements of the organisation, is created. It was also explained earlier that the Foundation Architecture has two main components:

- the Technical Reference Model (TRM) and
- the Standards Information Base (SIB).

Figure 3, shows a diagrammatic representation of the model and taxonomy of generic services provided by the TOGAF TRM.

**Figure 3: TOGAF's TRM and taxonomy of generic platform services**
(Source: TheOpenGroup, 2000)

The TRM identifies a set of services for each general service category. For example, TRM 'Security Services' are composed of the following nine services.

- Identification and authentication services
- System entry control services
- Audit services
- Access control services
- Non-repudiation services
- Security management services
- Trusted recovery services
- Encryption services
- Trusted communication services

(Note: the 'Qualities' area in the diagram indicates that the architect also needs to identify the level of quality the organisation requires for each required service - i.e. QoS).

Each service can then be related to an on-line Standards Information Base (SIB) entry. The SIB is a (dynamic) database of industry standards for populating a target architecture. The SIB provides the technical architect with a set of tools for defining the standards that a target ITA will prescribe, and for checking the availability in the marketplace of products guaranteed to conform to those standards.
Figures 4 to 7 demonstrate how some of the SIB facilities can be used. Fig. 4 shows the screen that is displayed after selecting the service category 'Security Services' and then selecting the service type of 'Identification and authentication services' from the drop down menu that first appears. The screen identifies the three different standards that meet the search criteria.

**Figure 4: TOGAF standards information base (SIB) search result example**

<table>
<thead>
<tr>
<th>Service category and type</th>
<th>Reference and status</th>
<th>Title and Year</th>
<th>Short Description</th>
<th>Other views</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Standard</td>
<td>Adopted</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Security Services</td>
<td>IETF RFC 2322</td>
<td>Simple Authentication and Security Layer, 1997</td>
<td>Describes a method for adding authentication support to existing protocols.</td>
<td>Details</td>
</tr>
<tr>
<td>Technical Standard</td>
<td>Adopted</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Security Services</td>
<td>Open-SSC-2561</td>
<td>Generic Security Service API (GSS-AP) Interface, 2001</td>
<td>Defines an generic application programming interface to security services.</td>
<td>Details</td>
</tr>
<tr>
<td>Technical Standard</td>
<td>Adopted</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

By clicking on the 'Details' hyperlink, further details of each of the selected standards can be obtained from the SIB. Fig. 5 shows the results of clicking on the 'Details' hyperlink for one of these standards – C902 (CDSA).

**Figure 5: Details of security service standard C902 (CDSA) retrieved from the SIB**

Clicking on the hyperlink shown at the bottom of Figure 5 retrieves further details of the standard from the SIB – as shown in Figure 6.
The screen above contains links to where the full specification of C902 (960 pages) can be downloaded.

The TRM represents the ITA, or application platform, as a single, generic, conceptual entity. The ADM provides a means of mapping the TRM to a specific target architecture that meets the organisation’s business requirements that were previously determined in the ADM cycle. During this mapping process the organisation will generally find that it does not need all of the TRM services or service categories—it may even find that it needs additional services. What is certain is that the set of services identified and defined for the application platform will change over time. New services will be required as new technology appears and as application needs change.
The physical application platform that actually gets implemented as the target ITA will typically not be a single entity. Generally it will be a combination of different entities such as web server, database server, DBMS, different application package architectures, and so on. Many of these real-world IT systems, that are procured and used today to implement an ITA, already come equipped with many advanced services, which are often taken for granted by the purchaser.

For example, the SAP R/3 applications software package will run on top of a wide variety of DBMSs and operating systems etc. The software itself implements services from many of the service categories of the TRM. Organisations that implement R/3 usually use consultants to design and configure a suitable (for implementing R/3) ITA as well as the R/3 services and applications functionality. Since the purchaser of an R/3 system often does not consider anything smaller than the total bundle of services that comes with the system, that service bundle can very easily become the organisation's platform. Indeed, in the absence of an organisational ITA to guide the procurement process, this is invariably what must happen. As this process is repeated across an organisation, different systems purchased for similar functions such as VoIP call-centre systems, CRM systems, etc., can contain markedly different bundles of services.

One of the first major tasks of the IT architect is to analyse the existing collection of real-world platforms, already in use within the organisation, in terms of the service bundles, or building blocks, they provide. Subsequently the architect needs to map the conceptual TRM platform to an organisation-specific IT architecture. To do this he must analyse the services actually needed in order to create an ITA that meets the organisation's business requirements in an optimal manner. Then, in order to implement the ITA, the organisation needs to procure real-world 'platforms' and products, i.e. service bundles or building blocks, that contain the required services and comply with the standards now embodied in the organisation specific ITA.

CONCLUSION & QUESTIONS FOR FURTHER RESEARCH

This paper has demonstrated how ITAs provide a framework for the implementation of a responsive IT infrastructure. The results of a number of studies show that IS managers have consistently regarded the building of a responsive IT infrastructure as a key issue. Somewhat surprisingly the results of the Palvia et al. study (Palvia, 1999) reveal that this issue receives relatively little attention in the IS (academic) literature.

However, a considerable amount of work has been carried out and published in this area by a number of industry groups (identified in Appendix 1). This paper has outlined one of these ITA frameworks, TOGAF, which prescribes what an organisation should do to design and implement an organisationally appropriate ITA.

This initial study raises a number of further questions including:

Does the academic IS world still pay relatively little attention to the key issues reported by IS managers and, if so, why?

What are IS managers doing to address their key concern of 'building a responsive IT architecture'?

These questions may be worthy of further research.
APPENDIX:

OTHER ITA PLANNING & IMPLEMENTATION PROCESS (ITAPIP) FRAMEWORKS

TOGAF, which has already been outlined in this paper, is only one of a number of ITAPIP frameworks in use today. Many of the other frameworks have much in common with TOGAF.

CORBA (Common Object Request Broker Architecture)

This is under development by The Object Management Group (OMG) and is an object-oriented architecture designed to support distributed computing and application integration. The OMG's object management architecture (OMA), sometimes referred to as the CORBA architecture, is an object-oriented application architecture centred on the concept of an object request broker (ORB). The ORB acts as a switching centre, locating objects, storing interface definitions and object implementations, and relaying messages between objects in a distributed heterogeneous environment. CORBA services are a low-level set of common object services covering functions like object creation and deletion, naming, security services, etc. CORBA facilities are higher-level functions such as distributed documents or printing. Domain Interfaces are vertical market-specific interfaces which will provide common facilities for applications within a particular market sector or industry. The OMA is currently under extensive development both for revision of existing interfaces and for extensions of the architecture into new areas.

Further details of CORBA can be obtained from:
http://www.corba.org/

The C4ISR (The Command, Control, Computers, Communications (C4), Intelligence, Surveillance, and Reconnaissance) Architecture Framework

The C4ISR Architectural Framework has now (in January 2000) replaced its predecessor - the 'Technical Architecture Framework for Information Management' (TAFIM). Both were developed by the US Department of Defense. The C4ISR Architecture Framework now provides a framework that gives comprehensive architectural guidance for all DoD areas, in order to ensure interoperable and cost effective military systems. The framework is already being used in government areas beyond the defense sector.

Further information on C4ISR can be obtained from:
http://www.fas.org/irp/program/core/c4ISR.htm

DCE (Distributed Computing Environment)

This was also developed by the Open Group and can now be regarded as a supplement to TOGAF – even though it was developed before TOGAF. DCE provides a set of services that can be used as the basis of a DCE-Centric Architecture related to TOGAF. DCE forms a layer between the application and the operating system and network services; it has been implemented in a variety of products supplied by a number of vendors including Transarc’s (now owned by IBM) DCE-Encina middleware.

Further details of DCE can be obtained from:
http://www.opengroup.org/tech/dce/
IEEE 1003 series standards (aka POSIX 1003)

Provided an architectural framework built on open systems standards. The 1995 ISO/IEC technical report ‘Guide to the POSIX Open System Environment’ was used in the development of the US Department of Defense Technical Architecture Framework for Information Management, (TAFIM). TOGAF was, in turn, developed from TAFIM. IEEE 103, TAFIM, and TOGAF all use a similar reference model at the conceptual level of their frameworks.

Further details of IEEE 1003 can be obtained from:
http://standards.ieee.org/catalog/posix.html

Note however, that the latest versions (March 1999) of the IEEE 1003 standards (IEEE 1003.2 c and 1003.2d are both designated as drafts and withdrawn which means that both are neither finished nor worked on by the IEEE any longer.

ISO RM-ODP (The ISO Reference Model for Open Distributed Processing)

RM-ODP was developed as a coordinating framework for the standardisation of Open Distributed Processing. It created an architecture within which support of distribution, internetworking and portability can be integrated. The 1995 version of RM-ODP ((ISO/IEC DIS 10746-1:1995) provided a framework to support the development of standards that will support distributed processing in heterogeneous environments. It identified the important properties of open distributed systems as openness, integration, flexibility, modularity, federation, manageability, provision of quality of service, security and transparency,

Further information on RM-ODP can be obtained from:

OCCA 6 (The Open Cooperative Computing Architecture)

This was based on NCR’s Enterprise Architecture Framework. The NCR Enterprise Architecture Framework was originally created to guide the development of systems, industry, and customer specific architectures.

Further details of OCCA (6.0.2) can be obtained from:
http://www3.ncr.com/architecture/occa6/

Please note that this page has not been updated since 2 July 1997
REFERENCES


Hong Kong Computer Society. [On-line]


An Exploration Of The Relationship Between ERPs, Best Practice and The Supply Chain

Ann Monday
School of Accounting and Information Systems
University of South Australia
Adelaide, Australia
Email: Ann.Monday@unisa.edu.au

ABSTRACT
A number of studies suggest that, even though supply chain management (SCM) is not a new concept, many organisations and industries are only just starting to recognise the importance of managing or exploiting their supply chains through applications such as ERPs. Very little research, however, has documented the extent to which this can be achieved using software systems based on the premise of 'best practice'. This paper suggests that a better understanding of the complexity of supply chains in the context of best practice will provide a better understanding of the extent to which ERPs can support supply chain initiatives.

Keywords: Supply chain, supply chain management, Enterprise Resource Planning systems (ERPs), best practice

INTRODUCTION
Even though the supply chain (SC) and supply chain management (SCM) are not new concepts many organisations and industries are just starting to recognise the importance of managing or exploiting their supply chains. ‘The supply chain refers to all those activities associated with the transformation and flow of goods and services, including their attendant information flows, from the sources of raw materials to end users. Management refers to the integration of all these activities, both internal and external to the firm.’ (Ballou et al, 2000). In Baatz (1995) it is suggested that conceptually it extends from “dirt to dirt”. It begins ‘when the raw material is extracted from the earth and ends when the product is reused or disposed of in a landfill’.

DISCUSSION
Many organisations are recognising that any competitive advantage they might have achieved from their back office systems is no longer sustainable. In looking for alternative methods of (sustainable) competitive advantage organisations are exploring ways of exploiting the extended (external) supply chain.

SUPPLY CHAIN MANAGEMENT
Anderson, Britt and Favre (1997) argue that ‘[t]o balance customer demands with the need for profitable growth, many companies have moved aggressively to improve supply chain management.’ In other words, some organisations are moving away from the traditional autonomous operating unit towards alliances and integration across the supply chain. Neumann, Ringbeck and Schwegmann (2000) note that companies who are performing best are those that are investing in systems that integrate their internal and external supply chains.
In the past supply chain systems were regarded as channels of distribution with each firm operating on its own, seeking to make the highest profits (Lancioni, 2000, Prahalad and Ramaswamy, 2000). We are now seeing a shift from these traditional business roles. ‘Major business discontinuities such as deregulation, globalisation, technological convergence, and the rapid evolution of the Internet have blurred the roles that companies play in their dealings with other businesses.’ (Prahalad et al, 2000). Cross-enterprise supply chain planning is seen as an opportunity to achieve sustained competitive advantage.

‘The inherent complexity of a global supply chain requires the efficient and effective coordination of all of the resources of the enterprise.’ (Challener, 1999). He suggests that for an organisation to be ever more responsive to its markets, partners and customers, new strategies are required for supply chain integration, supply chain optimization and inter-enterprise collaboration. However, he points out that there are cultural and technological barriers to implementing cross-enterprise supply chain management processes.

Industries are also beginning to recognise the value of their customers and their knowledge of the market place (Prahalad and Ramawamy 2000, Chizzo 1998, Simchi-Levi et al 2000, Anderson et al 1997, Challener 1999, Fall 2000). Organisations can achieve more accurate demand forecasting which enhances scheduling and enables inventories to be reduced, production becomes more efficient through planning optimization, products are delivered to customers on time and suppliers and customers can develop closer relationships, which allows them to share information more closely (Challener 1999, Sarkis and Sundarraj 2000).

The Internet has made possible the idea of integrating processes, not just transactions. This raises the issues of costs, intrafirm adaptability, interfirm adaptability, platform neutrality and interoperability, scalability, security, reliability, ease of use, customer support and perceived value (Sarkis and Sundarraj, 2000). These are issues that were repeatedly unresolved in EDI implementations (Kremar, Bjorn-Andersen and O’Callaghan 1995).

**ERPs and the supply chain**

ERP systems started life as inward looking control systems that originally did not consider all aspects of the supply chain. Typically, ERP vendors provided modules for finance and accounting, human resources, marketing and sales, manufacturing, maintenance and engineering (Sarkis and Sundarraj, 2000). They were primarily implemented to help reduce costs and improve productivity (Manji, 1998). More recently they have broadened their scope to include advanced planning and scheduling solutions. Al-Mashari and Mohamed (2000) comment that ‘SAP R/3 has been widely implemented to create value-oriented supply chains that enable a high level of integration, improve communications within internal and external business networks, and enhance the decision-making process’

**BEST PRACTICE AND THE SUPPLY CHAIN**

Malhotra (2001) refers to benchmarking as identifying and storing best practices for use by other employees. O’Dell and Grayson (2000) note that a wealth of knowledge and best practice is available from within the organisation and often remains untapped while organisations concentrate on external benchmarking. Dahle (1996) points out benchmarking is not about copying the best practice of another organisation but adapting the best practice to suit their own needs and culture.

The extended supply chain is complex and can be difficult to perceive. Mapping best practice across the supply chain requires assessment ‘from supplier relationships to internal operations to the marketplace, including customers, competitors, and the industry as a whole’ (Anderson 1997). ERPs offer powerful transaction processing based upon industry ‘best practices’. Anderson (1997) points out that many of the companies implementing ERPs will generate large amounts of data that management cannot easily use. Reutterer and Kotzab (cited in Lancioni 2000) are challenging the idea of a best practice solution for supply chain management. Malhotra (2001) suggests that organizations may find themselves doing ‘more of the same, better and better with diminishing marginal returns’ which may be appropriate for routine processes but would be unsuitable in a dynamic environment where organizations ‘need imaginative suggestions more than they do best practices’. Anderson argues that ‘excellent supply chain management calls for creativity and flexibility’. Holmberg (2000) recommends that organisations take a holistic view, focusing on the relationship between all activities along its supply chain.
RESEARCH APPROACH

A case study approach, using the Australian Wine Industry, forms the basis of the research. The Australian wine industry, until 20 years ago a cottage industry, is now exporting a huge amount of wine to the UK, Europe, USA, Asia and New Zealand. The growth of wine exports has created a new set of business relationships worldwide that has resulted in a more complex extended supply chain for the industry. The industry faces the challenges of designing its supply chain to achieve or maintain strategic advantage, developing and maintaining collaborative relationships within and between functional areas, forging supply chain partnerships and managing information for effective decision making.

The aim of this research is to examine supply chain initiatives in the industry and the extent to which ERPs, based on best practice, can support these initiatives. Four stages of the research have currently been identified. The first stage is to map the extended supply chain of the wine industry using Checkland’s (1999) Soft Systems Methodology (SSM). SSM was chosen as it offers an approach that helps to describe and analyse complex systems and reveal the key elements of the rich set of interrelationships in the modern wine industry.

The second stage will identify what the industry expects to achieve from its supply chain in order to provide (sustainable) competitive advantage. A pilot study (questionnaire and interviews) will be used to identify the supply chain requirements of the industry. This will be summarised and presented at a series of electronic meetings, using a keypad-based group process support system.

The third stage will explore the capabilities of supply chain systems that incorporate ‘best practice’.

The fourth stage will examine the relationship between the industry’s supply chain, and the extent to which its Enterprise Systems, based on ‘best practice’, can support supply chain initiatives.

CONCLUSIONS

It has been argued by a number of protagonists that ERPs can effectively support the extended supply chain. However, studies examining the link between ERPs, best practice and supply chain management are limited. There is plenty of evidence of experiences EDI implementations to provide a good understanding of the technology issues relating to creating inter-organizational links. However research has mainly focused on organizations as autonomous units using software to interface independent processing systems.

This study seeks to examine the supply chain in the wine industry ‘from dirt to dirt’ and the extent to which ERPs, based on best practice, can support it. If businesses need flexible systems able to respond to market demand, undertake advanced forecasting, as well as reduce operational costs and improve efficiency, they must consider to what extent ERPs can support supply chain initiatives when they are difficult to change, complex, and slow to respond to the more complex information demands of the external supply chain.
REFERENCES


Promoting Reflective Practice through a WORKING Skill Inventory

J. Luca¹ and M. McMahon²

¹ School of Communications and Multimedia
Edith Cowan University, Australia,
E-mail: j.luca@ecu.edu.au;

² School of Communications and Multimedia
Edith Cowan University, Australia,
E-mail: m.mcmahon@ecu.edu.au;

ABSTRACT

Over the past decade there has been a growing concern about the role of higher education institutions, and how they are meeting the needs of employers. Increasingly, universities are being asked by industry, government and funding authorities to help prepare students for industry with appropriate professional and work related skills. How then can tertiary educators design and implement learning activities to promote these skills?

In this paper we will investigate a conceptual framework to promote the development of professional skills through reflective practice. Students are given a validated, testing instrument to identify their strengths and weaknesses in this area at the beginning and end of the semester.

Keywords: Reflective Practice, Professional Skills, Higher Education

INTRODUCTION

Increasingly, higher education institutions are being asked by industry, government and higher education funding bodies to produce graduates with versatile professional or workplace skills, as well as subject-specific skills. This is causing a major reappraisal of higher education institutions purpose, learning outcomes and research activities. (Australian National Training Authority, 1998; Bennett, Dunne, & Carre, 1999; Candy, Crebert, & O'Leary, 1994; Dearing, 1997; Mayer, 1992).

As higher education institutions struggle to implement the development of these professional skills, they must firstly define what these skills represent. There are currently several synonyms for these including generic, key, core, life, competencies, employment, transferable, personal and others. These terms usually refer to “skills that are common to more than one work site, more than one occupation or more than one field of knowledge” (National Board of Employment Education and Training, 1996, p. 17). The Mayer Committee (1992) and the Finn Review (1991) identified the following as being required by graduates: working in teams, communicating clearly, personal and interpersonal skills, problem solving, understanding technology and using mathematical concepts efficiently. The range of different professional skills that cut across different occupations makes it impossible to define one definitive set of generic skills needed by all graduating students.
Even more difficult problems are being realised by higher education institutions when trying to implement appropriate teaching and learning strategies for the development of these skills in different disciplines. Resistance from lecturers to remove subject content in order to teach or integrate generic skills, and different perceptions of importance from students about learning these skills all contribute to making this a difficult task (Bailey, 1993; Leckey & McGuigan, 1997).

In this paper, a conceptual framework is considered, which promotes reflective practice through the use of a validated, on-line testing instrument - WORKING (Miles & Grummon, 1996). The instrument can be administered on-line, from which a full analysis is performed of the results and immediately returned to the student and tutor for consideration. This assessment helps students translate what they have learnt at university into skills needed for the workplace through explicit feedback on how well they are prepared for the workplace.

CONCEPTUAL FRAMEWORK

Teachers are good at transferring domain specific knowledge, but the learner can only generate the skills required by industry with the teachers' role becoming that of a facilitator. A model of Self-Regulation (McMahon & Oliver, 2001) is proposed that identifies the cognitive and affective dimensions essential to learners being able to activate and sustain the states, processes and strategies that are essential to working in environments where tasks are ill structured and non-domain specific.

Figure 1 identifies the key components of this model. It accommodates the role of both affective and cognitive aspects of self regulation, but also acknowledges the effects of external environmental factors upon an individual's ability to regulate their learning. Self regulation is viewed here as the intersection of self awareness at both a rational and emotional level. Metacognition and self concept are seen as the primary enabling process in this model, with self monitoring and motivation as subordinate processes which are involved in the development of cognitive and motivational strategies.

![Figure 1: A model for Self Regulation](image)

Self Regulated workers are able to think about their own thought processes, and are confident in their skills. Markus and Nurius (1986) cited by (Garcia, 1994) introduce the notion of self-schemas, which combine the cognitive and affective elements of self-awareness as "the cognitive manifestation of enduring goals, aspirations, motives, fears and threats." This overarching notion highlights both the similarities and differences between self-concept and metacognition. At the heart of each is an awareness of self, and while high self-consciousness is associated with a desire for self-knowledge, low self-consciousness breeds intellectual defensiveness.

The above psychological states are enacted by, and through, the processes of self-monitoring and motivation. Motivation results from the actualisation of self-concept. Anxiety, for example leads to a low level of motivation (Zimmerman, 1989), while those with a high level of metacognition monitor their thinking; a necessary process for being able to transfer understandings to new situations. The processes of motivation and self-monitoring led to the enactment of strategies. These strategies are both the end product and enabling tools that support the reflection and reflexivity necessary for the acquisition of generic working skills. It has been argued that
Professional skills are created through student-centred learning activities and reflection within a community of peers (Schon, 87; Kolb, 84). The strategies proposed within the above model can include activities such as journal and concept mapping, as well as the integration of techniques such as peer collaboration and bulletin boards. It has been proposed that encouraging students to solve problems while simultaneously reflecting on their own problem solution process can improve their metacognitive knowledge, skills as well as performance (Boekaerts 1997). However, the assessment of these skills poses problems.

Ultimately, the psychological conditions for the development of generic skills are internalised and not always easily articulated by an individual in finite terms. A tool needs to be developed that identifies the behaviours and attitudes that indicate the psychological states of metacognition & self-concept, as well as the key motivational and self-monitoring processes. It must be determined whether or not strategies for the maintenance of effort and reflective practice are manifest. Such a tool may also offer a role beyond pure assessment, by allowing students to reflect on their weakness, and have customised scaffolding given by tutors. It has been argued that one approach to the development of such professional skills is through explicit training about them (Brooks, 1997). An effective measure may also play a profound role in the promotion of the generic professional skills that are advocated within a self-regulatory framework.

ASSESSING PROFESSIONAL SKILLS

In this paper we propose using a validated testing instrument that allows students to reflect on and assess their own skills through on-line administration. It is used as a pre-test at the beginning of the semester to help students understand where they have strengths and weaknesses, followed by customised advice on how to develop "weaker" skills, so they can reflect on and practice these skills during the semester. At the end of the semester, a post-test is administered to check for changes, and again allow students to reflect on their strengths and weaknesses.

The WORKING assessment instrument (Miles & Grummon, 1996) is a self-assessment package for workplace skills, designed to help students understand what skills employers require, and how they rate against these. These skills are generally quite different to the regular academic and technical competencies students are normally tested for. WORKING is designed to give students feedback on nine professional skills, to help tutors and students identify areas in which students can benefit most from educational interventions to develop customised strategies.

The WORKING assessment instrument was created in US through a series of national and state surveys of workplace skills, reviewed to determine skills areas identified as most critical by employers, which go beyond just specific academic content knowledge (Carnevale, Gainer, & Meltzer, 1991; Commission on the Skills of the American Workforce, 1990; Michigan Employability Skills Task Force, 1987; Secretary's Commission on Achieving Necessary Skills, 1991) The skills adopted initially focused on 24 competency areas, which were reviewed by a panel, based on prevalence in the literature, ability to be taught or trained, and clarity with which it could be defined in assessment. Based on this analysis, nine scales or professional skills were developed, with fifty diagnostic items. The items were field tested during 1995 with sixteen different institutions in rural and city areas, and modified based on statistical results derived from reliability analysis.
The nine skills that make up the WORKING assessment instrument are representative of the cognitive and affective elements of Self Regulation. For example, “Systems Thinking” is predicated by the ability to think abstractly which itself is evidence of a metacognitive state. “Information Processing” is in essence self-monitoring, while the ability to solve problems, indicates a high level of cognitive strategy usage. In the affective domain, a tendency to volunteer, one of the elements described by the WORKING instrument as a commitment to “Life Long Learning” would be highly influenced by a person’s self-concept. “Taking Responsibility” and “Persisting” are evidence of the motivational processes and volition control strategies that are manifest in Self Regulated workers. Within the nine scales of the WORKING assessment tool are statements which requires students to reflect on their practice and the extent to which they use strategies for Self Regulation. What follows is a description of each of the scales and how they assess a student’s ability to adopt reflective practice in their professional activities.

**TAKING RESPONSIBILITY**

Measures students desire to complete tasks they begin, and ensure that all aspects of the task are identified and done well. Low scores on this scale indicate that students need to work on learning strategies for identifying the components of a task and setting goals for task completion. Students who consistently neglect their responsibilities may need counselling on the long-term consequences of such behaviour. The items for this scale included:

I keep and use a list of things I've got to do.
It really bugs me to see a problem that no one is trying to solve.
I check up to make sure that others have done what they said they would do.
As soon as I finish one task, I look for another one to do.
I prefer to let others take the lead in getting something done. (R)

**WORKING IN TEAMS**

Students' scores on this scale measure the degree to which they feel comfortable working in teams and are able to use the skills associated with effective teamwork. Students who score low on this scale may need more experience in working in teams to accomplish a task. They need to learn the qualities of an effective team member, including taking responsibility for individual assignments and for deciding how the team should accomplish its goal. Communication is also a critical factor in successful teamwork. The items for this scale included:

I don't usually like others giving me suggestions on how I should do something. (R)
I like working in teams,
I have found that group decisions are often better than individual decisions.
I prefer to learn with other people.
I explain to others why we need to work together.

**PERSISTING**

Students who score low have trouble sticking with a task or learning assignment long enough to see it to its satisfactory completion. They may give up too soon to really benefit from instruction. Students who score too high may be seen as stubborn and unwilling to compromise when such compromise is needed because of limited resources or available time. The items for this scale included:

I won't let go of a problem until I've got it licked.
I follow through on things no matter what it takes.
I set definite goals, then keep working on them until I've achieved them.
If I can't catch onto something quickly, I sometimes just drop it. (R)
I don't let go of something until I understand it.
A SENSE OF QUALITY

Students who score low on this scale need help in understanding how exceeding expectations can help them succeed in everything they do. Students may need guidance in learning how to judge what is "just enough" versus "more than expected" and why doing more is beneficial. Students who score low are also likely to need help in focusing in on details and paying attention to the quality with which work is done, rather than simply doing work. The items for the "sense of quality" scale included:

I do extra work to make sure things are done just right.
I won't settle for doing the minimum on anything, no matter what it takes.
I can't quit thinking about something until I'm sure I've done it very well.
I don't worry about the little details as long as I've done the main things okay. (R)
I seek out new activities and responsibilities.

LIFE-LONG LEARNING

Students' scores on this scale indicate an interest in engaging in learning in a variety of settings. Students who score low on this scale have a reluctance to look for learning opportunities and to take advantage of them when they are presented. Students may need help in identifying the many places and ways in which they can learn that go beyond the traditional educational setting. Students who are not motivated to continue learning may find their skills obsolete sooner than they wish. The items for this scale included:

I don't usually ask questions that go much beyond the immediate task at hand. (R)
I like to experiment with ideas and possibilities in my head.
I usually don't make a special effort to learn new things. (R)
I'm one of the first to volunteer to learn a new procedure or method.
When I have to wait, I will read anything I find lying around.

ADAPTING TO CHANGE

Students' scores on this scale indicate their level of comfort with frequent or major changes in their environment. Students who score low are less likely to seek out new experiences or to adjust to changes they experience. Students with a low tolerance for change may have trouble working in many environments where change is the norm. They need counseling to help them identify ways in which they can increase their ability to adapt to change. The items for this scale included:

I adapt quickly to new situations.
I usually do something I've enjoyed rather than try something different. (R)
I am uncomfortable when I have to handle several things at once.
I worry a lot about what could happen when things are changing. (R)
I am usually most comfortable when things are predictable.
PROBLEM SOLVING

Students' scores on this scale indicate their interest and skill at using systematic problem solving methods when approaching complex problems. Students who score low need help in understanding how to approach problems in a step-by-step fashion. Experience in using the scientific method or other systematic problem solving approach should help them increase their skills in this area. The items for the "problem solving" scale included:

When solving a problem, I keep double-checking to be sure I'm on the right track.
I make a detailed plan before I tackle a complex problem.
I consciously consider several different approaches before tackling a problem.
I will offer a suggested solution whenever I bring up a problem to someone.

INFORMATION PROCESSING

Students' scores on this scale provide insights into their competence in managing their own learning and in having and using multiple strategies when learning. Students who score low on this measure need to learn methods that they can use to help add meaning and organization to what they are trying to learn. Encouraging students to make active connections to their prior knowledge and experience is important. Equally important may be many basic study skill techniques, like outlining, paraphrasing, and summarizing. The items for this scale included:

I learn by figuring out how I can apply the things I'm learning to my life.
I understand new things by seeing how they fit with what I already know.
I consciously ask myself questions to see how well I understand something.
I make a mental picture of what I am trying to learn or solve.

SYSTEMS THINKING

Students' scores on this scale indicate their understanding of the relationship among parts in a system and the effects of actions within a system. Students who have a working knowledge of one system may still need help in translating that knowledge into general principles of systems thinking. Students who score low may be helped by learning the components of a specific system before being introduced to these general principles. These students need to understand that events do not happen in isolation and that their actions may have effects that are distant in time or space.

The items for the "systems thinking" scale included:

I want to see how one task is related to other tasks.
I tackle a problem by first trying to see how it affects others.
I frequently come up with new ideas for how to do things better.
I know how to get things done in a system or organization.

Sample output

The WORKING assessment instrument (Miles & Grummon, 1996) was used in semester 1, 2001 with a class of ninety final year multimedia tertiary students studying project management methodology. The test was given at the beginning of the semester and end of semester. Table 1, shows a 23% increase for one of the students across each of the nine scales. There was an overall increase of 15% across all of the student scores.
Table 1: Sample WORKING output

<table>
<thead>
<tr>
<th>Being Responsible</th>
<th>Team Skills</th>
<th>Persisting</th>
<th>A sense of Quality</th>
<th>Life Long Learning</th>
<th>Adapting to Change</th>
<th>Problem Solving</th>
<th>Info Processing</th>
<th>Systems Thinking</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre</td>
<td>45</td>
<td>50</td>
<td>15</td>
<td>5</td>
<td>55</td>
<td>95</td>
<td>15</td>
<td>1</td>
<td>149</td>
</tr>
<tr>
<td>Post</td>
<td>60</td>
<td>90</td>
<td>85</td>
<td>30</td>
<td>85</td>
<td>70</td>
<td>50</td>
<td>45</td>
<td>183</td>
</tr>
</tbody>
</table>

CONCLUSION

Tertiary institutions cannot ignore industry and governments increasing demands to having student graduates with better generic skills. Teaching and assessment strategies are needed to promote the development of these in tandem. Self-regulatory pedagogical approaches are required with valid assessment instruments that offer students feedback and scaffolding during the course of their studies are needed to enable students to focus and practice specific generic skills in which they are deficient.

REFERENCES


A Pilot Study of Using Intelligent Agents to Support Customer Management in a Cyber Shopping Mall

Ha Jin Hwang 1 and Jung Kyo Park 2

1 Faculty of Business Administration
Catholic University of Daegu
Daegu, 712-702, Korea
Email: hjhwang@cuth.cataegu.ac.kr

2 Faculty of Business Administration
Catholic University of Daegu
Daegu, 712-702, Korea
Email: jkpark@cuth.cataegu.ac.kr

ABSTRACT

The spread of Internet is so rapid that emerging e-Business is making dramatic changes in this digital economy. An important component of e-Business research is the issue of the effective marketing in the keen competition. Many agents are developed to help buyers handle the dynamic purchasing environment and reduce the complexity of purchasing data. However, while most existing agents are focused on buyers' needs, prior research on agents lacks the sellers' perspectives. This study is intended to demonstrate the agent system that supports analysis of buyers' purchasing data and predicts their behavior so that sellers can develop more systematic marketing strategies.

Keywords : e-Business, Intelligent Agents, Cyber Shopping Mall

INTRODUCTION

With the widespread of Internet, e-business becomes the cutting edge for today's business. In e-business environments, numerous buyers can access to the website dealing with so many products data to make a purchase decision. At the same time, sellers are facing a very difficult situation to manage back-office requirements in order to keep the quality of customer services (Shaw et al 1997). A variety of agents have been developed to assist buyers in searching websites and making purchase decisions. However, prior research on agents, mainly focusing on buyers' needs, has failed to address the seller's managerial perspectives. Most agents are designed to track the buying path and identify the websites visited to make a final purchase decision while some agents provide a comparison of prices and products details.

These agents can obviously help buyers save their time and efforts by reducing the amount of information to consider. However, as the importance of customer management and more effective sales strategies are required to keep competitive position in the market, sellers might be interested in agents that can analyze the buyers' purchasing pattern and predict their behavior in the websites.

The primary purpose of this paper is to demonstrate a sales agents that supports analysis of buyers' purchasing data and predicts their behavior so that sellers can develop more systematic marketing strategies. The agent system that introduced in this paper monitors buyers' activities in the websites, identifies possible features that might affect purchasing decisions, and finally provides a basis for preparing effective marketing strategies with suitable alternatives.
Moreover, existing agent systems do not reflect the time constraint. Consequently, they can't provide the timely adjustment based on the seasonal variation and the change of fashion. The agent system in this paper applies the adaptive system that considers the change of preferences based on the seasonal change and recommends the products at the latest fashion. Those information reflected in the change of preferences gives sellers insights to satisfy the buyers' needs and predict the product pattern that are attractive to the buyers.

This paper describes a cyber shopping mall using intelligent agents that incorporates considerations for buyer behavior analysis and purchasing pattern monitoring as well as time variations based on the change of season and fashion. The system considers the various aspects of the buyer behavior during the website search and suggests a guideline that sellers can concentrate on the factors to attract the buyers by analyzing the product selection process and the purchasing pattern.

**LITERATURE REVIEW**

Agents are computer programs that mimic human actions to address the needs of sellers and buyers to cut cost while improving the quality of goods and services and increasing the speed of customer services (Machlis 1999). Major characteristics of agents include personalized, continuously running, and autonomous, reactive and proactive. Jenning and Wooldridge (1998) describe properties of agents as follows.

**Autonomy:** agents operate without the direct intervention of humans or others.
**Social Ability:** agents interact with other agents and possibly human via some kind of agent-communication.
**Reactivity:** agents perceive their environment (which may be the physical world, a user via a GUI, internet, other agents, etc) and respond in a timely fashion to changes as they occur.
**Pro-activity:** agents do not only act in response to their environment, they exhibit goal-directed behavior and take the initiative.

According to Nissen (1995), agents are classified into five categories: watcher agents, learning agents, shopping agents, information retrieval agents, and helper agents. Many researchers address the effects of agents on electronic commerce (Jenning and Wooldridge, 1998; Maes, 1994). Mae, Guttmann, and Moukas (1999) predict the future development of such agents, and discuss the use of different kinds of applications to assist consumers in buying activities. Examples of these agents include Anderson Consulting's Bargain Finder, Curtin University's Bargain Boat, and University of Washington's ShopBoat (Choi et al 1999).

Intelligent agents perform specific tasks on behalf of users. For example, agents are designed to search the websites for information gathering, monitoring, and analyzing the environment. Some agents are applied to interact with other agent and may act upon messages from other agents. Other researchers predict that monitoring agents will continuously be developed to search the web for deals on behalf of users in e-business, considering that the importance of effective marketing has been increased for the success of e-business (Bogonikolos et al 1999).

Many researches have explored the opportunity to reduce the burden of buyers in gathering information and comparison of the products using comparison agents while push technology has taken part of delivering personalized marketing by analyzing buyer profile and preferences (Li and Huang 2000). These agents have significantly reduced the buyers' time and efforts to examine purchasing data. However, they still fail to address the seller's managerial point of view. Other research issue is reflecting time constraint for dynamically changing environment.
ARCHITECTURE OF THE SYSTEM

The system basically consists of two agents: the monitoring agent and the buyer analysis agent. The monitoring agent observes buyers' activity when the buyer enters a website and keeps track of buyers' interests and details of buyers' behavior. The buyer analysis agent generates a database that contains the information of the buyer behavior based on the results given by the monitoring agent. Utilizing the monitoring agent and the buyer analysis agent, sellers can identify the common characteristics of the moving paths, revisit patterns, time interval between the visits and other statistics. Sellers, then, can establish not only an effective promotion strategy but also well-organized product selection to make the website more attractive to the buyers.

The architecture of the agent system proposed in this study, as shown in figure 1, consists of user interface, application program, user monitoring agent, and user behavior analysis agent. Functions of each component can be summarized as follows:

- **User interface**: manages a dialog between users and the system.
- **Application program**: enables users to navigate, search, and make a purchase on the website.
- **Monitoring agent**: monitors users behavior on the website and record the data.
- **Buyer behavior analysis agent**: analyze and predict consumer's behavior based on the data from the monitoring agent.

Figure 2: Architecture of the System
The monitoring agent initiates its function as the buyer gets an access to the website. It differentiates a new buyer from the existing buyers and displays the suitable sets of product lists according to the buyer's status. It usually recommends the hottest items for new buyers and customized product lists for existing buyers. Figure 2 illustrates the process buyers take to complete their purchases. Buyers make a decision whether they keep on shopping or stop based on the recommended list. Sometimes buyers can manipulate their own wisdom to make a purchase decision regardless of the product recommendation.

Once the purchase is completed, buyers put the items into the basket. It is the responsibility of the behavior analysis database and the buyer history database to record all the purchase information. The behavior analysis database consists of order file, product file, purchase decision file, and log history file. The buyer record database contains all the buyer related information including http access history file, buyer IP file, log file, and purchase history file.

The recommended product list is drawn based on the previous purchase data, the purchasing pattern, product types, and buyers' personal data. Neural nets, as shown in figure 3, are employed to enable agents to learn the purchasing pattern and predict the future buyer behavior from the previous purchase data and buyer's personal data.
Figure 4 shows the Nassi-Schneidermann chart that explains the logic to generate the product list. The agent provides the real-time adjustment by adjusting the weights for the buyer behavior variables.

AN ILLUSTRATIVE APPLICATION

The target domain of this study is clothing business. The agent system is applied in the website whose URL is www.3b.co.kr. The System is built in PHP, C-cgi, JavaScript, and is Linux based. My-SQL is used to develop the databases. The back-end office of this site is located in Dongdaemun Clothing Shopping Mall. The target market is basically korean at this moment. Consequently, the site is built in korean. However, for the demonstration purpose, parts of the screens of the website are translated in english. The initial screen of the website is shown in figure 5.
Figure 6: Initial Screen of the Website

User Log Screen

Figure 6 displays the record that contains the information about visits buyers made to the website. The log file can be analyzed by IP address, Jobs the buyers performed, and the order placed.

Figure 7: User Log Screen
User Analysis

Figure 7 shows tasks that a particular buyer has done in the website. This profile is a basis of the learning process for the neural nets and can be converted into the purchasing pattern.

In figure 8, in order for sellers to examine buyer's purchasing preferences, the data is retrieved from the buyer record database and the buyer analysis database. This data will be used to test the hypotheses of the buyers' preferences.

For example, a recent one month data for a particular buyer can be retrieved from the database and sorted out in time, product name basis, and then weights are calculated and finally reflected into the buyer variable. Tables 1 and 2 show codes for analysis of purchasing pattern and buyer preferences.
### Table 1: Buyer Profile Code

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Field Code</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product-Code</td>
<td>Code</td>
<td>20 (character)</td>
</tr>
<tr>
<td>Product-Name</td>
<td>Name</td>
<td>40 (character)</td>
</tr>
<tr>
<td>Price</td>
<td>Price</td>
<td>1~99999</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>Prod</td>
<td>1~99999</td>
</tr>
<tr>
<td>After Sale Service</td>
<td>As</td>
<td>1~99999</td>
</tr>
<tr>
<td>Registered Date</td>
<td>Date</td>
<td>dd-mm-yy</td>
</tr>
<tr>
<td>Warranty</td>
<td>Warr</td>
<td>50 char</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teen</td>
<td>Age1</td>
<td>10~19</td>
</tr>
<tr>
<td>Twenty-Early</td>
<td>Age2</td>
<td>20~24</td>
</tr>
<tr>
<td>Twenty-Late</td>
<td>Age3</td>
<td>25~29</td>
</tr>
<tr>
<td>Thirty</td>
<td>Age4</td>
<td>30~39</td>
</tr>
<tr>
<td>Forty</td>
<td>Age5</td>
<td>40~49</td>
</tr>
<tr>
<td>About Fifty</td>
<td>Age6</td>
<td>50~99</td>
</tr>
<tr>
<td>Preferences</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formal</td>
<td>Pt1</td>
<td>1~5</td>
</tr>
<tr>
<td>Casual</td>
<td>Pt2</td>
<td>1~5</td>
</tr>
<tr>
<td>Traditional</td>
<td>Pt3</td>
<td>1~5</td>
</tr>
<tr>
<td>Modern</td>
<td>Pt4</td>
<td>1~5</td>
</tr>
<tr>
<td>Color</td>
<td>Pt5</td>
<td>1~5</td>
</tr>
<tr>
<td>Design</td>
<td>Pt6</td>
<td>1~5</td>
</tr>
<tr>
<td>Fashion</td>
<td>Pt7</td>
<td>1~5</td>
</tr>
</tbody>
</table>

### Table 2: Buyer Behavior Analysis Code

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Field Code</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buyer Code</td>
<td>Code</td>
<td>20(character)</td>
</tr>
<tr>
<td>Name</td>
<td>Name</td>
<td>40(character)</td>
</tr>
<tr>
<td>Sex</td>
<td>Sex</td>
<td>1~2</td>
</tr>
<tr>
<td>Age</td>
<td>Age</td>
<td>1~99</td>
</tr>
<tr>
<td>Occupation</td>
<td>Job</td>
<td>30 char</td>
</tr>
<tr>
<td>Address</td>
<td>Addr</td>
<td>50 char</td>
</tr>
<tr>
<td>Phone</td>
<td>Phone</td>
<td>13 char</td>
</tr>
<tr>
<td>Marital-Status</td>
<td>Ma</td>
<td>1~2</td>
</tr>
<tr>
<td>Hobby</td>
<td>Hob</td>
<td>30 char</td>
</tr>
<tr>
<td>Preferences</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formal</td>
<td>Pt1 (1~5)</td>
<td>Ps1 (0~99999)</td>
</tr>
<tr>
<td>Casual</td>
<td>Pt2 (1~5)</td>
<td>Ps2 (0~99999)</td>
</tr>
<tr>
<td>Traditional</td>
<td>Pt3 (1~5)</td>
<td>Ps3 (0~99999)</td>
</tr>
<tr>
<td>Modern</td>
<td>Pt4 (1~5)</td>
<td>Ps4 (0~99999)</td>
</tr>
<tr>
<td>Color</td>
<td>Pt5 (1~5)</td>
<td>Ps5 (0~99999)</td>
</tr>
<tr>
<td>Design</td>
<td>Pt6 (1~5)</td>
<td>Ps6 (0~99999)</td>
</tr>
<tr>
<td>Fashion</td>
<td>Pt7 (1~5)</td>
<td>Ps7 (0~99999)</td>
</tr>
</tbody>
</table>
CONCLUSION

e-Business has created many opportunities in today's internet based society. One of the most critical aspects influencing the success of e-Business is the effective marketing to interact with the buyers. Many agents have been developed to assist buyers in searching websites and making purchase decisions. However, prior research on agents, mainly focusing on buyers' needs, has failed to address the seller's managerial perspectives. Most agents are designed to track the buying path and identify the websites visited to make a final purchase decision while some agents provide a comparison of prices and products details.

Buyers are now well informed, networked, and even more wise in making their purchasing decisions. Therefore, sellers need to provide more personalized services based on systematic analysis of buyer preferences and purchasing pattern. In this regard, this paper demonstrates an implementation of cyber shopping mall using intelligent agents that support analysis of purchasing data and predict purchasing pattern as well as consideration of time constraint. The system appeared to be very successful implementation of agents for enabling sellers to prepare effective marketing strategy by analyzing product selection process and predicting purchase pattern.

Finally, the contribution of this study is that the system proposed in this study provides guidelines for developing cyber shopping mall using intelligent agents for seller's perspectives. For the future research, this study might need to be extended to utilize data mining approach to analyze very large data set and explore the possibility of web-housing to manage various aspects of purchase knowledge.
REFERENCES


Benefits from e-Business Implementations with ERP: Exploring the Antecedents of B2B Models

C.G. Ash

School of Management Information Systems
Edith Cowan University, Australia,
E-mail: c.ash@ecu.edu.au

ABSTRACT

The paper reports on the research carried out in 1999-2000 on the use of e-business applications in SAP-based organisations. These early adopters of e-business applications show a trend towards costs reduction benefits from e-procurement, e-store, and employee self-service applications. A structured interview-based vehicle was used to collect data on a variety of established organisations from a diverse range of industries. The findings are analysed according to the level of sophistication of e-business models. Two case studies of early e-business integration with a global supplier and its corporate customers are analysed in the context of the business-to-business model. Collectively, the set of case studies is used to demonstrate the effects of increase benefits stream from an e-business architecture based on a network of ERP enabled organisations.

Keywords: e-Business, B2B models, e-ERP implementation, SAP-based organisations.

INTRODUCTION

Like all information technologies, enterprise resource planning ERP technology has been profoundly influenced and transformed by the Internet. Less than two years ago, the ERP paradigm was largely confined within the walls of the traditional business enterprise. The current Internet trends serve to extend the original value proposition of ERPs, by breaking down organisational barriers. Now those boundaries have become almost obsolete. In the future, the structure of such organisations will be more like the web (Larsen 2000). Internet technologies offer an ERP based organisation the opportunity to build interactive relationships with its business partners, by improved efficiencies and extended reach, at a very low cost (Hesterbrink 1999). Organisations that fail to seize this opportunity become vulnerable, if rivals establish themselves first in the electronic marketplace. They may eventually be forced to participate in Internet commerce by competitors, customers or end-consumers.

This paper examines the benefits derived from the use of e-business applications with ERP systems. The early adopters of e-business applications show an initial trend towards realizing the benefits from e-procurement, e-storefront and employee self-service. Statoil expects savings of 30% from a 2b US$ annual purchases bill; Novartis has reduced the time to fill an order from 10 to less than 3 days; UBS Banking has an intranet for the internal organization of its multinationals business for its 40,000 employees; Scitec expects 25% of sales from its e-shopping mall.

The paper reports on the findings from the first phase of a longitudinal multi-case study of ERP enabled organisations that pioneered the use e-business (e-ERP) applications. The paper reports on the research carried out in 1999-2000 on the use of e-business applications in SAP-based organisations. The objective is to identify the benefits and problems encountered by the early adopters of e-business applications with ERP according to a framework of e-business models. A semi-structured interview questionnaire was used to collect data on a variety of established organisations from a diverse range of industries. The findings are analysed according to the stages of sophistication of e-business interaction model. The early adopters of e-business applications show a trend towards realizing benefits from e-procurement and employee self-service applications. A case study of the first B2B e-business integration with a global computer supplier and its largest corporate customer is used to demonstrate a more complex model of inter-organisational integration of ERP. The specific goal is to demonstrate the benefits stream from an ERP-based e-
business project. Finally the study is used to emphasize the added benefits from the adoption of inter­organisation e-business solutions.

E-ERP IMPLEMENTATIONS

To achieve the maximum level of benefits from integrating an e-business application with an ERP package, it is important to understand from the outset the complementary nature of an e-ERP implementation. The stakeholders of an ERP system are potentially every employee in the company as well as key suppliers and customers. Typically, an ERP system in its final rollout will replace the majority of legacy systems, and interface with the remaining systems. To the outside world however, the ERP system will be largely transparent, as it communicates with suppliers and vendors using traditional media or standard EDI transactions.

An e-business implementation is from the onset aimed at integrating business processes with outside business partners and is built on and supported by the ERP foundation. The main focus of the implementation will therefore be the integration of cross-company value chains using e-business tools (Kalakota 1999). An ERP implementation has a defined lifecycle, typically 12-24 months depending on the scope and other parameters (Blain, 1999). After the initial implementation, upgrade and functional enhancement projects follow in irregular intervals. e-Business implementations need to be significantly faster than initial ERP implementations (Hesterbrink 1999). However it can be expected that these activities will continue on an ongoing basis to accommodate changing relationships with business partners and enhanced functional and technical scope of existing relationships.

The importance of combining ERP packages with the Internet has a two-way benefit and return on investment. 'Once Internet technology is efficiently integrated into the internal operation, its effective use for external interactions becomes a natural and easy extension. Without the internal infrastructure, external interactions will always be strained and limited' (Telleen 1996). Also, the coupling of these technologies is seen as 'a shift from the traditional emphasis on transaction processing, integrated logistics and workflows to systems that support competencies for communications building, people networks, and on-the-job learning' (Manville 1997).

Although these technologies have distinctly different functions, integrated they offer a sound infrastructure for doing business on-line (e-business) (Venkatraman et al. 1998). Here e-business means 'making the key business processes of an organisation available over the Internet' (Boey 1999). Although simple, this definition nevertheless incorporates some subtle but key points about e-business applications with an ERP system. The primary beneficiaries of this e-business infrastructure are business partners (customers and suppliers). Figure 1 illustrates how these concepts relate to the business-to-business (B2B) models that form the major part a larger class of business models that also includes business-to-consumer (B2C)).
Figure 1 represents a B2B e-business model that has its roots in EDI supply chain management (SCM). The model describes a single organisation that has key internal processes inter-connected to the internal processes of the network of partner organisations; customers, distributors, and suppliers. This is in keeping with the above definition of e-business, where Internet technology (in various forms) is viewed as the enabler of e-business. An e-business application is the software component that links an organisation’s ERP processes with a partner organisation’s internal system. SAP’s B2B e-Procurement is an example of a ‘buy-side’ application that links to a supplier’s catalogues (SAP 1999).

**Early Investigation of Australian SAP Sites**

In February 1999, five Australian SAP-based organisations were contacted with a view to gathering information about the status of e-business developments within ERP environments. Significantly, SAP’s R/3 system dominates the local ERP landscape. A structured interview approach using open-end questions was used to capture information of current and future use of R/3 with Internet technology. In constructing an appropriate open-ended interview questionnaire, the issue of benefit maximisation was paramount, and the focus of this was towards supply chain automation based around various business-to-business models/principles.

<table>
<thead>
<tr>
<th>#</th>
<th>Case Alias</th>
<th>Industry</th>
<th>‘Business-to’ Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alumina.com.au</td>
<td>Mining</td>
<td>B2B – business-to-suppliers (b2s): Company uses the Inbound side, but needs Outbound side or business-to-customer (b2c).</td>
</tr>
</tbody>
</table>

In general, the responses from IT project managers interviewed revealed views and expectations of future developments similar to the key findings of the Norton Nolan Institute Australian industry based study, (NNI 1998):

- Integration across the entire organisation is the key to large efficiency gains;
- Transparency of implementation and changing process is important, both in terms of acceptance of the change and achieving the expected efficiency gains;
- Distinguish between striving to win new markets or customers and achieving cost reductions;
- Develop a benefits register and measure achievements against it.

These preliminary findings match those of the NNI Report (1998), where the actual benefits achieved from adopting e-business solutions have proved very disappointing. ‘The largest gaps between expected and actual
benefits are related to supply chain, product development and customer service. It is in these areas of business practice where ERP systems are regarded as being traditionally strong. The variety of models identified in Table 1, suggests a classification scheme for business interactions of an organisations as; B2B (business partners), B2C (consumers), as well as B2E (employees).

Industry Projections of B2B and B2C Models

Table 2: Comparison of $Values for B2B and B2C in Year 2000

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>40.48</td>
<td>75.9%</td>
<td>468.79</td>
<td>77.6%</td>
<td>11.58</td>
</tr>
<tr>
<td>Asia &amp; Pacific</td>
<td>3.81</td>
<td>7.1%</td>
<td>49.89</td>
<td>8.3%</td>
<td>13.09</td>
</tr>
<tr>
<td>Western Europe</td>
<td>8.54</td>
<td>16.0%</td>
<td>78.82</td>
<td>13.1%</td>
<td>9.23</td>
</tr>
<tr>
<td>Latin America</td>
<td>0.25</td>
<td>0.5%</td>
<td>3.32</td>
<td>0.5%</td>
<td>13.09</td>
</tr>
<tr>
<td>Africa &amp; Middle East</td>
<td>0.15</td>
<td>0.3%</td>
<td>2.00</td>
<td>0.3%</td>
<td>13.09</td>
</tr>
<tr>
<td>Eastern Europe</td>
<td>0.07</td>
<td>0.1%</td>
<td>0.90</td>
<td>0.1%</td>
<td>13.09</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>53.31</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>603.72</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>11.32</strong></td>
</tr>
</tbody>
</table>


Table 2 shows the worldwide estimates for the dollar value of business-to-consumer (B2C) and B2B transactions (Forrester Research 2000). Specifically the last column shows the ratio of B2B:B2C as a coarse measure of their relative value to the organisation. B2B is at least eleven (11) times the dollar value of B2C transactions for year 2000. According to Forrester Research, the industry projections expect the dollar value in online transactions in the B2B and B2C sectors will be billion $ 6.3 and billion $ 0.4, by 2004. In addition the ratio of B2B: B2C will have increased to 14. This has significant implications for traditional business with respect to future opportunities IT investment (ROI) in B2B sector of the economy.

For the rest of the paper, we will discard B2C consumer models and focus on the class of B2B models.

**METHODOLOGY**

In November 1999, eleven (11) SAP-based organisations were contacted with a view to gathering information about their use of SAP R/3, and in particular developments in Internet integration with their ongoing R/3 systems. To identify the sites, a search using secondary literature, web sites, and SAP related industry consultants were contacted to identify major e-ERP projects. Within the scope of this study the term e-ERP application is used to represent any instance of Internet-SAP technology adoption (eg SAP B2B Procurement, SAP Employee Self Service, SAP Retail Store), (SAP 1999).

The primary beneficiaries of this e-business infrastructure are, business partners (corporate customers and suppliers) and employees. Figure 2 illustrates how these concepts relate to the variety of business-to-business (B2B) sub-models; b2s, b2c, and b2e (Ash et al. 1999).
Figure 2: Developments in e-ERP and Business Practice for doing e-Business
(Source: Adapted from Ash and Rossouw 1999)

The findings of the preliminary investigation of established SAP sites are presented by the categories of the three B2B sub-models (Figure 2):

Business-to-Business (b2s) to support supply chain management between partner organisations.
Business-to-Customer (b2c) to develop customer interaction, via the Web.
Business-to-Employee (b2e) to harness the flow/sharing of corporate information, via intranets.

Eleven SAP enabled organisations known to have implemented e-business applications with ERP were selected. In each case a senior IT/SAP project manager was contacted for the purpose of conducting an interview. Table 3 summarises the profiles of six of (11) case organisations that participated in the study. The ‘e-business initiatives’ selection criteria insisted each e-business implementation was to have significant organisational implications.
Table 3: Classification of B2B Cases into Sub-classes

<table>
<thead>
<tr>
<th>B2B Automation</th>
<th>Case Alias*</th>
<th>B2B Sub-class</th>
<th>e-Business example</th>
<th>No. of Users</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>b2s/b2e</td>
<td>e-Procurement as first stage of b2e and e-Marketplace</td>
<td>~22,000 &amp; admin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b2s/b2e</td>
<td>e-Procurement as first stage of global e-commerce for B2C</td>
<td>~18,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>~28,000</td>
</tr>
<tr>
<td>ERP to ERP</td>
<td>5. Computer.com (linked to Electronic.com)</td>
<td>b2c &amp; b2s</td>
<td>B2B integration of 2 USA partners using EAI-to-ERP infrastructure</td>
<td>~18,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>~9,000</td>
</tr>
<tr>
<td>Network of ERPs</td>
<td>6. Scitec.com (cross-divisional)</td>
<td>b2s &amp; b2c</td>
<td>e-Buy across Divisions of a global conglomerate, extended to e-Sell across a network of Divisions</td>
<td>~30,000</td>
</tr>
</tbody>
</table>

* 6 Cases spanning 5 industry types, and ordered by increasing level of B2B automation

e-Bus with SAP Sites – Interviewed Nov 1999 and June 2000

This study was an exploratory investigation into the benefits from extending enterprise wide business systems beyond the organisation. More than ten SAP enabled organisations, known to have adopted e-business systems, were selected. The IT managers were interviewed to obtain a basic insight into each organisation’s status of the use of Internet technology (web, intranets, extranets, and e-mail). They were questioned about ‘the benefits and barriers arising from extending their R/3 business processes onto the Internet’. The questions were presented within the three sub-classes of the B2B interaction model (Figure 2).

FINDINGS

The findings are analysed according to the stages of sophistication of the e-business model. An e-Business implementation is from the onset aimed at integrating business processes with outside business partners and is built on and supported by the ERP foundation. An organisation that commits itself to enterprise resource planning (ERP), will inevitably need to extend its system towards a web-based architecture. In doing so the issue of benefit maximisation becomes paramount and the focus of this will be supply chain automation based around business-to-business models.

The findings of all case studies profiled in Table 3 are presented according to the business interactions model classification; b2s, b2c, and b2e. Within each classification the cases are presented in order of increasing e-business application sophistication. Further, the level of B2B automation is supported by an increasing complexity of ERP systems (Table 3).
The case studies profiled in Table 4 demonstrate the use of e-business ‘buy-side’ applications. This category of application links a company’s ERP to a supplier’s catalogues, eg SAP’s e-Procurement. It represents the earliest stage of an e-business implementation with ERP. The motivation for these developments or business driver is cost reductions from efficiency gains.

Table 4: Case Study of ‘b2s’ projects

<table>
<thead>
<tr>
<th>Case Alias</th>
<th>Orgn. Size</th>
<th>e-Business Project Title</th>
<th>No. of Users</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Biotec.com &amp;</td>
<td>Medium</td>
<td>Staff research procurement</td>
<td>200</td>
<td>UK</td>
</tr>
<tr>
<td>2. Pharma.com</td>
<td>Global</td>
<td>Sales Order Rapid Delivery</td>
<td>3,000+</td>
<td>Switzerland</td>
</tr>
<tr>
<td>3. O&amp;Gas.com</td>
<td>Large</td>
<td>Staff travel procurement</td>
<td>10,000+</td>
<td>Norway</td>
</tr>
<tr>
<td>4. Media.com</td>
<td>Global</td>
<td>Simple Ordering e-catalogue</td>
<td>9,000+</td>
<td>Germany</td>
</tr>
</tbody>
</table>

Key: Small < 100, Medium < 1000, Large (national), Global (multi-national)
'b2s' as e-Procurement for Shorter lead times and Lower costs

The cases in Table 4 are implementations of desktop procurement system (DPS) designed for the non-professional procurement staff (Segev et al. 2001). The focus is an indirect procurement function that includes maintenance, repair, and operating (MRO) supplies. It brings into play the issue of employee self service (ESS) that includes retraining for this change in roles.

With SAP B2B Procurement e-business solution, Biotec reported that ‘lead times to fill an order were shaved down from four to just one day – from the point in time when an employee identifies an order, to actual delivery’. Having achieved shorter lead times, Biotec no longer needs to keep large stocks of materials, so expenditures are down and cash flow is healthier. Indeed, the company expects to save between ten and 15 percent on the cost of purchasing materials. Another goal of the business-to-business project was to build more long-term links with preferred vendors. So far, Biotec has identified three such vendors. Their Internet sites were linked into the SAP procurement system, allowing Biotec staff to use e-procurement on the company’s own intranet and to purchase from both the internal catalogue and external online catalogues. This was made possible by a specially developed open catalogue interface. The procurement department already attributes one major success to its new procurement process: It has been able to increase the discounts previously offered by its three preferred vendors a further five percent (15% overall). But the benefits are by no means all one-sided. SAP B2B Procurement gives vendors plenty of opportunities, such as direct ordering. All three companies believe future benefits will come from industry portals, eg Chemicals and Oil and Gas.

To maximise the benefits, the notion of fast e-business adoption was emphasised. ‘Roll-out of the e-business solutions needs to be achieved very quickly for ROI’. Also, there needs to be ‘full cooperation between industry partners’. ‘Collaboration between suppliers, to standardise item numbers in catalogues’. Further, ‘it is only with content that you gain a win-win, eg industry catalogues. This implies the importance of the B2B value chain. Finally, to make use of SAP’s industry portal (mySAP.com) requires ‘organisational culture is in the right place’.

To minimise the barriers (eg resistance to change), all suggestions were concerned with technical or more practical issues. This appears to have been provoked by an IT driven project mindset. The procurement applications need to be much more user friendly. We recommended, ‘an upgrade to Web-enabled SAP R/3 4.6’ and ‘an increase in business application program interfaces (BAPI)s’.
In the future, all three organisations believe their ERP technology will play an integral part in helping these established enterprises build and operate online business-to-business models. In particular, the B2B e-procurement developments could lead to industry specific or private e-marketplaces.

'b2e' as Employee Self Service for an improve efficiency of work life

Cases 3 and 4 from different industries, implemented organisational intranets that combined with their SAP R/3 business processes. These solutions were easy to deploy while offering significant benefits from networking employees. Media.com implemented the SAP Internet solution for internal address management. It covers all organisational information within its global network and is the most-used Web application, available for 9,000+ employees, with 150,000 transaction calls per day. It also implemented its own Intranet integrated with R/3 to facilitate the networking of the staff in preparation of E-commerce (B2C). 'This is a generic back-office solution, not a SAP industry solution, to save time and paper for the distribution of staff information'. It offers transparent access to important policy manuals and procedure documents across all departments. 'It also offers collective use of many functions' (Perez et al. 1999: 49).

A leader in media sales and services world wide, Media.com implemented SAP Internet solutions to enable it 'to further leverage its investment in its SAP system by extending the functionality of the R/3 system to casual users'. This global integration strategy by networking the enterprise is viewed as 'e-commerce survival'. A change management team was commissioned to achieve this end. The numerous requests from various profit centres within the group for similar solutions showed a high level of acceptance from the user communities.

To maximise benefits, the design of intranet interface has to accommodate the least trained employees. Requires concerted corporate focus. Managers and IT staff must learn together (fast) to seek new business models. 'We need to develop our Intranet system as a learning system.'

To minimise barriers, increase the availability of supplier catalogues, collaboration between suppliers, and to standardise item numbers in catalogues. A greater range of application interfaces would reduce the cost of linking SAP data to the Internet. SAP needs to understand the Media business. 'We need to understand the environmental factors including IT infrastructure.' Corporate paranoia is in the minds of managers and consultants. Change management needs to be addressed and practiced.

Table 5: Case Study of ‘b2c’ linked with ‘b2s’ projects

<table>
<thead>
<tr>
<th>CASE ALIAS</th>
<th>Size</th>
<th>Country</th>
<th>B2B Sub-class</th>
<th>Project Title</th>
<th>Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>5a. Computer.com (linked to)</td>
<td>Large</td>
<td>USA</td>
<td>b2c</td>
<td>Customised online sales</td>
<td>~27,000</td>
</tr>
<tr>
<td>5b. Customer.com</td>
<td>Large</td>
<td>USA</td>
<td>(linked to) b2s</td>
<td>Staff MRO procurement</td>
<td>~14,000</td>
</tr>
<tr>
<td>6. Scitec.com</td>
<td>Global network</td>
<td>UK</td>
<td>b2c + b2s</td>
<td>Sell-side System to e-Mail to Gatecentre (e-Marketplace)</td>
<td>~40,000</td>
</tr>
</tbody>
</table>

Key: Small < 100, Medium < 1000, Large (national), Global (multi-national)
B2B Integration Between a Supplier and a Customer Organisation

The two case studies profiled in Table 5 demonstrate the application of B2B integration between the ERP systems of multiple organisations. In figure 4 the e-business applications link two organisation's ERP systems into a fully integrated corporate customer-supplier relationship or SCM system.

Figure 4: B2B Model of a Supplier linked to a Customer
(Source: Modellled from case studies, interviewed June 2000)

B2B Integration of ERP systems of two Companies for Complementary Benefits

In 2000 Computer.com pioneered (implemented) its first business-to-business 'B2B e-Business Integration' with one of its largest customers (Customer.com). This case illustrates a first stage system architecture to inter-enterprise computing. In this example, the integration of the system architecture is made possible through a variety of 'back-end', 'sell-side' and 'buy-side' systems.

Customer.com was able to leverage its existing SAP 'back-end' system and SAP Business Connector (powered webMethods technology) to communicate directly with Computer.com's component-based e-business system. The integration of Customer.com's ERP (SAP R/3) system and (SAP B2B) procurement application to Computer.com's Web catalogues, automates the e-procurement of all computer products from via the Internet (Dell 2000).

B2B Integration of a Network of ERP-based Companies (Divisions)

Stage 1 ‘b2c’ Computer Sales to other Divisions and Corporate Customers

The SAP-based Order and Request System (ORS) was developed in 1997 initial for Scitec Computer Systems (company division), for use all over Europe. In addition to standard features such as the ability to browse a catalogue, collect items in a shopping cart, and place an order, ORS provides the following capabilities: The system was developed to optimise processes between Scitec Computers and its other divisions. Some 80% of orders from 2200 key accounts are handled by the e-ordering system. Also, there was reasonable acceptance by the end-users, with less order errors aided by the reliability of SAP R/3 data.

Stage 2 ‘b2c’ Sales across Divisions

In 1999 the Scitec e-Mall was developed as an Internet marketplace for Scitec divisions to sell their products and services to business customers. The system architecture has the capability to connect/interact with a range of 'Buyer' companies SAP R/3 and R/2 systems, and other ERP systems. By June 2000, the company's e-Mall had progressed to version 2 with three companies - ICP, A & D, Medical. The intended benefits of e-Mall flow from the streamlining of sell-side business processes:
Scitec group specific product presentation;
Integration of Group’s materials systems;
“One face” to the customer;
Sales presence round the clock and world-wide.

Stage 3P: ‘b2s’ Procurement across Divisions

The Scitec Gatecentre is an electronic marketplace for Scitec’ companies to purchase their products and services from business suppliers. The worldwide presence of the Scitec purchasing network supports global sourcing and corporate-wide combined requirements. Scitec has 520 purchasing departments globally. The intended benefits of Gatecentre flow from the streamlining of buy-side business or procurement processes:

Individualised offers
Up to date cross group Scitec offerings
Convenient ordering at any time and anywhere.

The potential for procurement was characterized/defined by the company focus on cost-reduction. This was assessed in terms of procurement marketing and procurement logistics:

Procurement Marketing – strategic cost-reduction through;
global sourcing,
market transparency,
supplier management and demand bundling.

Procurement Logistics – operative cost-reduction through;
standard procurement processes,
optimisation of time, costs, and quality.

Outcomes and Performance Gains

Table 6 summaries the similarities and differences of the expected benefits from the two cases about business networks. However, within the issue of performance gains, improved customer response and an expanding customer base was seen as most significant factor. As a measure of its success and acceptance, future e-business solutions are expected to include the employee self-service of B2B e-procurement of office equipment and supplies.

The performance gains for e-procurement were achieved from two sources; 25% cost savings, and reduced cycle time from 2 weeks to 2 days, and access to (real-time) customer data via ERP technology. The project enabled efficiency gains from minimising of delays in customer orders, and effectiveness gains from optimising employee/staff time. For example; fewer complaints, improved management of the customer, increase to 50% with online orders (sales), and a growth in corporate sale of 45% (DELL 2000). Also, online access to real-time data for deciding on the optimal employee orders. The cost savings through operational efficiencies of all equipment purchases, compare favourably to those cost reductions in other e-procurement case studies. In the Biotech.com case study, the gains appear to be less; 20% cost savings, and reduced cycle time from 2 weeks to 4 days. However, the improvement in administrative efficiencies for staff, appear the same.
Table 6: Integrated Enterprise Systems Scorecard

<table>
<thead>
<tr>
<th>Orgn. Benefits</th>
<th>Computer.com</th>
<th>Scitec.com</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partner Benefits</td>
<td>Presentation of configurable products on the Internet</td>
<td>Presentation of configurable products on the Internet</td>
</tr>
<tr>
<td></td>
<td>Control and standardize procurement process</td>
<td>Ordering times optimised through online connection</td>
</tr>
<tr>
<td></td>
<td>Increase order accuracy and efficiency</td>
<td>Incorrect orders reduced to minimum</td>
</tr>
<tr>
<td></td>
<td>Reduced order cycle times</td>
<td>Shorter and therefore faster ordering times</td>
</tr>
<tr>
<td></td>
<td>Provides a model for use with all customers with SAP</td>
<td>Information management</td>
</tr>
<tr>
<td></td>
<td>Available 24 hours a day, 7 days/wk.</td>
<td>Available 24 hours a day, 7 days/wk.</td>
</tr>
<tr>
<td></td>
<td>Simpler ordering, resulting in savings in cost and time</td>
<td>Simpler ordering, resulting in savings in cost and time</td>
</tr>
<tr>
<td></td>
<td>Automatic online information on order changes and delivery acknowledgements</td>
<td>Automatic online information on order changes and delivery notifications</td>
</tr>
<tr>
<td></td>
<td>Extend existing infrastructure to the web for use by our suppliers</td>
<td>Tracking of orders at any time</td>
</tr>
</tbody>
</table>

In addition to the benefits from e-business implementations (Table 6), ERP imposes a discipline of best practice (however rigid) to internal business processes, eg order a stock item from a supplier. Such constraint offers integrity of data/information that external users find attractive and potentially trustworthy. Web-enabled applications with ERP were found to offer important business options for existing ERP enabled organisations with B2B models; a more flexible and agile IT architecture for e-engineering of business networks.

CONCLUSIONS

The early adopters of e-business applications show a trend towards realizing benefits from e-procurement and employee self-service applications. Standardisation of both business processes and vendor catalogues is a way to drive cost reductions in supply chain management. A further case study of the first B2B e-business integration with a global computer supplier and its largest corporate customer is analysis in the context of a more complex model. This case demonstrates the integration of ERP and non-ERP systems, using Web-based technologies, to provide the infrastructure required to optimise the overall B2B value chain. Also, the study is used to emphasize the synergistic benefit stream from B2B integration, the automation of inter-organisation e-business solutions.

Overall, the results from the case studies demonstrated that three divisions of a business-to-business interaction model (b2s, b2c, and b2e) provide a framework for studying e-business benefits. While this research found an important role for ERP in support of e-business, the message from these case studies is that the business model should drive an e-business implementation, not the technology.

As business thinking shifts from cost saving to revenue generation, this research framework is commended as a research tool, for future study of the broad and new complex phenomenon of e-ERP implementations. A candidate subject for future research is e-business in ERP environments as a composite strategy (Figure 2). The evidence thus far indicates that ERP technology will continue play an integral part in helping established enterprises build and operate online business-to-business that can lead to electronic marketplaces. Thus there is a need to redirect this study towards investigating those SAP sites that had implemented mySAP.com, SAP's portal for e-business solutions.

More recently, organisations that have begun to undertake e-business initiatives to meet strategic goals, recognise that they will only accomplish their objectives through people. Therefore placing importance on improving the quality of work-life issues. If effectively managed, employees should ultimately be more productive in their work tasks and better able to serve customers, suppliers, and business partners. The key performance improvements issues are; efficient company resourcing, quality of employee work life, and customer satisfaction (Venkatraman et al. 1998).
Finally; technology is important, business-to-business models are more important, but; people have to make them work.

REFERENCES


Perez, M et al, (1999) SAP R/3 on the Internet Addison-Wesley, USA


A BYTE OF PREVENTION IS WORTH A TERABYTE OF REMEDY

Craig Valli

School Of Management Information Systems
Edith Cowan University, Australia
E-mail: c.valli@ecu.edu.au

ABSTRACT

We monitor phone line usage and bar long distance calling on the most common modern communication device the telephone to maximise business benefits yet we are reluctant to apply the same scrutiny to our Internet connections. Common catch cries abound, such as “we don’t know how to do it” or “there is no way we can stop it entirely”. While these are all valid arguments they are not a valid excuse to not regulate use of your Internet connection. If institutions regulate their phone systems to keep costs down and ensure that the technology is used appropriately why then does it not follow that Internet connections are treated the same.

This paper outlines some of the risks than an unfettered connection to the Internet can present for modern organisations. It then provides some steps that an organisation can undertake to start reducing risks and costs associated with their Internet connection.

Keywords: Internet, risk, bandwidth, cost, monitoring

INTRODUCTION

As the use of the Internet becomes more ubiquitous and widespread in business the threats and risks associated with its abuse are increasing. We now have over 45% percent of Australians who access the worldwide web doing so at work (McLennan, 2000). So what measures can be put in the workplace to monitor this employee activity. We have established controls and measures in existence for other information communications technologies such as the phone and fax but what do organisations have in place for their web and e-mail traffic?

The optimal performance of a company's network infrastructure is an integral part of any modern business's productivity. The indiscriminate sending of e-mails, accessing MP3 audio files or video files and other non-business related materials could cause delays and slow down or even halt the network for legitimate business use. Employees are increasingly legitimately using e-mail to share large data files such as spreadsheets, graphics, reports and other business documents. This is starting to push often-scant bandwidth availability to breaking point, which is only further exacerbated by the illegitimate use of the Internet connection.

Recent surveys have figures between 60-80% of employees accessing pornographic material in the workplace (Hickins, 1999) and as well most staff are sending private e-mails (Holtz, 2001). So why is this problematic? Several factors make this problematic firstly, there is the lost productivity of the worker who is carrying out these activities. Secondly, the use of resources for reasons other than which they were deployed and finally the legal and social implications of such use in the modern workplace.
Many institutions do not even have established network policies and procedures to cope with normal network access requirements let alone the extended access into the Internet. Some organisations are deploying policies and filtering systems to counteract some of threats and risks that this access to the Internet poses to the organisation. However, the effectiveness of filtering systems alone is proving ineffectual in some cases to preventing this sort of abuse (Hunter, 2000; Neumann & Weinstein, 1999; Nunberg, 2001).

This paper will present a combination of policy and effective countermeasures to reduce the risk posed by such unauthorised and unsupervised of the Internet in most organisations.

**WHY FILTER AND POLICE?**

Most organisations that are connected to Internet have expended considerable amounts of capital and resource to provide and maintain the connection. After the initial provision of the server infrastructure typically the next biggest cost is the ongoing provision of the bandwidth which overtime can easily outstrip the initial capital cost of the physical infrastructure. So finding methods that reduce the unnecessary use of the bandwidth is imperative if costs are to be minimised and controlled.

One of the biggest areas of concern is also the workplace and legal issues that arise from employees misuse of the Internet. The range of issues that these present is wide, varied, and problematic.

"Insiders pose enormous legal dilemmas for their employers who have to decide how to deal with the threats or harm arising from computer misuse......Vicarious liabilities which might be attached to employers for the acts of their employees in the course of their employment and by their usage of the new technologies, have in the main been one of the biggest concerns and worries of employers."(Zaiton, 2000)

The legal as the aspects of this are not intended to be covered in any great depth in this paper. But we must acknowledge that unfettered access to the Internet can leave organisations open to liability and risks that they must attempt to reduce via a set of appropriate countermeasures and policy.

**Filtering the Noise**

Content filtering is a valid way of controlling access to an organisation’s Internet connection. There are very few organisations that need to have legitimate access to websites that would contain explicit pornography, hate literature, slander and libellous material. In the same way that phone lines are barred or monitored why are these same controls often not readily applied to incoming and outgoing web traffic.

While it is a given that most content filtering software does not block every undesirable site it does however, block most of the patently obvious sites. Herein lies one of its understated strengths if an employee does not actively view such materials at home for instance then the possibility that they will know some esoteric URL such http://203.38.0.163/~hatematerial is greatly reduced. A naive abuser however, is likely to know obvious brand names such as Playboy or Hustler that would which content filtering software will block. This would then send the appropriate organisational message to the end user. Conversely for the experienced purveyor of such digital material the entry of the esoteric URL's needed to bypass the content filtering software would easily show up in the log files of the proxy server.

For some sites between 10 to 70 percent of bandwidth used to display the page is taken up by extraneous material in the form of advertising banners, animated gifs etc that have very little if any functionality for the viewer. By using filtering techniques to remove most of these advertisements an organisation can increase the "relevant" information carrying capacity of their Internet connection.
Apart from increasing the relevant carrying capacity of the pipe the lack of advertisements and other extraneous click through possibilities should have an impact on user behaviour and productivity.

Bandwidth intensive media such as FTP, MP3 and streaming video long could be likened to a long distance phone call. Unlike web browsing and e-mail which is short bursts of information an FTP or video stream will typically download as fast as your pipe allows for as long as it takes to download that file.

So if there is a 45MB demo file of the latest game waiting at an FTP site and a person in your organisation decides to download it and there are no checks in place that effectively means that the Internet connection will become clogged with this traffic. Regardless of the fact that it has cost the organisation money to download the file there is the opportunity cost of having your Internet connection unable to service legitimate business activities during that time. There is also often the problem of copyright infringement when concerned with things such as the download of MP3 and video files.

METHODS AND TOOLS FOR REDUCING RISKS

Putting policy in place and maybe logging connections is simply not enough to reduce the risks. The question still remains what percentage of the Internet volume is being used for legitimate business purposes? What material is being downloaded? For these questions to be answered ongoing monitoring of the connection is needed. You rarely have to get to specifics but you can see if that suddenly www.freewhippy.com is chewing up 30% of bandwidth a day and has no relevance at all to your work. Then simply barring that site will allow you to regain that 30% of bandwidth back without the need for organisational witch hunts and sends a powerful symbolic message to people within the organisation (Brown, 1994; Feldman, 1981).

There are several relatively simple things that network administrators and organisations can do to effectively reduce the risk associated with Internet misuse and abuse. The following is a set of procedures and tools that can be used to help facilitate the correct use of Internet for business purposes.

It is assumed that access to the web is provided by proxy servers and that all connections to the web are provided through these. Likewise all e-mail transgresses through an internal mail server before being routed to the outside world.

Policy

Before anything can really be effected in the organisation it must develop an access policy for the Internet. This sets the bounds and limits for users as to what is reasonable and unreasonable use. The policy should explicitly state what expected of users.

"In order to protect its legitimate interests, the most important action that an employer can take is the development and enforcement of a telecommunications policy. For both legal and practical reasons, all of the rules, rights, and objectives of employer and employee must be clearly stated in the policy. If that is accomplished, an employer will have a great deal more flexibility in handling employee issues." (Thomas, 2000)

This access policy should be overtly apparent to all employees and should be communicated in writing to all employees ideally as part of the employment contract. The policy should also be reviewed at regular intervals to may sure that the policy is still relevant and addresses the needs of the organisation. The policy should be an integral part of the organisation information security approach.
Nailing Abusers Down

Before any site logging can be truly effective there must be a way of uniquely identifying who the person accessing the pages is. There are several ways to accomplish this namely manual user authentication, static IP addresses and automatic user identification.

Manual user authentication normally requires the user to input their password and user name which is often different from the network login name. The user must input this each time they wish to use the proxy server i.e. start their web browser on the client machine. This problematic as it can cause user disenchantment and frustration, but is also an unproductive and overtly intrusive use of technology.

The best method is the use of static IP addresses and automatic user identification. Automatic user identification involves the inclusion of the user/login name of the system that is accessing the Internet. This is normally done via the network operating system providing the login name to the logging server. It can also be accomplished via the use of public key infrastructure and the use of digital signatures and certificates to seamlessly access the network. Another alternative is the use of identd daemon technology that is freely available for most computer platforms and provides transparently the identity of the logged in user.

A static IP address means that the IP address is used exclusively by that device accessing the network and is set statically i.e. it does not change. Many systems administrators for ease of setup, use and maintenance use dynamically allocated IP addresses via the Dynamic Host Control Protocol (DHCP) suite. This is often problematic when trying to track perpetrators as the IP address of a particular workstation will change over time and hence it can prove difficult to prove a breach.

In the case of e-mail authentication this is automatic as user names and passwords must be provided in order to be able to receive and send e-mail for most systems.

Logging It

Having put in place structures to accurately identify each user on the network the next step is to provide sufficient logging to track the activity of each user. As indicated in the previous section logging of e-mail does not present any difficulty because users normally have to authenticate to use the service.

When logging accesses of the web the log file should as a minimum log the time, the requesting IP address, the requested URL and whether the access was successful. Most modern proxy servers log file formats easily cover all of these requirements for analysis. It is advisable however, to make sure that the logging is enabled and that the log file format does cover the minimum requirements. It is also important and that the logs have sufficient persistence so that a pattern of abuse/misuse can be established.

One overlooked point is that all servers that serve content should have their dates and times set centrally. The originating timestamp should be also sourced and regularly updated from official timeservers on the Internet, which makes analysis simpler and accurate.

Log file analysis

Having successfully captured in the log files the web browser based activity of the organisation some analysis must be conducted. There are a wide range of tools available for the purposes ranging from freeware, shareware offerings right through to full-blown commercial systems costing several thousand dollars.
Systems that provide the ability to graph usages are best as they give managers a quick glance to establish patterns. Most systems can provide highly detailed reports of URL's visited and bandwidth consumed down to specific users or IP addresses if so configured.

Then having processed the logfiles and having this information at their disposal the managers can determine appropriate remedies in-line with established policy.

Content filtering

This is simply the blocking of undesirable sites via either the existing proxy servers or the use of a third party software tool. Whatever method is selected it is important that the rule setting and procedures associated with these mechanisms is constantly reviewed as a result of the ongoing logfile analysis to be the most effective.

The system must allow for the additional customised blocking of sites to be effective. Sites that can start to be problematic may not be blocked by content filtering software as for all intents and purposes the sites are not offensive and are typically used for business purposes. By way of example an external site that is used worldwide for team based sharing of files in one company proved to be a problem. The author who monitored a site for a client upon deeper investigation of a legitimate site had staff transferring large pornographic movies to each other rather than work files the volume of which was around 50-100MB per day. The ability to track this enabled the organisation to reduce network traffic, reduce the risk of hostile workplaces and redress productivity issues.

As mentioned before the removal of advertisements and other extraneous materials can reduce page download sizes by as much as 80-90%. This may seem insignificant when you are saving say 50K a page view. However, if this is a search engine page that gets 1000 accesses a day this represents a bandwidth saving of 50MB a day and at 20c a MB download cost $10.00 a day or ~ $3500 a year in bandwidth. This again is facilitated by the monitoring of the network activity in the form of logfile analysis.

CONCLUSION

In the same way organisations monitor and control other communications channels the same measure of diligence and oversight should be applied to an organisations Internet connection. While content filtering and site monitoring have inherent faults in that they will not effectively capture every transgression and may block innocent sites. They do however, provide a valid baseline defensive mechanism for organisations to reduce risks, costs and threats associated with the provision of Internet access in the workplace.

The effective implementation of the content filtering and monitoring program is as much about tools and techniques as it is organisational acceptance and compliance. For content filtering and monitoring to be effective it must become a seamless part of the organisations policy and procedures. Significant cost savings and risk mitigation can be achieved through the effective use of content filtering and monitoring of Internet connections in an organisation.

Internet connected organisations that perceive they are not vulnerable to these problems or cannot simply justify the expense of monitoring software and or organisational procedures to combat non-business use of the Internet should re-think. This practise of e-ignorance is leaving the organisation libel to a range of potential legal risks. Furthermore; it is costing the organisation for every byte of non-business use that in or out of the organisation. So is your organisation “Net wise or byte foolish?”
REFERENCES


The Adoption and Use of Electronic Banking by SMEs in Australia

Doug Cameron and Philip Joyce

1 DWS Software Services
Melbourne Australia
E-mail: dougcameron@hotmail.com

2 School of Information Technology
Swinburne University of Technology, Australia
E-mail: philj@it.swin.edu.au

ABSTRACT

In the competitive world of commerce SMEs must examine every new enabling technology to not only remain competitive but to stay in business. Information technology is now providing SMEs with basic business tools that will enable them to increase their attention on their core business activities. One activity that can be greatly improved by information technology is electronic banking. In this paper we examine the use and adoption of electronic banking in an Australian context.

INTRODUCTION

The ability to reduce the demand on the organisation's operational resources by non-core activities and time spent performing these activities will naturally provide more resources for the production of the organisation's goods and/or services. Moreover, this will improve the organisation's financial performance, efficiency, and its use of the organisation central operational resource and staff members. The largest operational resource found in an organisation is staff time. Similarly, the largest operational overhead for an organisation is staff wages and salaries. The allocation of this organisational resource (staff time) on core and non-core activities is extremely difficult.

In larger organisations staff are allocated to perform non-core activities. These organisations use operational efficiency standards to ensure that staff employed to perform non-core activities work efficiently and see the value of completing non-core activities quickly. In contrast, smaller organisations, i.e., Small to Medium Sized Enterprises (SMEs) do not have the budget to employ staff that can be dedicated to non-core activities nor do many see the benefits of performing these non-core activities efficiently (Longenecker et al. 1998).

One administrative non-core activity that has not received much attention has been the banking function of SMEs. Traditional banking is a resource intensive process. For SMEs, these resources included travelling to and spending time at the bank, generation of cheques, etc. The routine nature of traditional banking allows for information technology to be used to reduce the operational expenses involved with this function. However, SMEs have difficulty identifying the need to use IT within their organisation to reduce non-core business inefficiencies leading to a poor awareness of electronic banking systems (DeLone 1998). The availability of information systems that allow SMEs to complete these activities more efficiently will greatly benefit them.
AUSTRALIAN SME'S ELECTRONIC BANKING SURVEY DETAILS

Central to this work is the development of an understanding of the current Electronic Banking perceptions and practices by SMEs within the Australia context. This paper focuses on the adoption and use of electronic banking by SMEs. Moreover, we focus on the possible removal of inefficient business processes through the use of IT as a method to assist organisational change. Electronic banking is an IT system that can be used to remove inefficiencies and is being actively promoted by the banking industry. The range of IT systems available to perform banking and SMEs ability to adopt these systems will be explored in detail with an inspection of the possible benefits and problems associated with this use. In detail we will investigate:

The nature of SMEs who are using electronic banking;
The nature of SMEs who have not adopted or are considering adopting electronic banking;
The main impediments of SMEs who have not adopted electronic banking;
The benefits and problems users of electronic banking are experiencing; and
The perceptions of Internet banking by all SMEs.

In this paper we use a simple conceptual model to examine the adoption and use of electronic banking by SMEs. The conceptual model of electronic banking was adapted from the EDI adoption for SMEs (Iacovou et al. 1995), as shown in Figure 1. This provides a framework for the development of a survey tool ensuring that appropriate questions were asked to gather the most relevant data possible.

![Conceptual model for the adoption and use of electronic banking](Adapted from Iacovou et al. 1995)

**SELECTION OF SURVEY RESPONDENTS — ELECTRONIC BANKING IN SMES**

The target group focuses on SMEs from the Geelong region of Victoria, Australia. Selection of SMEs was performed by obtaining a list of all possible organisations, within the Geelong region, from the Geelong Chamber of Commerce (GCC 2000). From the surveys sent a total of 57 surveys from the 66 returned were used in the analysis. From these respondents 24 or 42% of the respondents were from the Textile, Clothing, and Footwear (TCF) industry, 25 or 44% from the automotive industry and 8 or 14% from manufacturing/surfing allied industries. Clearly, with a survey of this size it is not appropriate to generalise the results. Initially the responses were broken into the three industry groups and analysed to determine if any results were industry specific however there were no standout differences between the industries (Cameron 1999). The respondent SMEs were separated into two groups: those currently adopting electronic banking; and those non-adopters of electronic banking.
In total 12 or 21% of SMEs were using electronic banking, 6 or 50% from the TCF industry, 3 or 25% from the Automotive industry and 3 or 25% from other industries. In contrast, 45 or 79% of the respondents did not use electronic banking. Eighteen 18 (75%) respondents from the TCF industry, 22 or 88% of the respondents from the Automotive industry and 5 or 62.5% of the respondents for other industries.

**SURVEY STRUCTURE OF SME’S ADOPTION AND USE OF ELECTRONIC BANKING**

The model of electronic banking adoption has provided the understanding of how SMEs may be using electronic banking. From this model six sections of the survey tool were established to obtain information from SMEs. The sections were:

- Company profile;
- Banking activity;
- Business use of technology;
- SMEs who use electronic banking;
- SMEs who don’t use electronic banking; and
- Perceptions of Internet banking.

**Company Profile**

The first section of the survey ‘company profile’ was used to ensure the respondent organisations were SMEs, from the Australian Bureau of Statistics definition (ABS 2000). It also provided information on the industry of the SMEs to allow comparison of industries.

**Banking Activity**

The second section of the survey was used to obtain information regarding the banking activity of the SMEs. The time to complete their banking weekly, their main banking activities, and how payments are made and received can be used to show benefits for non-users of electronic banking (Carter 1998).

**Business Use of Technology**

The third section regarded ‘technology use’ and was used to determine the IT use of respondents and complete the company structure (size, banking activities, and technology) as shown in Figure 2. Knowledge of the IT use enabled analysis between the three types of SMEs, non-users, adopters, and users. The effect of IT use on electronic banking adoption and use could then be established. If the IT use gap exists between trading organisations the effort needed for SMEs who were currently not using electronic banking to start using this technology could be shown. If no gap existed we could able to dispel lack of technical know how and use impediments of electronic banking, “the relative advantage of technology is an important factor in the adoption of technology by SMEs” (Rogers 1983; Fuller and Jenkins 1995).

**Business Who Use Electronic Banking**

The fourth section was to be completed by organisations using electronic banking. The time of use of the technology, benefit, and problems associated electronic banking use is determined. The effect time had on electronic banking use could be determined to put benefits and problems into greater perspective than just the association with company structure, as section 2.2.2. SMEs who are ready adopters are eager to understand the benefits electronic banking will offer their organisation (Abell 1996).
Business Who Not Using Electronic Banking

The fifth section of the survey was to be completed by SMEs not using electronic banking so that information relating to the barriers in using this technology could be found. The SMEs were then asked whether they would use electronic banking. Knowing whether or not they would use electronic banking provided further classification as to the SME being a non-user or ready adopter. For these SMEs their impediments could be determined and analysed with their company structure.

Perceptions of Internet Banking

The final section examined the 'perceptions of Internet banking' of all respondent SMEs. The Internet is the new enabling technology for electronic banking and it is envisaged that both current users and future users will have to use the Internet to perform their electronic banking (Grayson 1998). Identification of the benefits and risks SMEs associate with the Internet provide greater understanding of the impediments identified in section five.

<table>
<thead>
<tr>
<th>Category</th>
<th>Classification of SME by Use of IT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category 1 ‘Very Low’</td>
<td>Use a computer and / or Use a word processor (Word, MSWrite, etc)</td>
</tr>
<tr>
<td>Category 2 ‘Low’</td>
<td>Category 1 and two of the following: Create invoices using a computer Have a customer database Use an accounting package Have an inventory database</td>
</tr>
<tr>
<td>Category 3 ‘Medium’</td>
<td>Category 1 plus 3-4 of the following: Create invoices using a computer Have a customer database Use an accounting package Have access to the web Have an inventory database Have an Electronic Data Interchange (EDI) system</td>
</tr>
<tr>
<td>Category 4 ‘High’</td>
<td>Category 1 plus Create invoices using a computer Have a customer database Use an accounting package Have access to the web Have an inventory database</td>
</tr>
<tr>
<td>Category 5 ‘Very High’</td>
<td>Category 1 plus Create invoices using a computer Have a customer database Use an accounting package Have access to the web Have an inventory database Have an Electronic Data Interchange (EDI) system</td>
</tr>
</tbody>
</table>

Table 1: Categories of SMEs use of technology

Classification for Respondent SMEs

Technology use was determined to be an important factor in the adoption and use of innovation of within redeveloping business process (Raymond 1985; Iacovou et al. 1995). The benefit of electronic banking adoption and use to SME’s business processes is no exception (Cragg and King 1993). To establish the effect technology would have we had developed a classification 5 categories structure of IT use within a SMEs. The breakdown of each of these groups is shown in table 1. SMEs within category 1 have the greatest hurdles to overcome as they either do not own a computer or use their computer for basic tasks, such as word processing. Not only will they have to spend the greatest amount of resources to enable them to use electronic banking they will also require some form of computer training to use this technology. Category 2 SMEs use their computer with a limited number of applications that will benefit these SMEs but do not have access to the Internet where most of electronic banking systems are available. Some SMEs will have an accounting package and will be familiar with using IT systems to assist their banking. Category 3 and 4 SMEs have access to the Internet and would own the hardware components needed to operate electronic banking. Category 3 SMEs will require greater help to use...
electronic banking than category 4 SMEs, as they do not have greater depth of IT usage. All SMEs in category 4 have accounting packages and would already benefit from more organised financial data. SMEs within category 5 are in an ideal position to undertake electronic banking as they already use electronic communication mediums to transmit information to other organisations.

**SmEs Using Electronic Banking**

From the 12 respondent SMEs using electronic banking we have examined the standout characteristics of these SMEs. As expected the adopters of electronic banking had a “high use” of Information Technology (IT) and high sales volume to fund the technology. Importantly, this work highlighted the advantages of electronic banking use and of course the problems faced by the users of electronic banking. In the remaining sections we have categorised the tables based on the use of information technology based on the system outlined in section 2.2.6. That is the “very low”, “low”, “medium”, “high” and “very high” use of technology.

<table>
<thead>
<tr>
<th>Do you use ebanking</th>
<th>Very Low</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
<th>Very High</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>No</td>
<td>16</td>
<td>8</td>
<td>11</td>
<td>14</td>
<td>2</td>
<td>45</td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
<td>8</td>
<td>14</td>
<td>14</td>
<td>8</td>
<td>57</td>
</tr>
</tbody>
</table>

Table 2: Breakdown of technology use by ‘Do you use electronic banking?’ categorised by IT Usage

**Information Technology Used by Current Users of Electronic Banking**

From the respondent SMEs using electronic banking 6 or 75% had a “very high” use of IT, as shown in table 2. Compared to the other categories of IT use this was very significant with only 4 or 36% of respondent SMEs with “medium” IT use and 2 or 14% of respondent SMEs with “high” use of IT using electronic banking. No respondent SMEs with “very low” or “low” use of IT are using electronic banking, as these SMEs did not own modems. It is expected that SMEs with high use of technology can easily understand the benefits of electronic commerce from past experience using IT systems (Raymond 1985).

**Sales Volume of Current Users of Electronic Banking**

Respondent SMEs using electronic banking had high sales volume. Within the category of sales volume over $400,000 there were 9 or 30% of respondents within this class, as shown in table 3. In terms of overall SMEs the 9 respondents with sales volume over $400,000 represent a high proportion, 1 (14%) of the SMEs with sales volume less than $100,000 and 1 (25%) of the SMEs with sales volume between $100,000 and $200,000 are using electronic banking. SMEs with a high sales volume should have greater resources for IT. This will make the SME more inclined to purchase computer hardware and software and continue to expand their technology. However, if the SME does not have a history of technology use their sales volume will most likely not affect their use of electronic banking.
Benefits Gained by SMEs Using Electronic Banking

Users of electronic banking must be seen to be gaining benefits, if other SMEs are to adopt this technology. Initial users have taken a risk to use electronic banking in a hope to gain a competitive advantage over organisations. Using electronic banking and their experiences with its use will have a profound affect the further adoption. The most significant benefit of electronic banking was the reduction in time spent on banking. It was expected that the main aim of introducing electronic banking was to reduce the operational staff expense of time in banking. From the respondents 9 or 75% have achieved a time saving, as shown in table 4.

<table>
<thead>
<tr>
<th>Benefit of Electronic Banking</th>
<th>No. of responses</th>
<th>% of total responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saved time</td>
<td>9</td>
<td>75%</td>
</tr>
<tr>
<td>Reduced costs</td>
<td>4</td>
<td>33%</td>
</tr>
<tr>
<td>Increased information</td>
<td>4</td>
<td>33%</td>
</tr>
<tr>
<td>More convenient</td>
<td>3</td>
<td>25%</td>
</tr>
<tr>
<td>Easier to complete</td>
<td>2</td>
<td>17%</td>
</tr>
</tbody>
</table>

Table 4: Benefits gained from using electronic banking.

The timesavings have been achieved in many forms, with one respondent SME replying that ‘banking can be done after hours’ an obvious advantage of electronic banking. A lesser benefit was the ability to: reduce costs associated with banking i.e., 4 (9%) responses; and to obtain greater amounts of information, 4 (9%) responses. While the greatest benefit to electronic banking is time saving other spin-off benefits are achievable. Banking is a continuous service and the introduction of arms length communication provides SMEs more convenience and the ability to obtain more information.

Increased Cash Flow as a Benefit of Electronic Banking

As SMEs have limited resource, cash flow is a vital aspect of their survival and one that must be continually monitored. Two payments methods that improve cash flow are cash and Electronic Funds Transfer (EFT) as they have little or no clearing period. In EFT SMEs do not have to physically handle payments, they can be received electronically which improves the cash flow and is more convenient.

<table>
<thead>
<tr>
<th>Do you use ebanking</th>
<th>&lt; $100 K</th>
<th>$100 – 200 K</th>
<th>$201 – 400 K</th>
<th>Over $400 K</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>14%</td>
<td>25%</td>
<td>0</td>
<td>30%</td>
<td>11</td>
</tr>
<tr>
<td>No</td>
<td>6</td>
<td>4</td>
<td>7</td>
<td>21</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>86%</td>
<td>75%</td>
<td>100%</td>
<td>70%</td>
<td>38</td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
<td>5</td>
<td>7</td>
<td>30</td>
<td>49</td>
</tr>
</tbody>
</table>

Table 3: Breakdown of sales volume by ‘Do you use electronic banking?’
All SMEs surveyed showed the average amount of payments received by cheque was 54% with only 9% being received by electronic funds transfer, as shown in Figure 2.1. This evidence suggests SMEs have a deeply entrenched mindset to use cheques to make and receive payments. This contradicts their willingness to accept various methods of payment. An average of 81% of SMEs payments made to suppliers, employees, and other organisations are by cheque while 9% of their payments are by electronic funds transfer, as shown in Figure 2.2. With cheques being the second most costly method of funds transfer, to over the counter transfers, it is unusual that they persist in using this payment method while they try to cut costs in other areas of their business activities.

PROBLEMS ENCOUNTERED BY CURRENT USERS OF ELECTRONIC BANKING

Respondent SMEs using electronic banking had a number of recurring problems with their use. It was expected that due to the adolescence of the technology a number of problems would be apparent. The problems encountered were implementation difficulties. These included:

"Unable to pay all bills this way because not enough people use it." The greatest weakness of electronic banking was the low volume of electronic banking users. Electronic banking is still a new product and at the growth stage of the technology life cycle where the volume of customers is set to increase. As the volume of SMEs using electronic banking increase problems associated with a lack of people using this technology will decrease. However, the volume of users needed before this problem ceases is unknown (Stienfield et al. 1995).

"Alterations to internal systems have been necessary. Obtaining suppliers bank details has required a lot of follow up." Obtaining details from trading partners may time consuming. However, gaining suppliers may prove to be no more time consuming or involved than needed to obtain payment details from a new client of the SMEs. Furthermore some commercial packages, such as the Commonwealth Banks ‘Quick Line,’ provide a large range of account numbers for prominent organisations within Australia.

"It is not clear that all perceived benefits will not be offset by increased costs." For some respondent SMEs it is unsure whether the initial capital outlay to use electronic banking will provide a good return. Longitudinal research must be conducted to determine the impact electronic banking has on SMEs banking fees and reductions in staff hours spent on banking to establish the exact monetary benefit. Currently these exact monetary benefits are unknown but SMEs can determine savings in terms of reduced bank fees and reduced time.
SMEs Not Using Electronic Banking

By SMEs not using electronic banking we must examine some of the root causes for their reluctance and impediments in adopting and using technology. In order for SMEs to using the electronic banking we must examine how these organisations use technology.

Technology Use of SMEs not Using Electronic Banking

Expectedly SMEs with very low use of technology were unlikely to use electronic banking with only 9 or 31% of these SMEs considering its use, as shown in table 5. SMEs with very low use of technology must spend the greatest amount of resources to gain benefits from electronic banking. SMEs who would adopt electronic banking were expected to have high levels of technology as this mirrors other adoption models of IT inhibitors being economic costs and lack of technical knowledge.

<table>
<thead>
<tr>
<th>Very Low</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
<th>Very High</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>8</td>
<td>9</td>
<td>2</td>
<td>27</td>
</tr>
<tr>
<td>No</td>
<td>9</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
<td>7</td>
<td>8</td>
<td>12</td>
<td>42</td>
</tr>
</tbody>
</table>

Table 5: Breakdown of ‘Would you use electronic banking?’ by technology use

Sales Volume of SMEs not Using Electronic Banking

SMEs who expressed they would use electronic banking had, on average, higher sales volume and “high use” of technology. SMEs with sales volume over $400,000 were the most likely to adopt electronic banking with 18 or 86% of SMEs within this sales volume bracket considered as users of electronic banking, as shown in table 6. The smaller organisations, ones with less than $400,000 sales volume were divided as to whether they would or would not use electronic banking, i.e., 50% each. These SMEs would benefit greatly by using electronic banking and although this it was expected that they would not want to implement electronic banking as they could not see the benefit of improving their non-core activities.

<table>
<thead>
<tr>
<th>Annual Turnover</th>
<th>&lt; $100 K</th>
<th>$100 - 200 K</th>
<th>$201 - 400 K</th>
<th>Over $400 K</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>18</td>
<td>26</td>
</tr>
<tr>
<td>No</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>6</td>
<td>2</td>
<td>7</td>
<td>21</td>
<td>36</td>
</tr>
</tbody>
</table>

Table 6: Breakdown of ‘Would you use electronic banking?’ by annual turnover

Distribution of Information to SMEs Not Using Electronic Banking

Currently the majority of SMEs who had received information from banks but were not using electronic banking were larger in terms of employee size. It was found that only 8 or 26% of SMEs with 1-5 employees had received information from banks while among the other groups at least 50% of SMEs had received information, shown in table 7.

<table>
<thead>
<tr>
<th>Full time employees</th>
<th>Received Info</th>
<th>1-5</th>
<th>6-10</th>
<th>11-30</th>
<th>30+</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>8</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>23</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>31</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>45</td>
<td></td>
</tr>
</tbody>
</table>

Table 7: Breakdown of ‘Full time employees’ by has any banks provided your organisation with information regarding Internet banking?

From the respondent SMEs not using electronic banking 43 provided a response to whether they would use this technology. In total 28 or 65% of these respondent SMEs had 1-5 employees making them the largest proportion of overall SMEs. The lack of information provided to this group would suggest that they may be unlikely to use electronic banking but there was a strong interest in electronic banking with 16 or 57% of SMEs with 1-5 employees willing to use electronic banking, shown in table 8.
It is unclear as to why these smaller respondent SMEs have been excluded from the provision of information by banks, they may not be interested in the SMEs or that they have somehow been overlooked. Either way this group of SMEs shows great potential and should be encouraged by banks as they provide a lucrative market which will improve the efficiency of electronic banking for all users.

<table>
<thead>
<tr>
<th>Banking</th>
<th>1-5</th>
<th>6-10</th>
<th>11-30</th>
<th>30+</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>16</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>28</td>
</tr>
<tr>
<td>No</td>
<td>12</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>43</td>
</tr>
</tbody>
</table>

Table 8: Breakdown of ‘Would you use electronic banking?’ by employees.

CONCLUSION

Electronic banking provides SMEs with a mechanism to reduce the overall time spent on the non-core activity of banking. Importantly, the banking industry is uniquely placed to facilitate the use of electronic banking. In Australia, the use and adoption of electronic banking by SMEs is in its formative stages. Clearly, the problems faced by SMEs in adopting are not inconsequential but can be overcome. SMEs currently using electronic banking already have a good use of technology.
REFERENCES

[On-line]


Geelong Chamber of Commerce Web Page, GCC (2000) [On-line]


