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E-Security Guides for Australian SMEs

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ABSTRACT

There have been many standards and guides written for the implementation of computer security and information security concentrating on appropriate implementation of procedures for effective information security management. Such guides are limited when dealing with e-commerce and its implementation by small and medium businesses. In Australia there are two main guides that aim to provide a framework for performing such services while fulfilling the necessary security requirements. This paper presents an overview of these current small business guides to E-Security with special reference to deriving a common set of criteria for implementing security measures based on a comparative evaluation. The paper will culminate in the combination of the concepts of the criteria with a conceptual model of a process based approach to securing the small to medium business environment.

INTRODUCTION

E-commerce has expanded to encompass a large portion of business practices across the world. This growth has resulted in many documented and unreported instances of crime, fraud and network abuse. With such cases ever more so on the rise, an effective approach towards securing these business systems is becoming even more critical. There have been many approaches and standards released comprising details of managing security by implementing appropriate security technologies (AS/NZS ISO/IEC 17799 2001, AS/NZS 4444.2 2001). Policies have been written to advise who should have access to what information and procedures of how this information should be obtained (Janco 2001, RUsecure 2001, OECD 2002). In Australia Small to Medium Business Enterprises (SMEs) are increasingly turning to Web based services for undertaking their specific business practices including the provision of payment for goods and services being traded. Both Federal and State government bodies have established guides for small business regarding security management of online systems. Specifically “A Security Management Framework for Online Services” has been initiated by the Department of Commerce and Trade from the Government of Western Australia (OIC and CAMS 2000) and the National Office for the Information Economy (NOIE) have proposed an E-Security guide entitled “Trusting the Internet – Small Business Guide to E-Security” (NOIE 2002). This paper provides a comparison of these guides presenting their contribution to assisting the online practices of Australian small businesses and outlines a common criteria presented by these guides for e-security management. To extend on these basic principles a conceptual model is presented detailing a process based methodology towards security for small to medium business enterprises, designed especially for them to undertake e-commerce and have confidence when conducting payments using Internet payment systems.
COMPUTER CRIME

Even though Australian organisations have invested a great deal in security technologies, a substantial amount of computer crime continues to occur (AusCert and Deloitte 2002). The 2002 Australian Computer Crime and Security Survey indicated that 67 percent of respondents suffered a computer security incident in 2002. This represents twice the level of 1999 and 35 percent of these experienced 6 or more incidents. The incidences included data or network sabotage, virus and trojan horse infection, computer fraud, denial of service attacks and excessive network resource use through network scanning (AusCert and Deloitte 2002). Notably 89 percent of attacks were external with less than 65 percent originating from an internal breach. Alarmingly the use of bogus and/or unauthorized credit card numbers is increasing exponentially. Investigations have highlighted numerous businesses that have engaged in on-line trading with no or little experience of Internet security. Essentially these businesses have failed to protect their own interests as well as the interests of legitimate customers who hand over their personal and credit card details (AusCert and Deloitte 2002). These results summon for sound methods of securing the operational environment of Australian organisations. The foundation of a comprehensive approach is to employ the tools and techniques found in security management guides. The next section focuses on analyzing two such guides aimed at securing the e-commerce environment for Australian SMEs.

AN ANALYSIS OF SECURITY MANAGEMENT GUIDES

During 2000, market research was commissioned that showed that SMEs were confused about authentication technologies and really unsure about how they could secure e-commerce transactions. The results of the study pointed to business and consumer concerns about security and privacy that consequently were hindrances to the expansion of e-commerce in the Australian economy (NOIE 2002). To raise awareness of e-commerce security small business guides were commissioned by the Department of Commerce and Trade of Western Australia and the National Office for the Information Economy. The following section explores these two existing security guides aiming to identify a set of common criteria that is required for securing the e-commerce environment for Australian SMEs. The guides are described and compared with results collated into a table for review. A conceptual model is presented based on this analysis and proposes a process based approach to identifying and implementing an entire security framework for individual SME settings that is currently under development.

A SECURITY MANAGEMENT FRAMEWORK FOR ONLINE SERVICES

The preparation of this framework was a joint initiative in 2000 between the Department of Commerce and Trade’s Office of Information and Communication (OIC) and the Department of Contract and Management Services (CAMS) of the Western Australian Government. The framework addresses businesses-to-business e-commerce defined as the process of arranging the transfer of goods and services, including performing payment and exchanging information between buyers and sellers (OIC and CAMS 2000). The focus of the framework is to raise awareness of the security issues associated with e-commerce in government agencies and supplier organizations with the intention to aid in the development of baselines for desirable policies and practices along with the timely adoption of appropriate new technology (OIC and CAMS 2000). As the initial stage of a three part security project, this security management framework covers phase one which comprises the following five elements:

- Security project;
- Security Objectives
- Strategies to Address Risks
- Tools for Security Management
- Conclusion.
Each one of these is briefly described in the following section.

**Security Project**

This section prescribes the building blocks of the proposed Security Management Framework and suggests five steps that management should undertake to address security issues. Developed from workshops with agencies and suppliers, review of key documents like Australian Standards, liaising with other jurisdictions and Teleconferences with experts in e-commerce security, the requirements set out the means to:

- Identify the business risks;
- Develop a risk management plan;
- Adopt security objectives;
- Employ appropriate tools and techniques and
- Monitor and test for effectiveness.

**Security Objectives**

This section identifies the objectives of security management in e-commerce. These include measures for ensuring Authentication, Availability or Denial of Service, Confidentiality and Privacy, Integrity and Non-repudiation. A description of each is given with supplementary examples of risks like the unauthorized ordering or approving of transactions associated with the lack of or improper implementation of authentication.

**Strategies to Address Risks**

This section is separated into the subsections of Risk Management, Management Organisation and Three Levels of Control. Under Risk Management it is pointed out that organizations taking on e-commerce should identify the assets likely to be at risk and prepare a risk management plan following the risk management process based on AS/NZS 4360:1999 (Standards Australia 1999). This standard comprises a series of steps that include Establish the Context, Identify Risk, Assess Risk and Treat Risk. These are bound by the requirements to communicate and consult and monitor and review at each iteration of the stages. The Management Organisation subsection explains about In-House Management outlining the importance of coordination of security management between different levels and groups where responsibility may be spread between Senior Business Management (up to CEO level), Business Unit Management (applications management), Technical Management (IT Dept or contractors) and Auditors (Internal and External). In addition Inter-Organisational Standards are highlighted to address the need that agreed upon standards will have to be implemented across buying and selling organizations. A brief description is given of the Open Buying on the Internet (OBI) Standard which is a flexible framework for business-to-business e-commerce focusing on automating high volume, low value transactions between trading partners. Three levels of control are outlined for e-commerce security management (OIC and CAMS 2000). These are represented in table 1.
Table 1: Three levels of Control

<table>
<thead>
<tr>
<th>Level 1 – Basic In-House Information Security Practices</th>
<th>Level 2 – Protecting the Information System – Building a Shield</th>
<th>Level 3 – Transmission Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Effective password controls</td>
<td>• Extension of level 1 (internal controls) beyond organisation’s boundaries</td>
<td></td>
</tr>
<tr>
<td>• Periodic review of users</td>
<td>○ Agency security (client &amp; Server)</td>
<td></td>
</tr>
<tr>
<td>• Monitoring of changes to critical data</td>
<td>○ Transaction Security (gateways, application service provider and ISP)</td>
<td></td>
</tr>
<tr>
<td>• Backup and recovery procedures</td>
<td>○ Supplier security (client and server)</td>
<td></td>
</tr>
<tr>
<td>• Effective control over and recording of system changes</td>
<td>• Agency policies on Internet usage, awareness &amp; training</td>
<td></td>
</tr>
<tr>
<td>• Maintaining physical security</td>
<td>• Continuity of service in event of system or contractor failure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Protection against breaches: firewalls with other security measures</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Relationship based on trading partner agreement or contract that:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ Defines the EC relationship</td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ Agrees joint controls/procedures</td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ Defines method of resolution</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• For EC relationships the key elements to protect private data transmitted over public networks include:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ Authentication</td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ Encryption</td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ Integrity checking</td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ Non-repudiation</td>
<td></td>
</tr>
</tbody>
</table>

These three levels are more or less stated with no substantiation as to how to go about implementing such practices given the different profiles and procedures that exist between and within small businesses and their trading partners.

**Tools for Security Management**

This section focuses on detailing the tools that can be implemented to facilitate security management. Three levels are defined with accompanying descriptions of the controls that are contained in each stage. These are represented in table 2.
### Table 2: Tools for Security Management

<table>
<thead>
<tr>
<th>Level 1 Controls: Basic Practices</th>
<th>Level 2 Controls: Building a Shield</th>
<th>Level 3 Controls: Transmission Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Password Management</td>
<td>* Systems Hardening</td>
<td>* Public Key Infrastructure (PKI)</td>
</tr>
<tr>
<td>* Access Control</td>
<td>* Policies and Procedures</td>
<td>* Certification Authorities (CAs)</td>
</tr>
<tr>
<td>* Change Management</td>
<td>* Training and Awareness</td>
<td>* Digital certificates</td>
</tr>
<tr>
<td>* Physical Security</td>
<td>* Business Continuity</td>
<td>* Encryption</td>
</tr>
<tr>
<td></td>
<td>* Intrusion protection</td>
<td>* Digital signatures</td>
</tr>
<tr>
<td></td>
<td>o Content security</td>
<td>* Security of Keys</td>
</tr>
<tr>
<td></td>
<td>o Firewalls</td>
<td>* Smart Cards</td>
</tr>
<tr>
<td></td>
<td>o Personnel security</td>
<td>* Secure Socket Layer (SSL)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Secure Electronic Transaction (SET)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Virtual Private Networks (VPNs)</td>
</tr>
</tbody>
</table>

The levels provide a definition of the controls with a brief description of their purpose. There is little detail provided regarding their application and relevance in an actual business scenario. Without such detail a small business would find it difficult to implement such controls into their business environment. To illustrate four of the controls namely SSL, SET, firewalls and Digital Certificates are considered. The framework plainly states that SSL is a protocol developed by Netscape for the secure transmission of data between client/server applications and uses public key encryption to authenticate servers, encrypt data in transit and optionally to verify the client. The limitations of SSL are not described. For instance SSL is not very good at establishing who an entity is communicating with and additional security mechanisms are required to protect data that resides on the client’s host machine as SSL does not protect this in any way (Hutchinson and Warren 2001). Also the only indication that businesses and consumers have that they are communicating within a secure channel is by the page prefix https:// before the page address details in a browser window along with a padlock indicating a secure session has been entered into. In terms of SSL implementation there is a secure pipe that enables the secure exchange of data over an untrusted channel. This pipe is situated at the transport layer of the Transmission Control Protocol/Internet Protocol (TCP/IP), between the client and server of the communication network. Data transmitted using SSL is only secure during the session between the browser and the Web server. Thus any exposure of the transmission of data outside this layer is vulnerable to attack. For example if a Web hosting company collects data from a site that uses SSL but then forwards this data using email, there is no guarantee that the data will be secure on the subsequent part of the transmission. Also some SSL uses have been exposed to a certificate injection threat where a malicious SSL certificate is inserted to the user’s list of trusted root certificate authorities. A number of publicly disclosed vulnerabilities in Internet Explorer and Windows Media Player have enabled these attacks (DSD 2002).

The SET protocol is mentioned as it has only had limited acceptance in Australia. This is valid given that out of the 2 per cent of all transactions involving credit cards on the Internet or by telephone, they represent 50 per cent of all disputes, including those arising from fraudulent use (Fenton-Jones 2002).

Firewalls are depicted as being able to provide three levels of security including logging traffic in and out of a server, block undesirable traffic and control of traffic with strict protocols. Importantly a
The firewall can only monitor and filter traffic that is aimed at it. The firewall cannot detect and cannot control traffic that may be aimed via some other communications path (Sherwood 2000). For example an organisation implemented a firewall system to prevent unauthorised network traffic into their site. They then allowed in Web traffic, FTP traffic, ftp-data traffic, telnet, smtp, network time, news, gopher, and a range of other services to a variety of internal systems. In effect, the firewall was practically of no use (Smith 1997). Importantly stringent guidelines need to be in place so that small businesses are able to correctly configure their firewall and are made aware of how they function. Furthermore firewalls cannot provide complete protection from port scanning. Specifically port scanners are programs that scan firewalls and execute other penetration tests in order to find out how a firewall is configured. Apart from increasing the Internet usage of a business through extra data being transmitted from their responses, port scanning eventually leads to exposing vulnerabilities that can enable a breach to emanate from tunneling through non-standard ports. For example the port scanner nmap is able to identify over 100 different operating system releases, hiding the source of the scan by sending out decoy packets (Emigh 2002).

Finally the OIC and CAMS framework describes how a digital certificate can be used to give buyers restricted access to a seller’s network. There is no demonstration of how this is carried out and with what other controls or operations it needs to integrate and be compatible with. An example of this process involves the Visa credit card company. Visa provides digital certificates to card issuing financial institutions. In return, the financial institution provides a digital certificate to the card holder. Notably digital certificates can be compromised if not protected appropriately. It is vital that when using digital certificates only the person or business they identify can access and use them. In many cases where digital certificates are used in combination with digital signatures, this involves employing methods of protecting the keys used with the digital certificate. Some techniques that can be used to address this issue include assigning stored keys with a password, locking the certificate with an electronic smart card or by using a hardware ‘token’ which plugs into the Universal Serial Bus (USB) port now found on most modern PCs (NOIE 2002). Integration with a Public Key Infrastructure (PKI) is a further issue that needs to be covered.

Conclusion

The final section surmises that the framework is concerned with making trading of Online services between businesses safe and secure by raising awareness of the e-business security concerns both within the public and business sectors. It also offers a Security Controls Matrix that outlines Control Objectives, Control Description and Control Mechanisms that can be implemented to fulfill these objectives. However there is no prescribed methodology proposed of how these control mechanisms can be integrated to facilitate a sound security management approach.

TRUSTING THE INTERNET – SMALL BUSINESS GUIDE TO E-SECURITY

During 2002 the Minister for Communications, Information Technology and the Arts released “Trusting the Internet, a guide to help small and medium businesses understand the key issues of Internet security”. This guide describes how to ensure that business transactions performed on the Internet are safe and secure. It was commissioned by the Federal Government’s National Office for the Information Economy (NOIE) to increase awareness of e-commerce security and authentication technologies applicable to SMEs. The major topics covered include Internet security with regard to browsing a website, sending emails, conducting e-commerce transactions, dealing with government agencies online and conducting e-business activities (NOIE 2002). The following table gives a brief outline of each of the nine parts contained within the guide.
<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The need for e-security</td>
<td>The benefits of performing business on the Internet Why security is an issue on the Internet and its importance to ensure the protection of business data, including customer information and the undertaking of secure transactions.</td>
</tr>
<tr>
<td>2. How e-security technologies work</td>
<td>Outlines four basic security principles to consider and offers examples to map the technologies to these principles Authenticity (Password systems, Encryption, SSL, PKI, PGP, VPNs), Security, Non-repudiation, Privacy and Confidentiality.</td>
</tr>
<tr>
<td>3. Sending emails securely</td>
<td>Describes options for increasing the security of email and explains encryption. Topics covered include:  - Web-based email;  - Dedicated email encryption software;  - Secure email gateways.</td>
</tr>
<tr>
<td>4. Conducting secure transactions</td>
<td>Concentrates on SSL recognizing its restrictions including limited customer authentication and data only being secure between browser and web server, thus if data moved to another location security could be compromised. An example is provided of what SSL looks like.</td>
</tr>
<tr>
<td>5. Other security threats</td>
<td>Defines hacking and viruses as e-security threats that can be handled by installing specialized software like antivirus tools or firewalls. A subsection on securing a PC covers the issues of file sharing, browser security, physical security and personnel security.</td>
</tr>
<tr>
<td>6. Privacy for e-security</td>
<td>Highlights the need for all business websites to have a well planned privacy policy and for customer tracking technologies to be deployed in a manner consistent with this policy. Outlines the Privacy Act and e-security.</td>
</tr>
<tr>
<td>7. Laws for e-business</td>
<td>Outlines the specific laws and regulations that e-business is subject to in enabling electronic transactions to be carried out with confidence and ensure computer crimes can be penalized including the:  - Electronic Transactions Act 1999 (electronic transactions);  - Privacy Amendment (Private Sector) Act 2000 (e-security and authentication)  - Computer Crime Act 2001 (computer crime)</td>
</tr>
<tr>
<td>8. More information</td>
<td>This section provides places where more information on e-security can be located. Included are:  - Australian security and privacy forum &amp; associations  - Training organisations  - Industry and user associations  - International security and privacy forum &amp; associations</td>
</tr>
<tr>
<td>9. How do I</td>
<td>Sums up the parts and offers guidelines on choosing best authentication systems, ensuring against the interception of emails, ensuring the security of certificates &amp; keys, means for securing a PC as well as passwords, managing e-security when services are outsourced, managing real world security risks, protection from viruses and recognizing the completion of a secure transaction.</td>
</tr>
</tbody>
</table>

The benefit of this guide is that it provides reference to websites for direction to further information at the end of each part. In one instance a case is detailed demonstrating how PKI operates. This approach though is limited and the other technologies like SSL are not explained in this way. Further scenarios would give businesses a better understanding of how to integrate such technologies with their existing business procedures. The guide does not make a distinction between SMEs involved with business-to-
business (B2B) and business-to-consumer (B2C) e-commerce and their varying requirements and operational environments. Similarly the integration and implementation of such technologies for the different levels of SMEs, micro, small and medium, are not taken into consideration. SMEs are advised to seek help from an external consultant for these details.

COMMON CRITERIA

The analysis conducted enabled the drawing of a parallel between the CAMS and NOIE small business guides to e-security. The following diagram in figure 1 depicts these similarities with the highlighted circles displaying a set of common criteria required for securing the e-business practices for Australian SMEs based on the guide for security management and trusting the Internet. Although some similar e-security concepts are portrayed there is no distinction made between the implementation of these practices for both B2B and B2C e-commerce settings. This is significant when Internet based e-commerce is flourishing mostly in the B2C world with the selling of items like music and books. The lack of established and acceptance of existing standards is hindering the success in promoting B2B e-commerce solutions (Tian and Chung 1999). These issues need to be addressed considering that these two guides are commissioned by Australian government bodies.

Notably both guides:

- Identify security principles including authentication, security/integrity, non-repudiation as well as privacy and confidentiality;
- Acknowledge that e-security cannot be solved with technology alone. For example to ensure customer privacy it is essential for businesses to have a comprehensive privacy policy e.g. Email security policy to ensure all employees are sending messages securely;
- Concur that for securing electronic transactions SSL is required. Importantly NOIE identifies the limitations of SSL;
- Agree to the use of firewalls to keep a network secure from intruders. The guides lack the requirements for implementation and integration with existing small business systems as well as the limitations of firewalls;
- Recognise the requirement for physical security and personnel policy;
- Confer on a medium for identifying security controls. A security controls matrix based on control objective, control description and control mechanism presented by CAMS and an authentication table outlining specific technologies, how they work and their pros and cons from NOIE.

DEVELOPMENT OF CONCEPTUAL FRAMEWORK

These manuals serve the purpose of a user guide for small business outlining security technologies with descriptions and highlight important security issues. The lack of how an SME could apply such guides to the unique business requirements led to the development of an abstract model on which an SME could base an entire security management procedure including transactional based payments. This section outlines the steps of this model with the implementation being the focus of upcoming papers.

Part 1 – Profile Builder

The nature of the SME needs to be established. Whether the SME is a micro, small or medium business will have an impact on the ability to implement various security models based on the resources available to a given enterprise.

Part 2 – Participant Generator

The business participants including all the stakeholders of the small business will need to be identified. Obvious relationships will need to be built upon including those involved in both a B2B and B2C e-commerce business setting.

Part 3 – Operational Environment

The operational environment will need to be defined. This will include for example the use of distributed applications, computer networks and the Internet, Intranets and Extranets, WWW and electronic messaging as well as models for transactions including Internet banking and payment systems.

Part 4 – Security Level

Define an appropriate level of security for each of the components identified for the secure operational environment. Different security levels will need to be formulated for the Web server, email server, as well as the application server to handle external attacks and certain benchmarks will need to be put in place to prevent compromises from internal sources. Catering for e-commerce security services like authentication and non-repudiation should be included at this stage.

Part 5 – Transaction Management

A breakdown of the different transactions that need to be performed needs to be completed in order to integrate payment system requirements with other participant involved in the transaction process.
Part 6 – Security Technologies

The appropriate security technologies need to be identified for each of the components within the operational environment and mapped to the level of security required to ensure the secure operation of transactions.

Part 7 – Map Theoretical (offline) Model to Practical (live) Model

Once the security strategy has been outlined through a sound design phase that will eventuate by applying the steps in the previous phases, it will be a matter of transposing the model into an online application. This part will involve implementation of an actual running system with the implementation of the associated technologies required for a creating and issuing payments for transactions.

Part 8 – Testing

The live model will require testing. Various testing modes and scenarios are available and should be identified based on its relevance to the operational environment.

Part 9 – Security Policy

A security policy should be drawn up to indicate the appropriate use of the system and define responsibilities for each of the components contained within it.

Part 10 – Education and Training Program

A program will need to be initiated to raise awareness to staff and business partners of the security model that is in use.

Part 11 – Dynamic update of Security Model

The model will need to be monitored and updated accordingly. For instance ensuring that virus scanners are always up to date.

FUTURE USE OF THE FRAMEWORK

This conceptual framework is the initial step in developing a complete framework which will outline the security controls that are available but with the added functionality of prescribing the implementation of these controls with existing small business practices that will need to be integrated to formulate a comprehensive e-commerce security framework. The conceptual model proposes a process based approach whereby the technical controls, people and procedures involved in SMEs are incorporated to facilitate this comprehensive framework. Importantly the conceptual model encompasses the definition of SMEs as ranging from micro (less than five employees) to small (5 to 19 employees) to medium businesses (20 to 199 employees). These will be the building blocks for the complete model. Given the complexity of implementing a complete e-security program, the personnel and financial resources available to each of these groups will differ. One of the significant deliverables of the complete framework will be to direct the correct information at each one of these individual profiles such that the security needs that are unique to each are adequately identified and managed.
CONCLUSION

Small and medium businesses play an important role within the Australian economy. There is a strong business case for SMEs to be involved in e-commerce however resistance stems from credible security concerns reinforced by the extent of computer crime. This paper has concentrated on highlighting the attributes of e-security guides pertaining to securing the business environment for Australian SMEs. An analysis of two government initiated guides was presented resulting in a set of common criteria for effective implementation of security management practices for SMEs. The results indicated that the guides were more directed at raising awareness of security issues and presenting current security technologies that can be used to safeguard business activities like email and transactions. The guides lacked an implementation methodology that could be mapped to varying SME profiles and business practices engaging in both B2B and B2C e-commerce. To bridge this gap a conceptual model of a new security paradigm under development based on a process based approach was outlined to facilitate and overcome the limitations contained within these e-security guides. The complete framework with case study scenarios is currently under development and will be the focus of upcoming papers. Significantly by using this framework SMEs shall become more adept about e-commerce security and the underlying technologies relevant to their individual systems and be able to implement effective e-commerce security strategies.

REFERENCES


Strategic Tools for the New Economy

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ABSTRACT

Is it necessary to develop new strategic tools for Internet business? Rather than developing new tools for the new economy, it may be more useful to adapt an existing, tested tool to the new business environment. This paper discovers several constraints on the use of strategic tools: There are new factors within the new economy; The environment is changing and uncertain; A strategic tool provides a basis for strategy, not the strategy itself. Within these constraints, Porter's Five Forces model will be as useful in the new economy as it was in the old.

Keywords: strategy, Internet, e-commerce, e-business, Five Forces

INTRODUCTION

The Gartner Group provides an international, technology forecasting service. In order to explain some of their forecasts the Gartner Group developed a chart that they call, "The Hype Cycle". (See Figure 1.) The chart shows a standard cycle for any new technology: initial optimism and over-investment, then gloom and despair as some of the wilder promises are shown to be false. This is followed by gradual increase in use and profitability as more realistic expectations are developed for the now-established technology.

In a brochure advertising Gartner's "Symposium/ITxpo 2002" in Europe, a Hype Cycle chart is drawn for the Internet. The chart indicates that in 1998, the dot-com boom was reaching its "Peak of Inflated Expectation". In 1998, in an environment of optimism and over-investment in Internet technologies, Hamel was ready to throw out all existing theories of strategy:

"For the tide to turn, the practice of strategy must be reinvented. Sorry, did I say reinvented? ... No, we must start from scratch. The challenge is to invent anew the conduct of strategy in ways that make it intensely important to companies struggling to maintain their vitality in the innovate-or-die environment of the new economy." (Hamel, 1998)

By 2001, according to the Internet Hype Cycle, the dot-com collapse was moving rapidly downhill, well into an Economic Slump. Business expectations were entering a Trough of Disillusionment. In this less optimistic environment strategic management experts were beginning to recognise that the Internet was not, after all, an all-new environment requiring all-new principles. In 2001, with plentiful evidence of dot-com failures, Porter was able to conclude that business on the Internet would still require "the proven principles" of effective strategy. He wrote:

"Many have argued that the Internet renders strategy obsolete. In reality, the opposite is true..." (Porter, 2001)

With the power of hindsight it had become clear that a lack of strategic planning was as dangerous for an Internet business as for any other business. Porter's article then analysed the reasons for dot-com
business failures in terms of a well-established strategic analysis tool that had been developed in the
1980s: Porter's Five Forces model of competitive advantage.

The final stage of the Gartner Hype Cycle indicates a movement from enlightenment through recovery
to future profitability. By 2006, according to this Gartner forecast, Internet business will have reached an established Plateau of Profitability. For a business to profit from Internet technology, these more realistic expectations must be matched by an effective Action Plan.

Hamel demanded new views of strategy, a reinvention of the means by which a business would
develop its action plan. Porter stated that strategy was still an essential, that the mistakes of the past could be explained by use of a well-established strategic tool. Can the same tool that explained the dot-com crash be used to plan for a profitable Internet future?

In 1998 the Internet was a new technology offering new opportunities and demanding new and more rapid business responses. By 2001 the Internet had failed of its over-hyped promise and this failure had brought down numerous dot-com businesses. From now until 2006 the Internet will provide increasingly profitable business opportunities. To take advantage of these opportunities, businesses need an effective action plan; they need strategic planning.

Porter's Five Forces model provides an explanation of the mistakes of the recent past. Can it be used to adequately plan for the future? Given "the innovate-or-die environment of the new economy", what changes are required in order for the Five Forces model to be effective?

This paper looks at the key changes in the "new" economy. It considers the Five Forces model in light of these changes. And it concludes that the Five Forces model is still applicable, as long as the analyst takes account of a small number of new environmental factors.

![Image of Internet Hype Cycle](image)

Figure 1: From The Gartner Group: Internet Hype Cycle, 2001

THE FIVE FORCES STRATEGIC MODEL

Porter's Five Forces model examines the major issues facing corporate management. The Five Forces model describes these issues in terms of five market forces: Competitive rivalry, Customer buying power, Power of suppliers, Threat of substitutes, and Threat of new entrants. Each of these forces
draws "attractiveness" from the market. The more market attractiveness that is drawn by one force, the less is available for the others. (See Figure 2.)

![Porter's Five Forces Model](image)

The effect of each force is in turn affected by a number of factors. Competitive rivalry is affected by the number of competitors, the current balance between competitors, the rate of market growth, and so on. For more detail of forces and factors see, for example: (Johnson & Scholes, 1999; Nickols, 2000; Prentice-Hall, 2000).

### THE NATURE OF STRATEGY

In this section, we look at several views of strategy. These are: Fit or stretch (Hamel & Prahalad, 1993), Plan or objective (Orlikowski & Hofman, 1997), and Five steps to an e-commerce strategy (Bloch & Segev, 1996). The first two indicate that there is no one clear view of strategy; a strategic approach may be placed at various points on a number of non-complementary axes. The third view takes a simpler approach, with a claim that effective strategy may be implemented as a series of five sequential stages.

Hamel & Prahalad described one traditional view of business strategy as being based on the concept of fit, the allocation of resources to initiatives, and a long term perspective. That is, how does the business wish to fit in with the environment, to which investment opportunities will resources be allocated, and how willing is the business to invest early for a late and risky return. As an direct alternative to the fit approach, Hamel & Prahalad describe the concepts of stretch, leverage and consistency. That is, how dedicated is the business to stretching its goals, how far will resources be leveraged, and how consistent are the long term efforts.

The first of these views strategic planning as finding the best fit to the business environment and its investment opportunities. The Five Forces model begins with an examination of the business environment. In fact, it broadens this view by including potential new entrants and potential substitute products along with current competitors. The stretch view, however, views strategy from within the business itself. Use of the Five Forces model would predicate a fit rather than stretch view of strategy.

From another perspective, the Five Forces model provides an environmental, fit, analysis. The stretch view is then the way in which the business responds to the environmental analysis.

Both fit and stretch views of strategy require a long-term perspective. To match this, Porter’s model must look at potential new entrants and substitute products over a suitably long-term interval. This is
no restriction, it simply adds a time dimension to the strategic analysis. The strategic analyst must consider both the here-and-now and the possible future business environments.

Orlikowski & Hofman placed strategy as either a plan or as an objective. Viewed as a plan, strategy is enacted as a course of action determined in advance. If an unexpected situation occurs then the plan, or strategy, must be altered. Subsequent actions are then taken within the revised plan. The alternate view presents strategy as an objective. Each situation is examined in relation to the objective, action is taken to gain the objective from the new-current situation. So strategy is either a controlling plan, or an ongoing objective. Depending on circumstances, one or other view may be preferable.

A Five Forces analysis of environmental factors may indicate that, for example, the market is ripe for new entrants. The identity of potential new entrants may be uncertain. This indicates that an objective approach to strategy may be preferable: Set the objective and adapt it as new entrants declare themselves. If the environmental analysis indicates a more predictable future, the plan approach to strategy may be preferable. From either perspective, Five Forces analysis is a suitable means of initial analysis. The business response to the environmental analysis is then a matter for a business decision.

Bloch & Segev presented an approach to strategic planning that specifically aims to produce an effective e-commerce strategy. There are five steps: (1) Review current business trends throughout the relevant industry; (2) Review industry-related technologies, especially those of e-commerce; (3) Understand how both business and technology trends will affect strategies of existing players, opportunities for new companies to enter the industry, new competitive products, and reconfiguration of supply chains; (4) Define a suitable e-commerce strategy for the individual company; and (5) Plan for the impact of that strategy on technology infrastructure, organizational processes, organizational values and reward systems.

The first and third steps are direct adaptations from the Five Forces model; the second step emphasises the importance of technology in the market force analysis. The fourth and fifth steps are the application of the Five Forces analysis to the creation of a suitable strategy and impact plan. In this view of the creation of an e-commerce strategy, the Five Forces model provides an analysis of the environmental situation. The business will require further work in order to create the actual e-commerce strategy.

NEW FACTORS IN THE NEW ECONOMY

A number of authors present a variety of factors that are, they write, new to the new economy. In this section, these new factors are grouped into: (1) Relating to the customer, (2) New markets and channels, (3) Back office integration, (4) Supply chain management, and (5) Speed of change. The factors are briefly described, then the Five Forces model is tested against them.

Relating to the Customer

One of the new catch-phrases of the Internet is mass customization: The Internet offers automation of increasing sales to larger markets, yet customers are looking for products that are customised to their own needs. The technology of the Internet provides an opportunity to tailor marketing to each customer. The customer has Internet access to do-it-yourself product configuration; product price will be determined as a result of the customer's customisation choices. This leads to differential rather than standard pricing. (Feitzinger, 1997; Row, 1997; Sicango Cruz, 2000)

Knowledge of transaction history, and the ability to access and analyse that knowledge, leads to a tighter relationship with each customer, including ongoing customer service. Decreasing costs of data storage and analysis mean that the content of each transaction is more important than it may have been in the past. Business may now combine, compare and analyse information from three key groups of
customers: existing customers, potential customers, internal (employee) customers. Web sites and help desks use product and customer information to provide any time, anywhere sales and service. (Berry & Parasuraman, 1997; Row, 1997)

The ease of customer access to a Web site ensures that businesses are able to maintain close and continuous customer contact throughout the life of the product. They offer help with determination of purchase requirements, then with product acquisition, use, maintenance and replacement. There is an increasingly long-term relationship between the business and its customers. (Row, 1997)

The Internet provides an effective means of communication to a range of information sources. Producers and distributors have lost the monopoly on product information; product information may be supplied and supported by a variety of supporting and competing groups. The result is that more product information is now available to the customer. This has shifted power from the producer to the customer. (Evans & Wurster, 1997; Quelch & Klein, 1996; Sicango & Cruz, 2000)

The Internet has reduced the cost of reaching customers. There are corollaries which may have a negative impact on the business: Customer switching costs are low and choice for the customer is wider. In order to sustain its market share, the business must listen to its customers and decide whether it should market itself on price, quality or brand familiarity. (Evans & Wurster, 1997; Kalakota & Robinson, 1999)

Mass customisation, better customer service and long term relationships are possible business strategies. In Five Forces terms they will increase switching costs for customers and raise the barriers against new entrants. Customers who switch suppliers will need to accept less customisation. They will also need to redefine their product and service requirements with the new supplier. New entrants will be expected to offer the more costly customisation and service options, or differentiate their products by cost or quality. (See Figure 3.)

The wider distribution of product information is one of the factors affecting customer buying power, its effects are included in the Five Forces model. Similarly, customer switching costs are included in the model. The model can cater for these customer related factors; What has changed, is that the strategy analyst must be aware of the effect that the new economy and the Internet may have on each factor in the Five Forces Model.

New Markets and Channels

The Internet began as a simple and effective means of exchanging e-mail and documents. It has been transformed into a marketing and management channel that can become a critical backbone for business. This channel must be managed as a unique sales and marketing channel, not as an adjunct to existing channels. (Row, 1997; Sicango & Cruz, 2000)

The Internet channel offers new revenue streams for new and existing businesses. At the same time, common access to e-commerce puts pressure on profit margins. So there is an increased opportunity for new revenue and a balancing pressure that could reduce profit margins. (Feitzinger, 1997; Row, 1997) At the same time, many of the older marketing and distribution channels may become obsolete. There will be less need for intermediaries, or perhaps a need for new intermediaries. The use of e-
commerce allows businesses to restructure operations with their trading partners. The changing economics of information and communication will disrupt the value chain. (Evans & Wurster, 1997; Sicango Cruz, 2000)

The new Internet sales and marketing channel offers new strategic opportunities. The Internet and the Web offer more than a new marketing tactic for the traditional salesperson. They must be used as new marketing tools for the new e-commerce. This is a new medium for a new channel, for new markets. The marketing strategy, message and communication plan must all be rethought. (Row, 1997; Sicango Cruz, 2000) A traditional approach to strategic planning is to determine the most probable future and to develop a strategy to suit that future. This approach is not likely to succeed when the future has great uncertainty. A company must be prepared to abandon strategies, products, employees and customers as markets change and new efficiencies become available. (Carr, 1999; Courtney, Viguerie, & Kirkland, 1997)

New markets and channels may be analysed by use of the Five Forces model. The analyst must, however, be aware that new markets will interact with the old: The new market may attract new customers, it may also draw existing customers from the old market. So the strategic analysis will need to consider all factors and the effects on all markets. Similarly, new revenue streams may be truly new, or they may be transferred from other areas. Market force analysis will need to consider both positive and negative aspects of the new economy.

New channels may lead to new customers, new suppliers and new intermediaries. Porter's Five Forces provides a tool for the strategic analysis of these new business options. The analyst will need to be aware of these new options; The resultant strategy will need to allow for them. Accurate Five Forces analysis will indicate that the market and industry are changing. This will lead to strategies that take advantage of, or protect the business from, the changing environment.

**Back Office Integration**

To match the flexibility of the Internet environment, there must be a robust organisational form that is able to provide efficiency, effectiveness and flexibility. Maximum flexibility will be achieved if work is able to move freely between small, temporary teams. These teams will coordinate and organise themselves in response to changes in the market. (Carr, 1999; Porter, 1998) Management of these flexible teams will be supported by extensive use of information and communication technologies. The Internet environment enables unprecedented, complex changes such as global integration and distributed knowledge management. Order placement, fulfillment and supply are now being organized electronically and communication is now instantaneous. (Bloch & Pigneur, 1995; Orlikowski & Hofinan, 1997; Sicango Cruz, 2000)

"... competition depends on productivity, not on access to inputs or the scale of individual enterprises; employ sophisticated methods, use advanced technology, and offer unique products and services; employ advanced technology; all industries can be knowledge intensive." (Porter, 1998) The business must develop a cross-functional business perspective, it must reconsider core business practices and be more open to outside ideas or to the sharing of internal ideas with external partners. A new set of wide-ranging business data is available, this must be used effectively. (Row, 1997) The Internet and e-commerce allow many different systems to integrate with back office systems such as inventory control. Various internal and external processes may be seamlessly connected. (Porter, 1996; Sicango Cruz, 2000)

The Internet has placed business in a new situation and the rules are still evolving. The depth and complexity of interactions amongst activities may be fully understood only as the changes are implemented. Most managers do not see the complete picture. They see only parts of the benefits that are on offer. (Orlikowski & Hofinan, 1997; Sicango Cruz, 2000) To build an effective strategic action plan managers must understand more of the benefits and pitfalls of the Internet; Effective training is
required. In order to gain maximum benefit from the newly integrated systems it is necessary to develop the IT and business skills of both IT staff, for system development, and of the regular operational staff who will be planning and using the new systems. (Sicango Cruz, 2000)

Back office integration is a recommended strategy to cope with change, competition and new Internet technology. E-commerce, for example, integrates the business with its customers and suppliers. It may either raise or lower switching costs, depending on the way in which it is implemented. Will the result be good or bad? That depends on the implementation and its effects on supplier and customer switching costs. The necessity to examine these factors is included in a Five Forces analysis.

Other points relevant to back office integration may not be identified in a Five Forces strategic analysis. Organisational form, for example, is internal to the business rather than existing in the competitive environment. Adapting the form, however, is a possible strategic response to the environment. The Five Forces model provides strategic analysis. The business must then determine its strategic response.

**Supply Chain Management**

Businesses with a variety of skills and experience may work together on a common project. Effective supply chain management allows a business to produce real products, to provide valuable services, without investing in a lot of expensive fixed assets. (Carr, 1999) The partners need not be physically co-located, they may operate as a virtual organisation. There will be need of an inter-enterprise information system to support the business partner relationships of the virtual organisation. A business may be in a virtual organisation with its direct competitors or it may be partner, through separate virtual organisations, with businesses that are in direct competition with one another. (Bloch & Pigneur, 1995; Hamel, Doz, & Prahalad, 1989; Lethbridge, 2001) The new economy offers several new ways in which the value chain may be organised.

Business partners within a virtual organisation may be physically separated, as long as there is a means of maintaining a constant exchange of information. The Internet provides world-wide infrastructure to support this need for communication. Effective communications allow global sourcing to be used to reduce many input-cost disadvantages. New systems and new Internet communications technologies allow previously independent global value chain activities to be redefined and integrated. (Orlikowski & Hofman, 1997; Porter, 1998) Yet physical proximity of business partners will improve coordination and trust. Localised clusters of supporting businesses provide a critical mass for competitive success in specific fields. Within the global Internet economy there are advantages in local sharing of knowledge, relationships and motivations. (Porter, 1998)

Supply chain management is essential to business and the possibilities are increased within the new economy. If, for example, supply is dominated by just a few suppliers then Internet communications allow use of global sourcing to gain access to more suppliers. The potential to substitute previously essential raw materials may be increased by global sourcing, or by use of new technology as a replacement for the raw material. The high cost of switching suppliers may be reduced, or possibly increased, by forming a virtual organisation with several suppliers.

The potential effect of changes to the supply chain may be analysed using the Five Forces model. The analysis would look at the effect the changes would have on supply factors and the resultant changes in supplier power. If the supplier loses power then this is, in general, of benefit to the business. So a Five Forces analysis of the supply chain will provide a useful basis for strategy formulation in the new economy.
Speed of Change

Competition within the new economy is more dynamic than within the old. Change is happening at a pace that is much faster than many thought possible. To maintain its competitive advantage, an e-business requires more productive use of inputs through continual innovation. (Porter, 1998; Sicango Cruz, 2000) Environmental conditions have become more turbulent, more uncertain; they are in a constant state of change. Customers demand ever faster order fulfilment. The business must respond with increased flexibility and constant change although the direction of change may not be anticipated. The e-business will need to "keep pace or get out of the race". (Orlikowski & Hofman, 1997; Row, 1997)

Technology is no longer an afterthought for business, Internet technology is the key enabler of an e-business strategy. Technology changes may not be anticipated ahead of time. Software platforms are constantly changing and maturing, substantial investments are required for software development. (Kalakota & Robinson, 1999; Orlikowski & Hofman, 1997; Quelch & Klein, 1996; Sicango Cruz, 2000) Business changes due to the Internet involve both market opportunities and technology infrastructure.

The Five Forces model analyses the competition, this is one of the driving forces for business strategy. What is new is the rate at which competition may change. It is not safe for a business to analyse market and industry forces, to set an appropriate strategy, to blindly follow that strategy. The environment may suddenly change, the strategy may no longer be valid. It is now necessary to continually monitor the environment and to be prepared to quickly adapt a new strategy whenever necessary. Yet the basic Five Forces approach is still valid.

The new economy is subject to rapid change. Much of this change is due to technology. New technology is an explicit factor in analysis of potential substitute products, it is implicit in other factors. With specific inclusion of technology in the analysis of relevant factors, and with constant environmental monitoring, the Five Forces model can cope with the speed of change in the new economy.

CONCLUSIONS

The above analysis discovered several broad constraints on strategic planning:

- The strategic analyst must be aware of the impact that the new economy may have on particular factors of market and industry forces. The impact of Internet technology may be vastly different to the impact of similar factors in the old economy.

- The new economy is developing and changing fast. The business must be willing and able to change and adapt. A long term strategic plan may not be suitable, a strategic objective may be more effective in the changing and uncertain environment.

The above two themes may be seen as constraints on the use of Porter's Five Forces model in the new economy: The analyst must be aware of the potential for change and the business strategy must allow for change. A further constraint was discovered:

- The Five Forces model provides a framework for an understanding of key factors within the environment. It does not provide an automatic strategy for success within that environment.

The business must still provide the business strategy; the Five Forces model provides only an understanding of the factors on which the strategy must be based. This constraint does not preclude use of the model, the model is still suitable for use in the new Internet economy.
There is no need to abandon existing knowledge in a search for a strategic tool. Rather than developing new tools for the new economy, it is possible to use a tool that has proven its value over time.

It is necessary, however, to temper use of the Five Forces model with an understanding of the nature of the Internet: There are new opportunities, new threats and new strategic challenges. On top of this, there is rapid change, in technology, markets and infrastructure. Porter's Five Forces model provides a valid means for analysis of the Internet environment. It aids understanding, it will not provide a strategy. And the speed of change of the Internet requires that the Five Forces analysis be revisited, on a regular or continuing basis.

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Tacit to Explicit: Strategies to Convert Organizational Knowledge into Real Assets

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ABSTRACT

The advantage of being able to convert tacit knowledge into a more codifiable and storable commodity is becoming more recognised as organisations deal with the implications of globalisation, downsizing and outsourcing. However a successful method of conversion, technological or otherwise, has not been sufficiently developed and tacit knowledge remains an elusive and unquantifiable commodity that presents a gap in organisational intelligence. This paper is a synthesis of existing literature which covering tacit and explicit knowledge in the context of their role in organisational knowledge. It then examines methods being applied to identify and convert tacit or soft knowledge into explicit codifiable knowledge that can continue as an asset of the organisation.

Keywords: tacit knowledge, explicit knowledge, knowledge assets, organisational knowledge, information economy

INTRODUCTION

A key element in the growth of organisations is their ability to apply modern information technology to knowledge management. As the workforce shrinks because of a combination of economic rationalisation and efficiency driven by a better understanding of information technology, a corporation’s ability to capture and maximise its intellectual capital becomes more important. The knowledge residing within an organization can be the accumulated result of decades worth of collective, continual effort. When a corporation or small business is sold the buyer is paying for an asset which includes the intellectual capital, i.e. the organizational knowledge that resides with the workers on the floor and the suits in the office.

A more accurate quantification of organizational knowledge has been made possible by improved business technology through the 1990s. As a result, more data is stored and modern work culture demands faster deliverability and retrieval of it from anywhere at anytime. Organisational knowledge is, however, more than just data and it is disparately and unevenly held (Dignum, 1999) mainly as the experience of several experts or randomly in document boxes in different, possibly geographically dispersed locations.

The conversion of data to information to knowledge is a continuum within which each element is nothing without the other: data out of context is meaningless, information is a set of data that is structured with a context and provides meaning, and knowledge is information with added value (Spiegler, 2000; Tuomi, 2000). Knowledge management has been presented as the knowledge-information-data sequence because knowledge is needed to know what data to obtain (Tuomi, 2000).
The concept of the separation of two different types of knowledge that corporations deal with was introduced by scientist turned philosopher Michael Polanyi in the 1950s. The central point of his argument was that "we know more than we can tell...tacit knowing is the fundamental power of the mind which creates explicit knowing, lends meaning to it and controls its uses".

He argued that a sharp division between tacit and explicit ("capable of being clearly stated") knowledge did not exist. "Tacit thought forms an indispensible part of all knowledge. All knowledge is either tacit or rooted in tacit knowledge," he wrote. A wholly explicit knowledge, he argued, was unthinkable. Today’s knowledge management systems raise important questions about the nature of knowledge and challenge fundamental assumptions about its commodification.

This nature and the application of modern systems are explored in this paper which is written in an early 21st century business environment where firms that consciously invest in the creation of new knowledge and the revival of embedded corporate knowledge are seen to be maximising the return on their intellectual assets.

**TACIT VS EXPLICIT – THE DISTINCTIONS NOT ALWAYS CLEAR**

Intellectual and knowledge-based assets fall into one of two categories, tacit or explicit. This is the basis of Nonaka’s (1991) two-types-of-knowledge notion which expands on Polanyi’s (1966) work. Tacit, or implicit, knowledge is highly personal, hard to formalise and therefore difficult to communicate to others; explicit knowledge is externalised tacit knowledge, formal and systematic and easily communicated and shared. Any information that can be presented as “hard copy”, such as marketing research, business plans, customer lists, archives, tailored data bases and patents is explicit knowledge.

Tacit knowledge - the know-how contained in people’s heads - is not as readily quantifiable and the challenge to business is to work out how to recognise, capture, codify, share and manage it. Once it is identified it becomes part of the organisation’s intellectual base the same way as explicit knowledge. The distinction between the two, however, remains ill-understood and, simplistically, has been referred to as little more than whether an item of knowledge can be set down on paper or not.

Nonaka and, later, Nonaka with Takeuchi (1995) defined tacit knowledge as “personal knowledge embedded in individual experience (which) involves intangible factors such as personal belief, perspective and value system”. They contrast this to explicit knowledge which “can be articulated in formal language including grammatical statements, mathematical expressions, specifications, manuals and so forth”. They state it is “hard to formalise and communicate to others”.

Hedessstrom and Whiteley (2000) maintained that the first use of the term tacit knowledge is associated with knowledge that has not yet been formalised. Thus tacit knowledge is a subset of all knowledge consisting of those items that have not (yet) been made explicit. A second use of the term is associated with knowledge that cannot be formalised and there are two sub-categories here. The first argues that some knowledge cannot be formalised because the knowledge is embodied. The second argues that it cannot be formalised because of fundamental characteristics of the nature of the knowledge.

Tacit knowledge comes in three quite distinct variants (Boisot, 1998):

1. Things that are not said because *everybody* understands them and takes them for granted.
2. Things that are not said because *nobody* fully understands them. They remain elusive and inarticulate.
3. Things that are not said because while some people can understand them, they cannot costlessly articulate them.
There are four basic patterns for knowledge creation in an organisation (Digum, 1999, expanding Nonaka, 1991):

- **Socialisation**: Sharing of tacit knowledge between individuals. In this way knowledge moves from tacit to tacit. Thus knowledge doesn’t become explicit and cannot easily be used by the organisation as a whole.

- **Articulation**: An individual succeeds in formulating the fundaments of his/her own tacit knowledge in a way that can be communicated to others. This process of making tacit knowledge explicit allows it to be shared within the organisation.

- **Synthesis**: An individual can combine several pieces of explicit knowledge into a new whole. Knowledge changes from explicit to explicit, but does not really extend the ‘total’ knowledge of the organisation.

- **Internalisation**: Individuals use explicit knowledge to broaden, extend and reframe their own tacit knowledge.

Sveilby (1997) asserts that business managers need to realise that unlike information, knowledge is embedded in people, and knowledge creation occurs in the process of social interaction. Tacit knowledge is about feel, embodiment, anticipation, agility, cultivating instinct, learning from experience and through failures, understanding context and fast adaptation. This is costly, takes a long time, cannot be reliably measured or assessed, is risky and uncertain. It is fuzzy and involves people to people interactions. There are no shortcuts!

However as complex as it can be, the substantial investment put in to capturing and distributing (tacit) knowledge is worth the effort (Davenport and Pruzak, 1998). Having access to knowledge only when its “owner” has time to share it, or chancing to loose it completely if he or she leaves the organisation are problems which threaten the value of an organisation’s knowledge capital.

**CONVERSION CAPTURES MORE KNOWLEDGE**

A lot of intellectual capital resides in the minds of IT workers. Companies such as Anderson Consulting, Ford and Monsanto encourage employees to put “tacit” knowledge, the know-how in their heads, into “explicit” form, such as written reports or video presentations. The captured knowledge is then stored in repositories such as databases and intranet Web servers, all of which users can search (McCampbell et al, 1999).

Because knowledge management systems are computer-based, they require the knowledge that they are to manage to be computerised. This means that the knowledge has to be formalisable and commodifiable. However, not all knowledge can be commodified in this way and the knowledge that lies outside the system is tacit knowledge.

The embeddedness of know-how, that which makes it strategic, creates its own problems (Devinney, 1997). For a company to fully capitalise on the advantages of know-how it must be able to create and transfer it. Devinney believes the sheer act of transferring know-how will, by definition, take away much of its strategic advantage. The object of growth and expansion requires that the tacit understanding of how to do something must be made explicit so that it can be communicated to others.

As mentioned earlier, Nonaka and Takeuchi (1995) believe tacit knowledge is “hard to formalise and communicate to others”. This is supported in the knowledge management literature and the development of methods applied to convert tacit to explicit knowledge outlined later in this paper. In addressing day-to-day responsibilities, employees develop skills and expertise that through repetition eventually become nearly instinctive (Eisenhart, 2001). An employee who is no longer conscious of the individual steps in what he or she does probably won’t be able to explain the task to a newcomer.

Boisot (1998) identifies that the passage from tacit to codified and abstract knowledge incurs a cost. Whether they are aware of it or not, senders always know more than they can say. They will inevitably
retain in their memories a great deal of tacit knowledge that will not be available to receivers. Hansen et al (1999) depart from the general direction of thought on conversion and suggest that if much of the knowledge in an organisation is tacit then it is not worth trying to make it explicit. The organisation should instead enable all component parts to have access to the experts with the tacit knowledge. Alavi and Leidner (1999) argue that knowledge becomes tacit once it is processed in the mind of an individual and becomes explicit again “once it is communicated to others in the form of text, computer output, spoken or written words, or other means”.

Feigenbaum et al (1988) believe all knowledge can be formalised in computer-based systems with any difficulties simply being implementation problems. Dreyfus (1992) says the problems of commodifying all knowledge are indications of the complex nature of much knowledge. A common occurrence has been for the knowledge management technology to “alter the structure of our interests: the things we think about” (Postman, 1992) so that only knowledge that can be formalised in computer systems becomes important. In so doing, the technology takes on a life of its own (Winner 1977), becoming an autonomous actor (Hanseth and Braa 1998) and driving the actions of the organisation.

Malhotra (1998) supports Svieby’s (1997) contextual premise in defining tacit knowledge. Any attempt to make the tacit knowledge explicit, or elicit what is tacit, would be circumscribed by some context, according to Malhotra. Assuming that the key object was to communicate or to (attempt to) develop shared meaning, the same tacit knowledge could be expressed in different ways: via spoken words, written words, schematics, etc.

He cites an example of tacit knowledge being made explicit in the performance of Beethoven's Fifth Symphony by different artists using different musical instruments. The effect of most of these performances (on an audience member) would be different depending upon the ability of the artists with the instruments, their own “sense” of the score of the symphony, the specific performance that occurs, as well as the appreciation of the listener.

The process of conversion of tacit into explicit may be considered as a process of making sense of (or giving structure to) the unstructured “messes” that reside in one’s mind as assumptions, feelings, ideas, biases, thumb rules, memories, etc. What emerges as “explicit” from the process of sense-making is both facilitated and constrained by the context and the medium within which it is translated.

FIVE APPROACHES TO CONVERTING TACIT TO EXPLICIT

There is continuing work being done in academia and business to harness the value in tacit knowledge. By nature it is elusive and Stenmark (2001) says the process of turning it into explicit knowledge fails for three reasons: 1) we are not necessarily aware of our tacit knowledge, 2) on a personal level we do not need to make it explicit in order to use it, and 3) we may not want to give up a valuable competitive advantage. He believes tacit knowledge can be made tangible without it becoming explicit. Swap et al (2001) draw on relevant research in learning and cognitive psychology and focus on the transfer mechanisms of mentoring and storytelling to leverage knowledge, particularly tacit, to build an organizations core capabilities.

The approaches below have been selected for the different philosophical methods they apply to attempt to convert tacit knowledge to explicit.

Managing “soft” knowledge

Hildreth et al (1999) include tacit knowledge in their list of what can be included in “softer” types of knowledge, as recognised by Nonaka (1991) and Kogut and Zander (1992). Other examples of such knowledge include internalised experience and automated skills, internalised domain knowledge and cultural knowledge, embedded in practice. They contend that soft knowledge is acquired through the
praxis of work and consequently when an organisation loses staff, the soft knowledge that is lost cannot easily be replaced.

Lave and Wenger (1991) suggest that soft knowledge is created, sustained and shared through communities of practice by a process called Legitimate Peripheral Participation (LPP). They describe how in-coming newcomers regenerate groups and eventually replacing existing members. The newcomers learn from "old-timers" through co-practice that is graduated, permitting them to undertake more central and critical tasks. In so doing, they not only learn the domain skills associated with the practice but they also learn the language of the community, its values and its attitudes.

Hildreth et al (1999) discerned three trajectories of soft knowledge construction in technological communities:

- Firstly, the gathering of domain knowledge (for example, how to solve a particularly tricky diagnosis problem)
- Secondly, the construction of knowledge of work practices specific to a community (for example, knowledge of an individual machine's idiosyncrasies and how they are catered for)
- Thirdly, the knowledge that the community constructs about the competencies of its members.

Essentially, soft knowledge is embedded in the practices of, and relationships within, the group. Secondly, the source of the legitimacy of the knowledge differs from hard knowledge. "Hard knowledge" is accepted as legitimate by virtue of the formal authority of the designer of the system or the author of the procedure. Soft knowledge becomes accepted by virtue of informal authority and consensus within the group.

**Eliciting Tacit Knowledge**

Dignum (1999) writes about requirements engineering (RE) which involves discovery, development, analysis, negotiation and formalisation of knowledge in constructing the requirements' aspect of a project for it to evolve from initial development to a more encompassing model. The process draws on the experiences of stakeholders (customers), the developers and the organisation, among others, and is dynamic by involving collaborative negotiations as well as being knowledge intensive.

While adopting the definitions of tacit and explicit knowledge and the four basic patterns for knowledge creation, i.e. socialisation, articulation, synthesis and internalisation (Nonaka and Takeuchi, 1995), she also identifies situations where knowledge has not yet been internalised and must still be readily available.

The author describes a knowledge management tool called Wisdom™ developed by Arthur Anderson's Knowledge Services Practice in the Netherlands that provides facilities for collecting, coding, processing and distributing knowledge. Wisdom™ is placed with a new system called KARE, (Knowledge Acquisition and sharing for Requirements Engineering) which is designed to be a workbench for RE. The knowledge module within this system consists of three parts: knowledge acquisition, knowledge sharing and knowledge warehouse.

Knowledge Acquisition is defined here as the process of gaining knowledge and representing it in some computer-usable way. It corresponds to the process of extracting tacit knowledge and making it explicit using some knowledge representation software (e.g. Wisdom™). Through a negotiated process, knowledge is elicited and analysed. The process then moves to knowledge sharing via a knowledge warehouse where catalogues carry information about the contents and organisation of each knowledge base.
Knowledge Harvesting

Knowledge harvesting is a term applied to the process of eliciting the tacit insights and intuitive knowledge of experts or top performers and converting it into specific, actionable know-how that is easily accessed and used by others (Snyder and Wilson, 1997)

Conceived by Karl-Erik Sveiby, the process is undertaken through a software product, which supports procedural knowledge-based tasks by providing the learner with expert guidance on an “as needed” basis.

The harvesting process is proprietary, however it is a set of methods for:
1. finding valuable know-how
2. getting inside the mind of the expert performers to uncover the processes involved
3. optimising and deploying know-how to individuals and teams as software applications, and,
4. evaluating and improving applications.

Developed by LearnerFirst, the software is designed so that an individual can simultaneously understand, learn, perform and record the performance of a single action.

Sydney and Wilson (1997) believe the dichotomy of tacit and explicit is not authentic and must include a third concept, implicit knowledge. The latter includes that which the individual knows he knows, as well as that which the individual does not know he knows because he has not experienced a genuine opportunity to express this knowledge. Both tacit and implicit knowledge is embedded in the mind of the individual but only implicit knowledge can be made explicit. By definition, tacit knowledge is impossible to verbalise.

Group Memory System

Earlier theorists (March and Simon, 1958) postulated that an organisational memory is embodied in standard operating procedures.

Vasconcelos et al (1999) used Kuhn and Abecker’s (1997) definition of organisational memory in their long-term work to design a group memory system using ontologies. The definition explained OM as a comprehensive computer system that captures a company’s accumulated know-how and other forms of knowledge assets to make them available to enhance the efficiency and effectiveness of knowledge-intensive work processes.
One of the main objectives of their work is to test and implement knowledge modelling techniques using ontologies (a formal and explicit specification of a shared conceptualisation), particularly to represent less tangible knowledge assets within a business organisation.

The eventual aim is to develop and test a prototype Group Memory System (GMS) that can be used to support business activities and knowledge dissemination between employees.

It is proposed that the system will adopt an Intranet access model and will provide a view of the group knowledge that is embedded in processes or developed in teamwork. It will provide access to different sources of knowledge such as business objectives, business cycles, stakeholder properties and group competencies.

![Vasconcelos' Theoretical Knowledge Taxonomy](image)

**Figure 2: Vasconcelos' Theoretical Knowledge Taxonomy; from Vasconcelos, J, Kimble, C and Gouveia, F. R (1999) A Design for A Group Memory System Using Ontologies, Proceedings of 5th UKAIS Conference, University of Wales Institute, Cardiff**

**Formal Concept Analysis**

Busch and Richards (2000) have refined a technique for graphically measuring tacit knowledge at the individual level as well as a qualitative textually-based alternative, which in turn handles graphical visualisation of tacit knowledge.

The first makes use of survey questionnaire returns then applies formal concept analysis as a means of assessing individuals in terms of their tacit knowledge similarities. This is based on the work of psychologists such as Sternberg's (1995) group at Yale that seek to test tacit knowledge differences in individuals by means of expert-novice comparisons.

The second approach to tacit knowledge modelling was to attempt to define how to model definitions of what such knowledge may constitute. This involved a qualitative approach with software that permits coding of literature dealing with tacit knowledge, the codes then being used to form network maps. The maps were successful in that they provided visual support for what was discussed textually.
CONCLUSION

Capturing and converting tacit knowledge to explicit knowledge remains elusive. With all the computing power available, knowledge management is working hard but is yet to hit on a successful, codifiable solution. As systems develop and more companies recognise the value of that which we don't tell, more attention will perhaps be focussed on extracting the embedded knowledge of the "experts". The five applications examined above go only part of the way to mining this acknowledged rich vein that exists in all organisations. Two of the applications, numbers one and five, do not rely on technological tools, rather they depend on organisational management to deliver the tacit to explicit conversion. The other applications are based on a form of IT-assisted conversion and there is insufficient quantitative evidence to indicate progress. Further research is needed into the practice of managing knowledge if organizations are to going to be able to retain possession and access to the tacit knowledge their employees gather. This research should focus less on the technological methods of conversion and more on collection and technological inputs.

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The value of knowledge – Why the Balanced Scorecard can be used towards the application of knowledge for competitive advantage

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ABSTRACT

Knowledge is a resource or factor of production, which should be managed like all other resources available to an organisation for the achievement of competitive advantage. An understanding of the aspects and types of knowledge can help the organisation hone its business strategy to achieve this advantage. The Balanced Scorecard is a tool or framework which can facilitate the alignment of business strategy with knowledge management initiatives.

Keywords: knowledge management, balanced scorecard, intellectual capital, business strategy

INTRODUCTION

"The great end of life is not knowledge but action"
Thomas H. Huxley
1825-1895, British Biologist, Educator

Lately, there has been a growing interest in treating knowledge as a significant organisational resource [1, 2]. Knowledge is a resource which when combined with tangible resources such as land, labour and capital, produces services and goods.

In recent times, with the advancement in information technologies (the internet, intranets, extranets, browsers, data warehouses, data mining techniques and software agents) a class of information systems referred to as knowledge management systems (KMS) has evolved. The objective of KMS is to support the creation, transfer and application of knowledge in organisations [3]. However, many organisations and even nations [4] have attempted to implement knowledge management initiatives but the cost benefit of some of these initiatives may be questioned. Most organisations’ efforts consist of investing in knowledge repositories such as intranets and data warehouses, building networks so that people can find each other, and implementing technologies to facilitate collaboration. These are all activities that treat knowledge like steel or any other resource, to be gathered, shared and distributed [5]. It is not the knowledge existing at any given time but the organisation’s ability to effectively apply its existing knowledge (and create new knowledge) to take action that forms the basis for achieving competitive advantage.

This paper will review the theoretical frameworks of the balanced scorecard and organisational learning and unify them into a single framework to provide a tool for the implementation of knowledge management initiatives. This paper posits that the source of competitive advantage resides from the application of knowledge by process improvement and innovation and that organisations should align their knowledge management initiatives with that of the organisation’s business
strategies. The Balanced Scorecard (BSC) [6] provides a framework for achieving this, in addition to being a technique for measuring and managing intangible capital.

It is necessary to first consider the nature and types of knowledge before understanding how the BSC can be used.

**DEFINITION OF KNOWLEDGE**

It is unnecessary for the purposes of this paper to engage in the taxonomy of data, information and knowledge. Knowledge may be defined as a justified belief that increases an entity’s capacity for effective action [7, 8].

Many views of knowledge however have been postulated in various literature. It is useful to consider some of these views and in particular the perspective that this paper takes, so as to better understand the implications it has for KMS initiatives and business strategies.

Knowledge may be viewed from several perspectives:

1. A state of mind;
2. An object;
3. A process;
4. A condition of having access to information; or
5. A capability [3]

Table 1 (below) summarises these perspectives.

The perspective relied on in this article is that knowledge is *Capability* because organisations must strive to improve its performance and promote continuous improvement. Failure to do so may lead to a loss of competitive advantage [9].

However, improving performance and promoting continuous improvement are not sufficient for sustaining competitive advantage. Organisations that previously succeeded on efficiency based on optimisation for given business contexts and failed to change their strategy to the changing business environment were hobbled by their past recipes of success. Examples of such organisations included IBM and GM that suffered huge corporate losses.

Knowledge management initiatives should therefore also cater to the critical issues of organisation adaptation, survival and competence in the face of increasingly discontinuous environmental change. Essentially, it should embody organisational processes that seek synergistic combination of data and information processing capacity of information technology and the creative and innovative capacity of human beings [10].

Business strategy must therefore be linked to knowledge management initiatives and an understanding of the different types of knowledge may help explain why this is the case.
Table 1. Knowledge Perspectives and Their Implications
(adapted from MIS Quarterly) [3]

<table>
<thead>
<tr>
<th>Perspectives</th>
<th>Description</th>
<th>Implications for Knowledge Management</th>
<th>Implications for Knowledge Management Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>State of mind</td>
<td>Knowledge is the state of knowing and understanding</td>
<td>KM involves enhancing individual's learning and understanding through provision of information</td>
<td>Role of IT is to provide access to sources of knowledge rather than knowledge itself</td>
</tr>
<tr>
<td>Object</td>
<td>Knowledge is an object to be stored and manipulated</td>
<td>Key KM issue is building and managing knowledge stocks</td>
<td>Role of IT involves gathering, storing and transferring knowledge</td>
</tr>
<tr>
<td>Process</td>
<td>Knowledge is a process of applying expertise</td>
<td>KM focus is on knowledge flows and the process of creation, sharing and distributing knowledge</td>
<td>Role of IT is to provide wider breadth and depth of knowledge flows</td>
</tr>
<tr>
<td>Access to information</td>
<td>Knowledge is a condition of access to information</td>
<td>KM Focus is organised access to and retrieval of content</td>
<td>Role of IT is to provide effective search and retrieval mechanisms for locating relevant information</td>
</tr>
<tr>
<td>Capability</td>
<td>Knowledge is the potential to influence action</td>
<td>KM is about building core competencies and understanding strategic know-how</td>
<td>Role of IT is to enhance intellectual capital by supporting development of individual and organisational competencies</td>
</tr>
</tbody>
</table>

KNOWLEDGE TYPES

Quinn, Anderson and Finkelstein argue there are four types of knowledge [11]:

1. Cognitive knowledge (or know what);
2. Advanced Skills (know how);
3. Systems understanding (know why); and

Cognitive knowledge is basic mastery of a discipline through training. It is essential but insufficient for business success.

Advanced skills translates book learning into effective execution by the process of learning by doing [12].

Systems understanding is deep knowledge of cause-and-effect which helps solve more complex problems and being able to anticipate consequences. The idea that an understanding of cause-and-effect processes within an organisation is key to effective selection of strategic management activities is well established [13, 14].

The most important type of knowledge Quinn et al argue is self motivated creativity which consists of will, motivation and adaptability for success.
Without self-motivated creativity, organisations can lose their knowledge advantage through complacency. They fail to adapt to changing external conditions and particularly to innovations that obsolesce their earlier skills – “just as the techniques of molecular design are superceding chemical screening in pharmaceuticals today” [11]. Organisations that nurture care-why in their people can simultaneously thrive in the face of change and renew their cognitive knowledge, advanced skills and system understanding in order to compete in the next wave of advances.

**Table 2 summarises the types of knowledge by way of examples.**

<table>
<thead>
<tr>
<th>Knowledge Types</th>
<th>Definitions</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive</td>
<td>Know what</td>
<td>What drug is appropriate for an illness</td>
</tr>
<tr>
<td>Advanced skills</td>
<td>Know how</td>
<td>How to administer a particular drug</td>
</tr>
<tr>
<td>Systems understanding</td>
<td>Know why</td>
<td>Understanding why the drug works</td>
</tr>
<tr>
<td>Self motivated creativity</td>
<td>Care why</td>
<td>Understanding limitations of the drug and improving or discovering new drugs for an illness</td>
</tr>
</tbody>
</table>

When organisations understand the nature of knowledge and its importance to competitive advantage, they can better understand the need to integrate and align their business strategies with knowledge management initiatives to derive maximum shareholder value at minimal cost. Misdirected initiatives in the area of information and knowledge management, has contributed somewhat to the information paradox where there is no relationship whatsoever between computer expenditures and company performance [15].

The Balanced Scorecard (BSC) [6] provides a framework for achieving the alignment between knowledge management and business strategy.

**THE BALANCED SCORECARD AND KNOWLEDGE MANAGEMENT**

The Balanced Scorecard is a recently adopted system that many companies use to overcome the limitations of traditional strategic performance management systems. The system is so named in recognition of the balancing the objectives of performance measurement being that of creating shareholder value and the promotion of strategic objectives. It does this through the use of financial and non-financial indicators which are capable of addressing both short and long term strategic objectives. This is in contrast to traditional systems, which consisted of measures that had no clear link to the promotion of strategic objectives.

The Balanced Scorecard is unique in that it is tailored to the organisation’s needs, operating environment and strategy, using measures that are critical to the organisation’s success. These measures comprise of four perspectives:

- innovation and learning perspective;
- internal business perspective;
- customer perspective;
- financial perspective

Kaplan and Norton [16] hypothesise about the cause and effect that leads to strategic success. There are 4 stages in the this chain of cause-and-effect:
1. The fundamental cause of strategic success is attributed to people. People are the source of innovation, which is necessary for the long-term success and competitiveness of organisations [1]. Organisations should therefore employ appropriately trained people and foster continuous learning. A healthy organisation is one in which the learning culture prevails [17].

2. In organisations where the culture encourages people to make suggestions and question the status quo, new ideas emerge. Argyris describes this as double loop learning which occurs when in addition to detection and correction of errors, the organisation is involved in questioning and modification of existing norms, procedures, policies and objectives.[12].

3. Improved procedures and business processes lead to improved products and services, which in turn leads to customer satisfaction. The balanced scorecard measures customer satisfaction but improving processes produces it.

4. Improved customer satisfaction, leads to increased market share and directly affects the organisation's profitability.

The above four stages of cause-and-effect are also the four perspectives of the balanced scorecard as espoused by Kaplan and Norton. This is illustrated as follows:

**Figure 1: Cause-and Effect relationships of the BSC perspectives**

Corresponding to the causal chain are three areas of potential strategic management activities:

1. The learning and growth perspective is fostered by activities such as training (formal and informal), document management, collaborative communication systems, knowledge and skills audit of employees, knowledge base development and development of communities of interest. While the objectives established in the financial, customer and internal process perspectives identify where the organisation must excel to achieve break through performance,
it is the initiatives in the learning and growth perspective, which enable ambitious objectives in the other three perspectives to be achieved.

2. The internal processes perspective help managers identify the critical processes at which they must excel to meet the objectives of shareholders and customers. The internal processes perspective is nurtured by business process engineering initiatives and one example of such initiatives is supply chain management.

3. The customer perspective enables companies to align their core objectives of customer satisfaction, loyalty, retention, acquisition and profitability. Initiatives in this area include Customer Relationship Management.

Additionally, to ensure that strategies are adapting to meet changing circumstances, organisations need to integrate management control with strategic learning. Two feedback loops can help accomplish this. In the first, the Balanced Scorecard is the focus with emphasis on strategic performance. The second feedback loop tests whether the implemented strategy is working as planned and whether recent developments warrant any modifications.

Controlling the strategy is thought of as management control. The thermostat provides a metaphor for such control since it detects differences between actual and targeted temperatures and adjusts the heating or air-conditioning unit to bring the outcome back to the desired state. The first feedback loop focussed on the Balanced Scorecard, expands this thermostatic process by offering an opportunity to report and discuss all strategically relevant measures, along with performance improving initiatives. It intensifies the focus on the strategy and identifies the management and organisational actions required to get performance back on track.

More fundamentally, managers must determine whether their strategies are valid and will deliver the intended performance breakthroughs. Through the process of double loop learning, they can examine the assumptions underlying their strategies. The process should allow for testing and adapting the strategy. Two processes that do so are:

1. Examining the impact of external discontinuities and

In today’s dynamic environment, changes in competition, technology, regulation and economic events can undermine the assumptions used to create the Balanced Scorecard. Management needs to assess the impact of external changes on their strategies.

If the organisation has communicated and made strategy everyone’s job, the scorecard provides the shared understanding that helps employees filter potentially significant information so that inputs on strategic opportunities (and threats) come from the entire organisation. If knowledge is about beliefs and commitments, as noted by Nonaka and Takeuchi, the emphasis should be on building commitment to organisational vision rather than compliance to rules and pre-specified best practices.

Similarly with emergent strategies, employees are often the source of new strategies, through initiatives and experimentation or by identifying variations in existing strategies that yield new growth opportunities.

The double-loop strategic management system enables management to perform critical functions as:

- Monitoring performance against strategy;
- Working as teams to interpret data
- Developing new strategic insights
- Updating the measures on scorecards and
- Adapting strategies to changing environments.
All of these activities form part of knowledge management initiatives and it is not difficult to see why the Balanced Scorecard can be used towards the application of knowledge for competitive advantage. Organisations however need to plan their knowledge management strategies in alignment with their business strategies.

CONCLUSION

The strategic context of an organisation’s knowledge management initiatives should be to exploit its knowledge and learning capabilities better than its competitors [25, 26]. It includes the extent to which members of an organisation believe that superior knowledge provides a competitive advantage, and how they explicitly link strategy, knowledge and performance. Successful organisations are able to articulate the link between strategy of the organisation and what members of the organisation need to know, share and learn to execute that strategy. This guides their deployment of organisational and technological resources and capabilities for leveraging knowledge, increasing the probability of adding value.

The BSC provides a strategic framework for the implementation of knowledge management initiatives. It is hoped that further research is focussed on how to enhance the measurement of intellectual capital to allow comparability between organisations.

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Management of Information in the Logistics Support Branch of an Australian Defence Forces Barracks: How soft systems methodology rich pictures can be used to visualise organisational change

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Leigh Alver
Mark C. Williams

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ABSTRACT

This case study is used to demonstrate how rich pictures can be used as metaphors to envisage organisational change. The Logistic Support Branch procures goods and services for the Defence Corporate Support Centre, which has the responsibility to provide administrative support regional Australian Defence Force units. The efficient and effective management of information within this unit is essential to the overall performance and quality of outcomes. The Australian Government are putting greater pressure on the unit to outsource non core activities under the Defence Reform Program. Using a soft systems methodology approach, the management of information is investigated with the outcome highlighting areas for changes to be made. The focus of the research conducted was to investigate ways in which the organisation could integrate its electronic, organisational and social networks to create a sustainable competitive advantage. In particular the potential for electronic commerce is considered. This report analyses rich pictures visualising organisation change to provoke recommendations to improve the flow of communication and management of information within the Logistic Support Branch.

INTRODUCTION

The Australian Defence Force (ADF) administers its regional bases through a network of Defence Corporate Support Centres (DCSC). These centres are tri-service (combined Navy, Army and Air Force) in theory, as shown in figure 1, but predominantly Army in reality.
The Defence Corporate Support Centre in Western Australia (DCSC-WA) is located at Leeuwin Barracks East Fremantle. One of the internal supporting agencies of DCSC-WA is the Logistics Support Branch (LSB), which administers transport, barracks support, and stores procurement and issuing services to the DCSC-WA. LSB is located at Leeuwin Barracks with DCSC, but also maintains two shop fronts at the Karrakatta and Guilford military bases, to provide face to face customer support.

Application was made and accepted for the project team to view the communication and information networks which operate within LSB, with a view to enhance productivity through the integration of the organisation’s network.

Literature Review: Soft Systems Methodology

A Soft Systems Methodology was used to investigate the processes relating to the management of information at the Logistic Support Branch. An explanation of its conceptual framework is provided. Historically managers have employed traditional problem-solving techniques, "hard systems approaches," to solve well-defined problems. However, hard systems techniques are inappropriate for ill-structured problems and have led to the development of a soft, holistic approach. Skolimowski (1966), discussing the structured thinking in technology, summarises the distinction in the sentence: “In short, science concerns itself with what is, technology with what ought to be.” (Checkland, 1981, p 126) Checkland states: “where science is concerned with new knowledge, and whether it is true of false, technology and engineering are interested in action directed to a defined end, and whether it is successful or unsuccessful.” (Checkland, 1981 p127).
Peter McLaughlin summarises the essence of Soft Systems Methodology:

"There is a growing concern about the interactions between humans in highly structured technology-based organisations. The focus, in this context, changes from "hard" systems (technology-based structured organisations) to "soft" systems (the human activity and relationships within the hard system). Performance management is in essence a soft systems problem which poses the question of how performance can be improved within the existing physical structure. This is where the soft system methodology (SSM) plays an important role. The goal of SSM is not to try to define the right way of doing things, but rather to define and build better ways of doing things which more closely meet the diverse perceptions of the people involved in the things that have to be done." (McLoughlin, P, 1986 p 16).

SSM guides analysts through 7 steps, which are shown in figure 2. In one approach to SSM, a list of “early impression” (eg see the section below) is listed to inform the creation of the rich picture.

**EARLY IMPRESSIONS**

<table>
<thead>
<tr>
<th>Client</th>
<th>The initial interview with Captain Jones indicated he was a man that embraced change and would drive in the changes needed. Captain Jones, his superiors and his successor will have an input into future changes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem Solvers</td>
<td>Captain Jones and his successor will implement changes.</td>
</tr>
<tr>
<td>Problem Owners</td>
<td>All employees have a stake in this. All employees appear helpful and have the capacity to be multi-skilled.</td>
</tr>
<tr>
<td>Overall Impressions</td>
<td>An essential function with dynamic leadership, inadequate IT support.</td>
</tr>
</tbody>
</table>

The following information was provided at the initial interview, this is represented in pictures for ease of understanding (see figures 3, 4, 5, 6, 7, and 8).
OVERVIEW OF INFORMATION SYSTEM

People

People are vital to the efficiency and effectiveness of an organisation. Information management is about making people more productive. Productivity gains cannot be achieved without people.

As Trevor Bently describes in Management Accountant:

"I often hear senior managers describe the people who work in the organisation as their major asset, and then I see them act in ways that can only be described as neglectful. The money and time available to maintain and develop this 'major' asset is often derisory, and though many organisations talk about performance management many also only pay lip service to what it means in terms of investment and action. SSM provides a framework for the human elements of performance management to be defined and understood, which is the first step in making it happen." (Bentley, 24)

LSB employs approximately 30 people that function through a system of 17 direct reports. The mix of employees includes uniformed and civilian personnel who are under the command and management of an army captain (Recent structural changes have redesignated the OIC of the LSB to WO2 rank), who in turn, reports to the Operations Branch of DCSC.

A wide range of skill sets are employed within the LSB. These include competency in electronic computer systems in order to carry out day to day tasks.
Hardware

Microcomputer hardware consists of devices for input, processing storage, output and communications. (O'Leary, p11) The computer hardware employed within LSB restricts the quality and capacity of productivity. Computer Hardware consists of commercial desk top personal computers of between three to five years of age. The age of the computers is reflected in the individual capacity which is restricted in both systems unit (486 central processing capacity and primary memory storage RAM of 8 megabytes), and secondary storage (limited to 3 1/2 and 5 1/2 inch diskettes).

The majority of the computer hardware is linked into the local area network (LAN) within Leeuwin Barracks which provides for E-mail communication. However, Internet access is restricted as is the capacity to access shareware from a central server.

In summary the existing hardware is out of date and below the capacity necessary for effectiveness and efficiency to meet LSB functions and tasks.

Software

Computer software consists of two kinds: application software and system software.

Application Software used by LSB: Microsoft Office 97.

The system software is Windows 95 disc operation system (DOS).

Due to the wide use of this application within the Australian Defence Force (ADF) and commercial establishments, compatibility with internal and external customers, and suppliers is assured. Novell is used for a stand alone database in the procurement cell.
The limitations of the current computer hardware capability is reflected in the slow performance of the software applications. This greatly restricts productivity.

Procedures

LSB is a formalised bureaucracy dependant on written procedures which meet common defence standards. The procedures often benchmark best practise but are not always employed. For example defence procedures reflect the requirement to purchase up to date computer systems. However in reality these standards are not always applied because of insufficient allocation of resources for continuous improvement.

Data and Information

Three separate databases are used to manage the procurement of stores, these are:

<table>
<thead>
<tr>
<th>Database</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto Q</td>
<td>Provides access to complete inventory holdings within Army by type, cost and serial number. This allows for individual item (regardless of size) to be identified and ordered for a customer.</td>
</tr>
<tr>
<td>Pinnacle</td>
<td>An asset management database which allows all current items held in stock to be identified.</td>
</tr>
<tr>
<td>EPU</td>
<td>Electronic Purchasing Unit which is a limited purchasing record database. Not used to maximum capacity</td>
</tr>
</tbody>
</table>

These data bases are important tools in the management of large and diverse stores and equipment holdings. The ability to expand the data base capacity and speed is limited by the capability of the hardware currently in use.

Communication

Face to face communication is the primary means of communication within the LSB. The majority of workers employed within the LSB are housed in a two story building in the centre of Leeuwin Barracks. The command cell is located on the upper floor along with the Procurement Cell, in an open office plan with discrete office space for managers. There were no physical barriers, allowing free access all staff members and customers by means of a central waiting area. The Receipts and Issues Cell and the Barracks Support Cell are located on the lower floor, where once again an open office plan has been utilised. The Transport cell is located adjacent to the main building in the transport yard. The shop fronts consist of one staff member at each location of Karrakatta and Guilford Barracks. A common tea and coffee area is available to all staff and is the central point for social interaction of a day. The environment is considered adequate in space, lighting and ergonomic design to assist face to face communication and human interaction.

Telephone communication via the public subscriber telephone network (PSTN) is freely available to staff and is attached to a central voicemail system. Limited STD access for direct interstate calls is available, however, operator connected calls via a central switch operator are available. Electronic facsimile is available and used as a primary ordering communication link with suppliers.

Electronic mail is available via CC Mail but is limited within the Leeuwin Barracks Local Area Network. Access is also limited to individual appointments restrictions. Access to Internet, intranet
and extranet greatly limits the communication mediums available to access Defence Corporate resource and use of electronic commerce to customers and suppliers.

**Information System serving the real world action**

The information system is represented in the diagram.

*Figure 5. An information system entails data manipulation and meaning attribution. In this case the demand for goods and services to a standards at a time and place are transformed by electronic technology and actioned by the LSB.*
Figure 6. Stage 2 Development of Rich Picture The problem is described in a rich picture.

Stage 3 of the SSM process, is shown in the elements of the root definition through the so-called CATWOE analysis (see frames 1 and 2 below).

<table>
<thead>
<tr>
<th>CATWOE Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Customers:</strong></td>
</tr>
<tr>
<td><strong>Actors:</strong></td>
</tr>
<tr>
<td><strong>Transformation:</strong></td>
</tr>
<tr>
<td><strong>Weltanschung:</strong></td>
</tr>
<tr>
<td><strong>Ownership:</strong></td>
</tr>
<tr>
<td><strong>Environment:</strong></td>
</tr>
</tbody>
</table>

*Frame 1*
Root Definition

The Logistic Support Branch is a Defence asset which provides logistic support to the Defence Corporate Support Centre -WA, through the provision of good and services, drawn from Defence resources and direct purchasing from the private business sector, in order for DCSC-WA to achieve its mission, to provide administrative support to ADF regional units.

To achieve the purpose springing from the root definition, LSB must be effective and efficient. This is achieved through proactive and reactive responses to DCSC-WA needs.

CONCEPTUAL MODEL

Figure 7. Conceptual Model. Human activity is logically structured by use of
Figure 8. Demonstrates best practice - with an upgrade to hardware and software, enhanced databases, and electronic communication.

RECOMMENDATIONS

The rich pictures were used to visualise the organisational change necessary to improve the situation at the Barracks. The images used provoked motivation and creative thinking to effect ideas for organisational transformation.

- Total Hardware upgrade to current PC capacity.
- Integrated network to serve customers and suppliers.
- Integrated database.
- Upgrade of asset control.
- Just in Time Purchasing
- Database warehousing
- Program of ongoing training and upgrade

CONCLUSION

The Logistic Support Branch provides an important service to the Defence Corporate Support Centre at Leeuwin Barracks. By upgrading the existing electronic computer system, enhanced internal and external communications will greatly enhance productivity and reduce costs.

The existing system is inadequate and is need of immediate upgrade, due to the age of the current hardware and lack of integration. By using rich pictures to visualise organisational change, creative approaches were envisaged to begin the process of organisational transformation.
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Business Strategy Modelling in the Information Age

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ABSTRACT

The sophistication of technical and organizational networking enables not only a broader range of business architectures and business models, but also allows for their faster adaptation to innovations. By increasing the degree of formalization of strategy modelling, model consistency can be enhanced and specifications can be reused in subsequent business engineering phases like process (re-)design and information systems development. Modelling techniques for business architecture specification and business model specification, are outlined and notations are presented. Experience from applying these techniques in financial service companies is summarized.

Keywords: Business Networking; Conceptual Modelling; Business Model; Business Architecture; Strategy Making

INTRODUCTION

Electronic channels, business networking and web services do not only allow for more flexibility in sourcing and bundling products and services, but also enable new forms of disintermediation and re-intermediation. As a consequence, many industries that were traditionally characterised by complex, monolithic business models are transforming into networks of smaller units which are focused either on specific production processes or on specific customer processes (Osterle 1999, Winter 2001). Such transformations lead to a greater variety of possible business models. Moreover, business models have to be adapted more frequently due to increased market dynamics and due to changes induced by accelerating technical innovations (e.g. in the field of mobile commerce).

Being the primary subjects of strategy specification, business architectures and business models are usually developed in widely informal strategy making processes and documented as well as communicated mostly by means of natural language. If not only the range of possible business architectures and business models is extended, but also the speed of their alteration is increased, both the method of development and the means of documentation and communication become increasingly problematic.

Business Engineering as a discipline is aimed to provide methods and models which support all phases and aspects of collaboratively constructing men-machine systems in business. Methods and models cover business strategy development, business process development and information systems development (Osterle 1995, Osterle and Winter 2000). Like business process (re)design is supported by appropriate conceptual process models and information systems development is supported by appropriate conceptual data models and functional models, strategy development can be significantly improved if business architectures and business models are developed, maintained, documented and communicated using appropriate conceptual models.
In academia and much more in companies, the utilization of the term 'model' in conjunction with conceptual modelling is often ambiguous: 'Model' is used to designate a modelling technique or modelling rules (e.g. entity relationship model), but is also used to designate the result of the modelling process (e.g. business model). From a database oriented perspective on conceptual modelling, we should designate the modelling technique as 'model' and the resulting specification as 'schema'. Since the term 'business model' is widely used in academia as well as in companies or by consultants to designate a result of the strategy making process, we maintain this term. As a consequence, we designate the modelling rules as 'technique'. A technique is characterized by a set of rules governing the modelling process and by an underlying conceptual information model. Techniques are associated with certain notations for representing their results (Brinkkemper et al. 1996).

In this paper, we present notations and outline techniques for business architecture specification and business model specification. In Section 2, design principles for networked business architectures are identified and a notation is presented. Specification dimensions for business models are presented in Section 3. The application of the proposed techniques in a strategic planning process of a retail bank is described in Section 4. This case is also used to present industry specific scales for the business model dimensions. A short summary concludes the paper in Section 5.

**BUSINESS ARCHITECTURE MODELLING**

A sophisticated technical networking infrastructure together with an organizational business networking infrastructure allow to broaden the transformation scope from isolated companies or business units towards entire value networks. This effect is considered to be the most important business potential of recent information technology innovations (Österle 1999). Enabling 'technologies' for networked business architectures include cheap, high-bandwidth communication networks, business oriented communication standards (e.g. ebXML CPA/CPP), software packages that support the management of inter-company business processes (e.g. SAP APO), electronic markets, and successful business networking practices.

Parallel to advances in business networking, internet literacy and internet access have become available to a growing portion of end consumers. By communicating directly with service providers via electronic channels, end consumers can be integrated into value networks more closely, and service design can be influenced more directly. Particularly for services based on products bound to electronic media (e.g. software, information, music, movies) and for financial services, offerings can be customized to specific needs of customer segments.

As a consequence, companies can focus on a production (or resource utilization) oriented competency or on a customer process oriented competency and team up with partners that bring in complementary competencies instead of having to implement both competencies in one monolithic business model. The value network is then composed of production-oriented components and customer process-oriented components. Due to the similarity of the composition of a value network to the composition of a traditional, monolithic business model, traditional business process types can serve as templates for value network component types:

- **Procurement and distribution processes** integrate products and services according to customer needs. Together with customer relationship management, these processes support the customer side of a traditional business model and therefore become the foundation of a 'customer intimacy' business model type in a value network.

- **Transaction processing processes** (e.g. production lines for consumer products, processing of financial products) organize efficient production of services in large numbers, thereby becoming the foundation of a 'factory' business model type in value networks.
While the various processes are traditionally linked together by a company-specific communications and integration infrastructure, value networks require an open ‘business collaboration infrastructure’ (BCI) to flexibly support collaborations of the participating companies / business units. The relationship between value network component types and a generic process map for financial service institutions is illustrated by Figure 1. According to Österle and Winter (2000), ‘customer intimacy’ type business models are designated as ‘service integrators’, ‘factory’ type business models are designated as ‘shared service providers’, and ‘specialist’ type business models are designated as ‘exclusive service providers’ in a value network.

Figure 1. Relationship of value network component types and traditional business process types

Customer processes become the focus of the overall value network design. Service integrators aggregate standardized product and / or service components in order to create solutions that are tailored to a specific, holistic customer process (e.g. buying a home) or a specific life event (e.g. retirement, marriage, moving to a new community). In most cases, information components become a more important solution component than in traditional products. The most important success factors for service integrators are flexibility (implemented e.g. by personalization capabilities) and customer intimacy (implemented e.g. by customer knowledge management). Examples for service integrators are autobytel.com, yourhome.ch or thirdage.com.

Shared service providers produce large amounts of standardized products / services that can be reused by many service aggregators and / or other service providers in subsequent stages of the value network. It is most important for shared service providers to exploit economies of scale and to support an efficient interface to as many other nodes in the value network as possible. Examples for shared service providers are IT insourcers or transaction banks.

In contrast to standardized, cheap product / service components that are reused in many solutions, some product / service components may be produced exclusively to create a unique selling proposition or by exploiting a specific competency or resource. As a consequence, such exclusive service providers may maintain direct, one-to-one networking links to their customers (service integrators or
other service providers) instead of maintaining an adapter to the BCI. Examples for exclusive service providers are engineering companies for product development or funds management companies and risk management units in financial services.

A BCI is needed to support the open and flexible exchange of services and information necessary to run value networks. The services component of the BCI comprises standardized, cross-industry business support services like payments services, risk trading, payroll processing, business directories, and network operations (just to name a few). These services are complemented by communications standards not only on the software level (e.g. SOAP) and on the application level (e.g. ebXML compliant industry standards), but also on the process level (e.g. ebXML process standards) and particularly on the business level (e.g. contracting standards, service level agreement templates, ebXML CPA/CPP).

The four levels on which communications standards are defined (business, process, applications, software) are also used to describe business models that participate in the value network. On all levels, business models are linked either directly (e.g. exclusive service providers to service integrators, service integrators to end consumers) or using the BCI. In Figure 2, a generic business architecture model is illustrated. By replacing generic business model types with actual business models, this generic architecture model can be used to specify a concrete value network.

![Figure 2. Generic business architecture (based on Leist and Winter 2000)](image)

**BUSINESS MODELLING**

A business model specifies strategic (i.e. long-term, stable) properties of a company or business unit that may act independently on a market at a certain point in time with regard to certain dimensions that represent value proposition, potentials, resources, and markets (Heinrich and Winter 2002). The respective company / business unit should be able to influence these properties at least indirectly. Business strategy making intends to change the strategic positioning of a company or business unit by certain actions (Kreikebaum 1997). Hence strategy making, often referred to as corporate
development, can be interpreted as the process of specifying or modifying properties of the business model.

A short discussion of explicit business model proposals as well as strategy making paradigms is used to identify relevant business model properties. The identified properties are then presented as elements of an external view and an internal view of the business model, respectively. Alternative notations for the proposed business model are proposed in a fourth subsection. The conceptual discussion as well as the notations are mostly based on (Heinrich and Winter 2002).

**Related Work and conceptual foundations**

Schwaningers (1989) 'business system' comprises dimensions and relationships intended to support the identification of business units. Customer problems / requirements, problem solution technologies, products, distribution channels and customer segments are arranged in a circle which allows to represent not only these dimensions, but also binary relationships between them. For every dimension, a scale is proposed that represents the most important potential properties. This approach covers many important aspects of business modelling. In contrast to our definition, dimensions are included that cannot be significantly influenced by the respective company / business unit (e.g. competition).

As a component of IBM's 'Enterprise Solutions Structure' project that aims at a comprehensive architecture for business, processes, and information systems, McDavid (1999) proposed 'business concepts' to specify the most important constituents of business systems. In this approach, relationships between business concepts represent dependencies. These relationships are then grouped in order to identify business patterns. Although the process of identifying business concepts and their relationships is not documented in detail and the analysis is rather generic (i.e. the model is not directly applied to actual cases), relationship analysis is instrumental in analysing dependencies among business model dimensions.

Another widely diffused approach is Timmers' (1998, 2000) 'business models' that were proposed to conceptualize business practices in (mainly B2B) electronic markets. Timmers defines business model as 'an architecture for the product, service and information flows, including a description of the various business actors, their roles, the potential benefits and the sources of revenues' (Timmers 2000). The primary focus is on market view and economic foundation of business activities. Business models are understood as building blocks of value networks. Based on 'interaction patterns' and simulated intermediation as well as disintermediation, the analysis of value networks is intended to identify novel business models. A resulting typology of eleven types of business models is described verbally but does not in all cases cover all aspects of the proposed business model structure. In contrast to our definition, market and valuation properties that cannot be directly influenced and that are closely interlinked dominate the business model. Moreover, Timmers' approach is only partially formalized.

In summary, these approaches to business model specification provide important features like specification dimensions or dependencies between specifications. No approach, however, covers value proposition, potentials, resources, and markets at the same time and is sufficiently formalized to support a systematic modelling process (Heinrich 2000).

Even if no explicit business model is proposed, approaches to business strategy making could provide additional input for specifying business models systematically. Approaches following the 'market based view' call for business strategy to primarily focus on markets and in particular sales markets. Design parameters for business models therefore are based on a structured specification of relevant markets or an industry sector (as defined by related or similar products and / or service). In order to create structures for markets or industry sectors, dimensions like product groups, customer segments, distribution channels or geography are proposed. Porters (1998) value chain approach proves the significance of business networking for realizing competitive advantages and its interrelationship with
a company’s internal organizational structure. Early ‘market based view’ approaches in Germany (e.g. Meffert 1985) assign a pivotal role in strategy making to marketing planning. Hence constituents of marketing planning like products / services, contracting, communication, sales support and distribution have to be considered in the business model.

An alternative approach suggests that business strategy should focus on internal resources and potentials. The reason for such a ‘resource based view’ is that, since specific company potentials are not considered enough in the market based view, the resulting strategy is nearly arbitrary and could be imitated quite easily. In contrast, specific resources and potentials reflect the individual company’s ability to compete much better. Resources and potentials are developed in a core competency oriented process. Core competencies are long-term capabilities that cannot be transferred and imitated easily, cannot be substituted short-term and are complex in creation as well as in application (Hamel and Prahalad 1990, 1994). As a consequence, specific resources and core competencies should be included in the business model.

A third approach to strategy making is the ‘value based view’. Initially based on Rappaports (1986, 1990) shareholder value concept, value creation is considered the primary goal of business strategies. The value based view is interpreted as a combination of the market based view and the resource based view, being complemented by rigid quantification and evaluation mechanisms that are oriented on value creation (Gomez 1993). A business model should represent - and not evaluate - properties that allow for a classification, analysis, and comparison of business strategies (Heinrich and Winter 2002). Hence the quantification and evaluation mechanisms of the value based view are not incorporated into our approach.

### External view of a business model

The external view of a business model corresponds to the ‘market based view’ on strategy making, focusing on the ‘selling’ side of a company or business unit. If modelled as a system, constituents of the selling side can be derived by asking which customer processes and segments are supported at which locations / regions by which products and services at which prices, which distribution channels are used, which time frames are relevant, etc. The following compilation is summarized from (Heinrich and Winter, 2002).

The **regional** dimension represents the spatial properties of markets. It ranges is from very ‘local’ (e.g. sales areas for insurance brokers) to countries, currency or language regions and world areas (e.g. EMEA or Americas) to worldwide (e.g. global customers).

The **validity & subject** dimensions represent the point in time (or time period where the business model is considered to stay unchanged) where the business had, has or will have the properties specified by the business model and the entity (business unit or company) which it represents, respectively.

**Customers** are the most important party in the value creation network. Relations to customers comprise product / service transfers, funds transfers and information flows. These relations can be differentiated into ‘what’-type relations (products / services, contracting, communications) and a ‘how’-type relation (distribution) (Meffert 1998).

Product / service transfers relate customers to ‘core’ **products / services**. In contrast to elementary products / services, ‘core’ products / services are derived from the analysis of customer processes (e.g. buying a home, managing financial assets) and should support such processes significantly. In addition to quality requirements for elementary products / services, success factors for core products / services address the degree to which complex customer processes are supported.
An important business model aspect that relates core products/services to customer segments is **brand design**. Branding is intended to create a distinctive, unique perception in the market. It is related to products and services (Weber 1992), but also can be related to the organization as a whole (Halstenberg 1996). Other constituents of the marketing strategy that relate to both core products/services and to customer segments are communications policy and pricing policy (Becker 1998). For all three relationship types, it is essential to identify generic types in order to create a usable scale for the respective business model dimensions.

Interactions between a business unit and its customers are determined primarily by **sales channels** and **customer services** (Berndt 1995). Sales channels are used for the transfer of products/services, funds and information, thereby representing different forms of interaction between business units and customers (Kreuzer 1998). Customer service design does not only assign sales channels to products/services, contact channels, and customer segments. In addition, quality criteria and success factors for this assignment are specified.

With regard to **communications policy**, unidirectional and bi-directional communication are differentiated (Berndt 1995). Unidirectional communication comprises all activities intended to increase the general propensity of anonymous customers or prospects to do business with the organization (e.g. public relations, advertising). In contrast, bi-directional communication is directed at individual customers (although not necessarily having to be performed individually) and aims to trigger specific sales activities (e.g. direct marketing). While unidirectional communication can be represented similar to brand design (i.e. relating core products/services to customer segments), bi-directional communication should relate specific products/services to specific sales channels.

**Internal view of a business model**

In contrast to specifications of the external business model view that reflect marketing strategy, the internal business model view represents sources, characteristics and effects of capabilities. It corresponds to the ‘resource based view’ on strategy making, focusing on the ‘production’ side of a company or business unit. If modelled as a system, constituents of the production side can be derived by asking which competencies are exploited to team up with which partners in which way.

The two central concepts of the internal view are competencies and the value chain. While competencies can be specified by **relevant resources** and **relevant impacts**, the value chain can be specified by the **degree of integration of partners**, the **degree of coordination of (sales) channels** and the **degree of (spatial) decentralization** (Heinrich and Winter, 2002).

We do not represent specific value-creating activities because this would either impede the easy communication of business models (if activities were modelled in too much detail) or be too superficial (if activities were modelled too abstract). It is not possible to identify one ‘right’ level of detail for modelling activities when taking into account the multitude of applications and users of a business model.

In addition to competencies and value chain, **organizational structure** and, relating it to competencies, **corporate culture** are considered to be important dimensions of the business model that have to be included in the internal view. Similar to brand design or communication policy, for all three relationship types, it is essential to identify generic types in order to create a usable scale for the respective business model dimensions.

**Graphical business model representation**

If combined and complemented by appropriate scales, the dimensions identified as relevant in the preceding two subsections can be interpreted as a meta model for business models. Based on Heinrichs
(2000) initial work, Heinrich and Winter (2002) present rules that support strategy makers in assigning appropriate values for all dimensions, integrity constraints that guide the analysis process and avoid inconsistent business models, and alternative notations for documenting and communicating business models. To support strategy makers in working with such business models, typical values of the proposed modelling dimensions should be provided. In our experience, the definition of appropriate scales is dependent from the industry sector. Eg., the dimension ‘core products / services’ would comprise values like ‘financing’, ‘invest & save’, ‘value transfer’, ‘retirement’, ‘insurance’, ‘law & tax services’ and ‘other services’ in (retail) financial services, while different values would be needed not only in completely different sectors like mechanical engineering, but even in related sectors like private banking.

![External view](image)

*Figure 3. Cobweb diagram of external business model view (Heinrich and Winter, 2002)*

Business models that are specified by assigning values to more than three dimensions can be graphically represented as cobweb diagrams. Figures 3 and 4 are cobweb diagrams of a business model’s external view and internal view, respectively. These representations are created by selecting values (e.g. degree of coordination of channels) or ranges of values (e.g. sales channels) for all dimensions using industry specific scales - in this case scales for retail banking.
An alternative graphical representation of the proposed business model is illustrated in Figures 6 and 7. In this ‘box-type’ representation, business model dimensions are arranged vertically while industry specific scales are arranged horizontally. The specification of a business model is achieved by marking appropriate values or value ranges. If the business model does only partially correspond to a particular value, the grade of compliance can be represented graphically by grey tones.

If different business models (e.g. as-is vs. t-be, business unit A vs. business unit B) are to be compared using the same graphical representation, the use of different colours (for cobweb diagrams) or fill patterns (for box diagrams) is recommended.

APPLICATION EXPERIENCE

This Section summarizes the application of the proposed techniques in a strategy making process of a large retail bank. The business model subsection is based on the case study described in Heinrich and Winter (2002). All specifications have been elicited in workshops with top executives. Other applications of the proposed techniques for business architecture specification and / or business model specification in retail banking are described in several articles by Leist and Winter (2002).

Business architecture ‘retail banking’

The regarded retail bank understands itself as a service integrator. For different geographic regions and also for selected customer segments, business models are defined that differ with regard to sales channels, customer potentials and services offered. All service integrator units reuse as many shared services as possible, e.g. ‘factories’ for payments processing, custody services, leasing services and securities trading regardless of whether these services are offered within the corporate network or by external companies. Investment funds management, risk management and product development are among those services that are sourced exclusively from certain specialists. A common platform for business networking is used as widely as possible. Over this platform, support services like card processing or foreign exchange trading are sourced. A simplified version of the to-be business architecture is illustrated by Figure 5.
Business model 'bank region X'

With regard to **regional orientation**, countries are differentiated due to widely different legal banking regulations. The modelled business unit targets German customers (ANSI country code = DE).

With regard to customers, basic orientation, consumer behaviour and customer potential are differentiated. According to Sinus (2000), **basic orientations** can be conservative, materialistic, hedonistic, post materialistic and post modern. **Consumer behaviour** can be classified to be complex, dissonance reducing, habitual or event oriented (Assael 1987). **Customer potential** should be measured as average, future oriented lifetime value. The regarded bank focuses on a materialistic, dissonance reducing customer segment with medium potential.

According to Weber (1992), **brand design** of banks can be classified into traditional, convenience, exclusiveness, professional, community, discount and modern & innovative. The bank’s **price policy** can be oriented on value, volume or number of transactions, on time, on performance or can focus on flat rates per service or even overall flat rates (Bernet 1995). The bank’s brand stands mainly for convenience and its price policy focuses on value / volume of transactions.

According to Kreuzer (1998), **sales channels** in financial services can be stationary (i.e. bank component is bound to a location, no customer component), mobile (i.e. bank component is mobile, no customer component) or electronic (i.e. bank component and customer component are computer applications, location is irrelevant). **Success factors** for sales processes can be time, convenience, value added / cost efficiency, competence & quality, flexibility, or image. From an output perspective, the bank can offer complaint management, consulting, personal sales and information services. **Customer contacts** can take place primarily as self service (e-banking, ATMs, phone banking), as passive, semi personal contacts (e.g. customer care teams in branches), as passive, personal contacts (e.g. personal bankers in branches) or as active contacts (e.g. outbound call centres) (Kreuzer 1998). The regarded bank utilizes all sales channels with a focus on mobile. Convenience and image are regarded as primary sales success factors. All services are offered with a focus on personal sales and complaint management. Personal customer contacts are sought after actively although self-service and semi-personal contacts are also supported.

A retail bank’s traditional **core products and services** are financing, investments & savings, value transfers, (financial) retirement planning, insurance, and law & tax services. **Success factors** for these products / services are time, standardization (compatibility to other products, comparability), range of
products, price / costs, risk, performance, flexibility and image. The regarded bank offers all products except for insurance with a focus on investment / saving and financial retirement planning. These products are primarily designed to be compatible with complementing financial services from other service integrators.

Being the final dimension of the external business model view, the service combination of elementary products and services can be driven by products, by product bundling, by customer problems or by customer events. In the regarded case, the primary focus is on product bundling while also some problem-oriented services are offered.

The business model specifications of all dimensions in the external view are illustrated by Figure 6.

![Figure 6. Alternative representation of external business model view](image)

The value chain is described by the degree of integration of partners, the degree of integration of (sales) channels and the degree of decentralization. With regard to the integration of partners in the value-added network, several business networking arenas can be differentiated: Partners can be integrated in logistics, product development, procurement, operations, marketing & sales, support, and / or even management processes. Multi-channel management, i.e. the integration of sales channels, can be centred around customer segments, products (e.g. common procurement), processes & systems (e.g. common platform), marketing (e.g. common pricing), finance or combinations of these. Regarding the (spatial) decentralization of operations, the same decentralization arenas can be differentiated as for business networking. The regarded bank collaborates in all areas except for marketing & sales. Particularly product development, procurement, and operations are implemented in close collaboration with partners. A comprehensive multi-channel approach covering all aspects is followed. However, the largest extent of channel integration is reached for products and marketing. No
activities are totally centralized. Among the decentralized activities, marketing & sales is considered to leave the highest autonomy to the business units.

Competencies can arise from employees, organizational capabilities (e.g. ‘economies of scale’), corporate culture & mentality (e.g. innovation culture), reputation, knowledge, technology, or capital and other production factors (Lado et al. 1992, Hamel 1994). Regarding their impact, it can be differentiated whether the focus is on management capabilities, synergies and change capabilities, transformation capabilities or output-oriented capabilities (Heinrich 2000). For the regarded bank, employees and reputation are considered to be the most important sources for transformation oriented and output oriented competencies.

With regard to organization, management policies, processes & structures, responsibilities and the range of activities are differentiated (Bleicher 1999). As basic management policies, a high degree of control, situative control, general frameworks (e.g. management by objectives) or total autonomy can be implemented. Processes & structures can be highly formalized and standardized, problem oriented and flexible, or open and subject oriented. Responsibilities can be defined in a task oriented, distributed (e.g. team organization), synergy oriented or centralized way. The range of activities can be small or broad, and activities can cover many production stages, but also only a specific stage. The regarded bank claims to organize its processes problem oriented and flexibly and to manage by objectives. Responsibilities are task oriented, and job profiles usually cover a broad range of activities while focusing on specific production stages.

Corporate culture is difficult to classify. According to Bleicher (1999), openness and basic orientation are the most important criteria. Regarding openness, a primarily internally and externally oriented culture should be differentiated. It is important whether content (e.g. business problems) or norms are
more important for employees. An organization’s basic orientation is either more traditional (e.g. preserving values) or transformation oriented. Regarding the role of employees in the organization, more individuality oriented and more community oriented approaches can be observed. The regarded bank appears as a modern organization with external orientation, content orientation, transformation culture and individual focus.

The business model specifications of all dimensions in the internal view are illustrated by Figure 7.

Application experience

The proposed techniques have been utilized in different ways:

1. **Documentation**: Using industry specific scales and specification rules, actual business architectures, companies and business units have been modelled ‘as-is’.

2. **Envisioning**: Based on ‘as-is’ specifications, ‘to-be’ specifications have been derived by simulating the effects of technology innovations (e.g. mobile broadband access to banking services), business changes (e.g. targeting new customer segments or using new incentive plans), and / or cultural changes (e.g. opening the organization by selective business networking).

3. **Manipulation**: Business model comparison, aggregation and consolidation has taken place during competitive analyses (comparison of ‘as-is’ models), mergers & acquisitions (aggregation of ‘as-is’ models), or strategic planning (consolidation of ‘to-be’ models).

From a methodological perspective, these processes should be separated because the role of the business model, the quality control and the project goals are different: The success of documentation projects as well as envisioning projects depends on the appropriateness of scales and the compliance with integrity constraints that guarantee that values of different scales are consistent (e.g. a focus on electronic sales channels and self-service is not consistent with a focus on conservative customers). Documentation projects and envisioning projects however differ with regard to the extent of applicable quality control because the latter are visions and not models of an existing, real phenomenon.

In contrast to documentation and envisioning usage, manipulation usage incorporates discussion, evaluations, and group decision making in order to develop several input business models into a single output model or an aggregate evaluation. For this type of projects, the proposed techniques can only be regarded as a partial yet important methodological support.

CONCLUSIONS

We have presented an approach to support strategy making that is based on a discussion of related work, widely diffused strategy making paradigms and experience with strategy making processes in several retail banks. By using the proposed techniques to specify business architectures and business models,

- business strategies can be compared and classified: E.g., the strategy making process can be documented by a series of business models that differ in time reference, technology focus, transformation focus, etc.
- business strategies can be standardized: E.g., reference business architecture and reference business models for specific industries can be used as a foundation for individual adaptation.
- business strategies can be checked for completeness and integrity: The proposed dimensions specify the market-based view of the firm as well as the resource-based view. Integrity constraints can be used to avoid value assignments that are incompatible.
strategy making can be linked to process (re-)design and information systems development: In actual applications, many specifications from the business model have been reused in subsequent stages like customer process analysis, process vision, process output analysis and process dynamics modelling.

In summary, the proposed strategy modelling techniques proved instrumental in supporting the representation of ‘as-is’ business structures as well as the envisioning of ‘to-be’ business structures and their consolidation. Since application experience is limited to companies of one industry sector, however, it has to be shown whether the meta models are general enough to be applied to completely different industries. Furthermore, the scope of our research was limited to ‘service integrator’ type business models so that the technique’s applicability to other business model types (e.g. shared service provider, exclusive service provider) is pending. A detailed, maybe formal analysis of interdependencies between specification dimensions and the integrity constraints resulting from these interdependencies is also pending.

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What’s driving e-fulfilment: new aims, new frames

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ABSTRACT

The approach by online retailers to logistics, supply chain, delivery and warehousing is aggregating into a set of activities termed “e-fulfilment”. More than just a collection of these activities, e-fulfilment is starting to be recognised as a new discipline requiring end-to-end, and quite different approaches to information and physical process management.

When considering the growing body of analysis related to online retailers’ success and failure, and applying it to e-fulfilment as a whole, there is evidence for a framework that can put structure and predictive capacity into successful e-fulfilment, and indeed can serve as the basis for its planning and implementation.

Keywords: fulfilment logistics online retailer e-tailer

INTRODUCTION

In traditional bricks and mortar retailers, the physical processes and information, from customer order to final delivery of the product, have involved discretely bounded systems: financial, supply chain management, warehousing logistics/inventory, and distribution/delivery. The latter two have in recent years become increasingly consolidated into what is commonly referred to as fulfilment.

Due to the pressures initially driven by e-tailing, now reinforced by the whole thrust of e-commerce, fulfilment for online retailers is the subject of frenetic commercial activity. This is coming to be known as “e-fulfilment”. Much of it is reactive, as it must be to address rapidly changing opportunities and threats, and may often take the form of patching together solutions by adapting, mixing and matching capabilities of companies and their allies. An academic outcome of this activity to date is a growing body of information about various approaches, and what emerges as success and failure indicators.

This paper therefore considers this information to examine the underlying forces that may be driving it, and to determine whether a framework exists that can lend predictive capacity to the known success factors. A greater understanding of these factors in turn sets the scene for a longer term strategic perspective of this area.

THE DEFINITION OF E-FULFILMENT

To analyse e-fulfilment success factors and their outcomes, it is important to first set the scope for analysis. Fulfilment in the online world now incorporates physical, information and financial aspects of the value chain from supply through to ultimate delivery, and even product returns (Bussiek 1999). As this has become apparent particularly because of the disciplines being required by e-tailers, the
term "e-fulfilment" has been coined to represent it. Several authors (Barsh, Crawford et al. 2000; Pyke, Johnson et al. 2000; Colin 2001; Raman 2001), in their work on fulfilment for e-tailers, though not using the term "e-fulfilment", collectively include the following in the scope of their discussions:

- picking
- packing
- customer service
- financial transactions
- warehouse costs
- delivery
- transport mechanisms and flows
- procurement management
- management information systems
- front end (ordering) services
- after-sales service
- returns
- realtime tracking

Such activities and systems are bound together by virtual proximity between e-traders and customers (Colin 2001), driven by close alliances and tight end-to-end linkages.

KEY E-FULFILMENT SUCCESS ELEMENTS IDENTIFIED

A holistic treatment of e-fulfilment success factors

Table 1 summarises success factors analysed from the literature. They represent empirical evidence from e-tailers (successful and failed) to date.

<table>
<thead>
<tr>
<th>Success Factor</th>
<th>Implications</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concepts and strategies</td>
<td>The supply chain and its descendants are considered to be a foundation for achieving success. Leverage it at strategic level to convert physical flows to information flows, and capitalise on physical infrastructures</td>
<td>(Rayport and Sviokla 1995; Schuster and Sporn 1998; Bovel and Martha 2000; Reynolds 2000; Bhatt and Emdad 2001; L.Lee and Whang 2001; Kambil and Dik 2002)</td>
</tr>
<tr>
<td>Economic sustainability</td>
<td>Business cost/revenue structures that are sustainable</td>
<td>(Laseter and al ; Reynolds 2000)</td>
</tr>
<tr>
<td>Social sustainability</td>
<td>an e-tailer must actually contribute something to the community</td>
<td>(Reynolds 2000)</td>
</tr>
<tr>
<td>Process control</td>
<td>Increased end-to-end process control and coordination</td>
<td>(Bowersox, Closs et al. 2002)</td>
</tr>
<tr>
<td>e-Fulfilment as a strategic decision</td>
<td>Organisations that consider their fulfilment needs as an integrated part of their offering have better chances of succeeding</td>
<td>(Gulati and Garino 2000; Anderson and Lee 2001; Gurau, Ranchhod et al. 2001)</td>
</tr>
<tr>
<td>Industry experience</td>
<td>Businesses with retailing/logistics experience have a better chance of success</td>
<td>(Laseter and al )</td>
</tr>
<tr>
<td>Customer density</td>
<td>High overhead costs associated with establishing both the hubs and network of delivery agencies are defrayed against the number of deliveries carried by each of the agents, so a significant minimum customer</td>
<td>(Laseter and al ; Laseter, Houston et al. ; Harty 2000; Bannister 2001; Colin 2001)</td>
</tr>
</tbody>
</table>
Success Factor | Implications | References
---|---|---
base – and one with significant density - is required in providing a profitable and practical delivery service.  
Market critical mass | rapid establishment of a critical-mass to raise business profile, defray overheads and advertising costs, and reduce per-delivery costs through high customer density | (Schuster and Sporn 1998; Elias and Starry 2000; Jones 2001)
Order process stringency | Failure to meet increased stringencies rapidly erodes customer confidence and their propensity to remain as customers. | (Jones 2001)
Alliance savvy | Because of the increased sophistication in the value net which e-tailers depend on, that e-tailer’s abilities in managing and maximising those relationships will impact on its success. | (Smith 1999; Bovel and Martha 2000; Anderson and Lee 2001)

**EVIDENCE FOR A FRAMEWORK OF SUCCESS FACTORS**

In examining the success factors in the first part of this paper, there is a degree of arbitrariness. They have today’s perspective stamped on them: new factors may emerge; perhaps potentially important ones have not been drawn out fully; perhaps different interpretations of success factors can lead to different outcomes.

The major limitation of simply stating a series of empirically determined success factors is that it does not take into account forces that are driving e-fulfilment and the strategic, vision-based outlook that this fosters. Nor does it recognise cause and effect relationships that may exist between them. A framework giving context to these factors would be far more valuable. And more valuable still would be one which could assist business to make e-fulfilment decisions.

Taking into account the information that now exists, a framework for the elements of success can be proposed.

**Features of the ‘e-fulfilment Success Funnel’**

The proposed framework avoids preoccupation with functional elements (warehousing, logistics, delivery, etc). In e-fulfilment terms, we believe these are artefacts of old disciplines, bearing similar names to e-fulfilment functions, but having diminished relevance in creating successful outcomes (fig 1).

The fundamental utilities of this framework are to:

- categorise success factors into logical groups – to assist in identifying and capturing types of success factor and making identification of emerging or changing success factors more practical;
- focus each category on a successful business outcome – to ensure e-fulfilment initiatives have practical value;
- place the categories into a logical order that moves from strategic to operational planning, and then to implementation;
- maintain an e-fulfilment focus while retaining alignment with other business decisions.
Why this is a funnel

Overarching these aspects is a fundamentally important concept; that one starts (on the left of the funnel) with many options. Some will be appropriate and some will be sub-optimal. As e-fulfilment initiatives move iteratively and cyclically through planning and implementing stages, then to successful financial and customer outcomes, the options for success continuously decrease; a funnelling process filtering out “bad” options, leaving a much smaller set of optimal ones for the truly successful organisations.

The ‘decision focus stages’

Each of the stages in the funnel is treated as a “focus” stage, where activity and interest is centred on a particular set of circumstances and indicators. This is the focus of activities at that particular time.

The order is important, since success in a stage is a prerequisite for success in the next. In this way, the funnel is also the basis of a structured methodology, and also is links all the activities into a contiguous whole.

Each stage is discussed below:

Stage I: Viable business value models

To be sustainable it is necessary to have a business model that produces long-term profit acceptable to stakeholders. This impacts e-fulfilment in two ways:

- There is a trade-off between speed, range and time of deliveries with respect to costs of the e-fulfilment processes. So the relative cost structures may vary dramatically between a “slow speed” and “express” service, between “go anywhere” and “limited range” delivery ranges, and between “customer-specified time” and “most cost effective time” of delivery. Such cost
structures must therefore be in line with the products being offered, while still being part of an overall competitive price (Wind, Mahajan et al. 2002).

- If the overall business’s profit model is not viable, financial pressures will soon be exerted on the e-fulfilment component of the business. It is likely to affect systems and assets requiring capital, and to put pressure on reducing per-transaction costs; perhaps with consequent compromise of expected customer service.

Without a viable business model, the specific efficacy of the business’s e-fulfilment solutions is irrelevant!

Stage II: Fulfilment selection mechanism

Assuming that a viable business model exists, then even the actual mechanism used to select an e-fulfilment strategy appears prima facie to be important to overall success of the e-tailer. This may well be because such a decision-making approach is driven by several factors also important to the business’s chances of success:

The reasons for developing an online retailing operation are varied, as summarised in table 2.

Table 2: Relevant skills attributes and deficiencies in different e-tailer segments

<table>
<thead>
<tr>
<th>Situation *</th>
<th>Online Opportunity</th>
<th>Skills possessed</th>
<th>Skills lacking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pureplay</td>
<td>new venture, entrepreneurial</td>
<td>web development, supplier relationships</td>
<td>retailing, fulfilment, warehousing</td>
</tr>
<tr>
<td>Online channel expansion</td>
<td>better use of existing capabilities, new customers, (often) new division, synergy between channels</td>
<td>existing distribution arrangements, brand, customer base, market knowledge</td>
<td>online experience, e-fulfilment experience, online market differences</td>
</tr>
<tr>
<td>Disintermediators</td>
<td>remove wholesale &amp;/or retail components, more control of product</td>
<td>shipping, flexibility in production timetables (maybe), finished goods warehousing</td>
<td>retailing, fulfilment, online experience</td>
</tr>
</tbody>
</table>


As noted in this table, each category of e-tailer has expertise and gaps in the skills they can bring to their e-tailing opportunities. These will influence the organisation’s perception of e-fulfilment; elements such as:

- priority within the organisation;
- understanding of the complexity of the e-fulfilment tasks required;
- experience with various (and different) aspects of e-fulfilment;
- useful relationships and alliances;
- sophistication in making supplier and e-fulfilment alliances, supply and other relationships.

In turn, this knowledge will influence how a business chooses to set up an e-fulfilment capability (Bekker, Flur et al. 2000; Gurau, Ranchhod et al. 2001), from complete outsourcing of both the strategy and implementation, through general e-fulfilment tenders and contracts, to detailed and
proven strategies with specific and quantified resource requirements and well designed
outsourcing/supplier arrangements.

It is suggested (Hock 2001) in discussing these aspects of an e-supply chain comparing success of
organisations with operational v’s strategic, and integrated v’s fragmented approaches, that the
methods used influence the nature – and by implication, the appropriateness of the e-fulfilment
solution to the e-tailer’s needs, and therefore is an indicator of success.

Stage III: Strategic operating capacity

An e-fulfilment strategy is broad and resource intensive, so a strategy that underestimates these
resource requirements will be compromised.

The resources suggested are the typical ones for core business functions:

- appropriately skilled people with adequate time and authority related to e-fulfilment;
- portfolio of suitable assets such as warehouses and capital equipment;
- adequate operating funds to ensure systems and processes can be carried out correctly;
- computer and other systems to deliver timely and relevant information;
- external services and alliances, with suitable contractual guarantees, which may include
  alliances/arrangements/contracts with delivery agents, finance providers, etc, etc.

Stage IV: Disintermediation positioning and process capability

A strong requirement for successful e-fulfilment is the ability to integrate operations and information
flows, reduce or eliminate associated physical pools and provide end-to-end continuity of process
(table 1). These requirements in turn fuel a strong desire to reduce the number of non-coordinated
players in the entire process in favour of:

- new processes that bypass or telescope various phases of the purchasing-warehousing-
  logistics-delivery chain;
- alliances that provide close integration, cooperation and information sharing in the processes,
  so reducing the need to treat them as “black boxes” with pools and information interfaces
  operating at entry and exit points for that box.

Such behaviour produces forms of disintermediation, and in so doing delivers efficiencies and
capabilities appropriate to the needs of e-tailers.

In the proposed model therefore, after engineering successful strategic positioning outcomes
(establishing business model viability, choosing an approach to e-fulfilment strategy, making and
aligning capabilities and resources to it – the first 3 parts of the funnel), positioning the e-fulfilment
strategy for effective disintermediation capabilities represents an essential part of the framework
geared at actually implementing it.

Stage V: Spatial and temporal immediacy

It can be argued that forces act on e-tailers to make them increase their capabilities for temporal
convergence and spatial divergence: because the ability to deliver cost-effectively anywhere and at any
time provides a significant competitive advantage for an on-line retailer.

How does that manifest itself in a real e-tailing operation? Examining Coles Online and Amazon.com
provides some insight.

Coles online (Harty 2000) approached fulfilment for its grocery e-tailing business by initially offering
full services within only limited regions. This is not an unusual scenario. In French B2C sites (Colin
2001) 52% provided worldwide service, 16% Europe-wide, while the rest restricted service regions to
their own countries. US figures (Gurau, Ranchhod et al. 2001) show 36% targeting only domestic markets, and only 9% prepared to target global markets.

With respect to regional fulfilment, e-tailers can choose to totally exclude, or support only at lower service levels (lead-time for delivery, security, return-ability, insurances, etc), those areas not in their optimal region(s). This differentiation also applies to time of delivery, with caveats such as "within business hours" being common disclaimers.

Amazon.com, as an example of a more mature e-tailer, originally only offered fixed service level delivery in the US. Now, through service-level agreements that seamlessly link a now extensive and sophisticated US distribution network with various delivery agents throughout the world, tight guarantees can be made for delivery in most parts of the world, albeit at this stage, still with a regionally-based cost and turn around time differential.

These examples provide some indication that as the disintermediation ability of the organisation improves, the range over which this can be effective also increases. It is therefore logical to include this as the next focus stage the funnel.

Stage VI: Meet customer expectations

The first decision-focus stage concentrated on a viable business model – with its emphasis on designing cost and revenue models that create sustainable profit. Stage I thus sets the scene for all the business’s operations. Stages II to V concentrate on achieving required capabilities within the boundaries of the model. All of these stages look inward. None of them relate their effectiveness in commercial measures that count: profit, growth, market share and so on.

The model therefore proposes the last stage focus on meeting customer expectations. By so doing it determines whether all processes, initiatives and alliances have achieved what was expected of them in terms of customer wants.

And if they don’t, changes can be made to better align the overall offering within the confines of the other parts of the model.

Mapping the elements of success – a practical use for the funnel

Both to provide evidence as to the efficacy of the e-fulfilment decision filter model, and to provide practical anchor points for its operation, it is beneficial to relate it to elements for e-fulfilment success, as based on the literature.

Indeed, it is possible to relate each success factor to a stage in the model, as shown in Table 3.
Table 3: Success elements superimposed on the e-fulfilment success funnel

<table>
<thead>
<tr>
<th>Success factor</th>
<th>Decision focus Stages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
</tr>
<tr>
<td>Postpone physical logistics process</td>
<td>O</td>
</tr>
<tr>
<td>Dematerialise material flows</td>
<td>O</td>
</tr>
<tr>
<td>Resource exchange pooling</td>
<td></td>
</tr>
<tr>
<td>Leverage shipments</td>
<td>O</td>
</tr>
<tr>
<td>Clicks &amp; mortar model</td>
<td></td>
</tr>
<tr>
<td>Create dynamic supply network/virtual value chain</td>
<td>O</td>
</tr>
<tr>
<td>Choose the right product mix</td>
<td></td>
</tr>
<tr>
<td>Customer expectations can be profitably sustained</td>
<td>O</td>
</tr>
<tr>
<td>Delivery service offerings are appropriate</td>
<td>O</td>
</tr>
<tr>
<td>Delivery features are profitable and acceptable</td>
<td>O</td>
</tr>
<tr>
<td>Delivery routing is sustainable</td>
<td>O</td>
</tr>
<tr>
<td>Synergistic partnerships are in place and delivering to expectations</td>
<td>O</td>
</tr>
<tr>
<td>Socially sustainable activities/image</td>
<td></td>
</tr>
<tr>
<td>Process controls - positive results</td>
<td></td>
</tr>
<tr>
<td>Suitable e-fulfilment plan considers strategic and operational issues</td>
<td>O</td>
</tr>
<tr>
<td>Direct (or acquired) fulfilment experience</td>
<td></td>
</tr>
<tr>
<td>Customer density is sustainable</td>
<td>O</td>
</tr>
<tr>
<td>Suitable range limitations on fulfilment</td>
<td></td>
</tr>
<tr>
<td>Suitable fulfilment infrastructures accessible</td>
<td>O</td>
</tr>
<tr>
<td>Critical mass reached for market – within financially reasonable time</td>
<td>O</td>
</tr>
<tr>
<td>Order processing is stringent</td>
<td></td>
</tr>
<tr>
<td>Can demonstrate alliance savvy</td>
<td>O</td>
</tr>
</tbody>
</table>
Using the Model

It is proposed that the model can be used in 2 ways – (1) by practitioners inside e-tailing businesses, and (2) by researchers to act as a sensitive indicator of success factors (as they are discovered, and as they change).

For practitioners:

Relating the stages of the model to e-fulfilment success factors provides a specific set of “successful” and “not-successful” features for strategy, tactical and operational components. Mapping them into the decision focus stages relates them to this model, and so provides tests for each decision that will impact on e-fulfilment success.

The sequential nature of the model lends itself to providing the skeleton of a methodology: stages I, II and III mainly concentrate on strategic and tactical aspects, while stages IV, V and VI focus on tactical and operational aspects that result from previous stages’ decisions.

Combining these two aspects, a structured methodology resolves that can be followed from initial planning at strategy level, through implementation and operations, ending at tests of success that relate to customer expectations and sustainability. Results of these tests can then be fed back into the model iteratively.

For Researchers:

Research activity into e-fulfilment to date has been ad-hoc in that a) the scope of e-fulfilment itself is not fully elucidated, and b) there is no framework in which success factors are placed; are there factors not yet identified? Are there factors which appear separate but are in fact closely related?

It is suggested that answers for both can be obtained by relating all success factors back to the framework provided by the proposed funnel.

Testing the model

On the basis of the literature survey and its applications, there is arguably a framework on which success factors hang, and the suggested phases represent logical projections of the experiences of e-tailers to date. But this information is enough for a conceptual model only.

To establish the strength of this model, and fully elucidate the phases, further research is planned, incorporating survey information.

CONCLUDING REMARKS

By force of their changed and very stringent requirements, e-tailers have altered forever the nature of fulfilment, logistics, warehousing, and many related systems. These changes have been referred to occasionally and only casually, as e-fulfilment.

The paper examines the literature relating to these successful e-tailers and identifies a series of success factors. In so doing, a framework is suggested in which these factors can be placed to provide predictive capacity for e-fulfilment initiatives. The model outlined is termed the “e-fulfilment success funnel”. It is proposed that this can serve as the basis of a strategic and operational planning methodology, and as such will be the subject of ongoing research activity.
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Managing Knowledge Transfer and Creation during Information Systems Development

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ABSTRACT

Software development is a knowledge management process par excellence, and is essentially concerned with creating and moving abstract concepts through a chain of staff roles until their ultimate codification into programming rules and data definitions. In order to manage knowledge transfer, a clear definition and understanding of the processes associated with creating, storing, and sharing knowledge is required. We derive this definition and understanding from the sociology of knowledge. Based upon a social-constructivist theory of knowledge with a strong and established theoretical base, we present a model that describes and interconnects knowledge processes. This model gives us a clear set of concepts with which to develop a tool for the management of a knowledge environment during a software development project.

INTRODUCTION

Software development projects are undertakings historically dogged by failure and they continue to be fraught with risk. There still exists a high rate of dissatisfaction, in spite of great gains in technology, programming tools, methodologies and management techniques. Lyytinen and Robey (1999) point to the still 'alarming' rate and scale of failure. Lycett and Paul (1999) observed that 'though there has been much progress made in information systems development, the systems themselves continue to disappoint'. The Standish Group Chaos report (1996) puts the overall success rate ('on-time and on budget') at 16%, with 31% of systems abandoned before completion. Wastell (1999) describes "the continuing prevalence of information systems failure" and claims this shows that new organizing principles are needed for projects, drawn from other areas of research such as management science.

The research described in this article seeks to examine the translation of stakeholder requirements into designs and programs. Recent research (Tassey 2002) has found the cost of repairing requirements bugs to be up to 440 times the effort prior to going live, and up to 880 times after productive use of the software commences. Marakas & Elam (1998, p38) "found that over 50% of the systems reviewed had problems necessitating a return to the requirements analysis phase due to important requirements being missed the first time". Jalote (1997) quotes a 1993 survey by Davis and Bach which found that 54% errors are found after testing and of these, 45% were requirements and design errors manifested in not meeting user needs. Somerville and Sawyer (1998) quotes a "recent European survey...which showed that the principal problem in software development and production are the requirements specification and the management of customer requirements".

The approach in this article has its origin in the perspective of software development as a knowledge transfer process and the observation that it involves creation, emergence and movement of knowledge,
rather than a process of increasingly detailed analysis and codification, as described in most texts on software development. Over time and within a variety of disparate disciplines, factors that affect knowledge transfer have been identified, analysed and understood: these disciplines include information systems research, cognitive science, management science, philosophy, sociology, psychology and even architecture. The model of knowledge transfer presented here, being a comprehensive process depiction of the steps required to effect knowledge transfer, provides a ‘superstructure’ for the ongoing inclusion of these factors.

METHODOLOGY

The research described in this article is based on critical analysis of the literatures of knowledge and information systems. The origins of “knowledge” in Western thought, and recent extensions of our understanding of knowledge, are used to illustrate how our perception of information systems as emergent and socially constructed are consistent with modern concepts of the social construction of knowledge. This article therefore draws on social constructivism to develop a model of knowledge transfer and creation which can be incorporated within an information system development methodology.

We conclude with a brief discussion of empirical verification of the model and the associated tool, but the primary purpose of this article, however, is not to present the case studies, but to use logic and critical analysis to explain how knowledge transfer and creation during information system development may be modelled in such a way that it can inform, in a practical way, information systems development projects.

SYSTEMS DEVELOPMENT AND KNOWLEDGE

The view of ‘knowledge’ that pervades information systems development reflects the positivist perceptions that have dominated western thinking since the time of Plato, in works such as The Republic, Theatetus and Euthyphro. In this century, philosophers such as Ryle (1949), Polanyi (1973) and Wittgenstein (1958), cultural anthropologists such as Whorf (1956) and Sapir (1964) sociologists such as Berger and Luckmann (1967), and Erving Goffman (1975), and more recently knowledge management researchers such as Nonaka and Takeuchi (1995), von Krogh and Roos (1996) and Davenport and Prusak (1998), have influenced our thinking to appreciate that knowledge is relative to cultures and contexts. It covers knowing ‘how’, knowing ‘that’ and knowing ‘why’, as well as knowing ‘what a clarinet sounds like’. Our concept of knowledge has moved from a Cartesian subject, standing in a static, cognitive relationship of certainty to propositions stating facts about the empirical or logical (i.e. mathematical) world, to social beings who act in certain ways to exhibit knowledge and achieve certain ends, whether that is a skill, a fact or a body of theoretical knowledge.

In the social constructivist paradigm (Berger and Luckmann, 1967), knowledge can be characterised as the sets of beliefs people use to interpret actions and events in the world. A shaman’s knowledge of the spirit world allows him to interpret naturally occurring phenomena as portents or signs. Moral knowledge allows us to assess behaviour as right or wrong, criminal, unethical or fair. Social constructivism eschews any judgement about whether or not there are actually such things as “spirits” or “right and wrong”. “What is ‘real’ to a Tibetan monk may not be ‘real’ to an American businessman” (Berger and Luckmann, 1967, page 3). The reality of the shaman or the business manager is constructed by each of them and is generally developed within social groups over periods of time and absorbed by people most dramatically (and ontogenetically) during primary socialisation. For something to be objective, or real, does not necessarily mean that you can stub your toe on it. But it can certainly cause pain.

Information Systems Development projects are intensive exercises in constructing social reality through the organizational modelling they undertake. These model are informed with the particular
world view and background of systems designers (Westrup, 1996; Winograd and Flores 1986; Hirschheim, Klein et al., 1995) and uses their particular formal representations to achieve objectivation (Robillard, 1999; Fichman and Kemerer, 1992). In ISD projects the objective social reality is a new and explicitly constructed one and has objectivity through negotiated agreement between participants from ‘two cultures’ (Checkland, 1999; Angell, 1990). Under normal working conditions, this agreement can largely be tacit (a state of “optimal fuzziness” is reached) and indeed be defined through lack of disagreement. Disagreement may remain hidden until, in the process of clarification and articulation required in information systems development, a “crisis of legitimation” occurs (Banville, 1991).

It therefore follows that the properties of the information system emerge as we proceed in the analysis and design of a business system (Boarder and Laming, 1995; Checkland, 1999; Stage, 1991). However, most contemporary design methodologies do not use the conceptual tools or language of social construction: they use the language of engineering, a discipline which builds lasting structures of steel and concrete from pre-existing elements. Information Systems Development Methodologies exist as structured approaches to systems development that “tell us what steps to take, in what order and how to perform those steps...” (Jayaratna, 1994). The knowledge paradigm behind these methodologies has been overwhelmingly based upon a correspondence theory of truth and geared towards the discovery and description of a positivist reality in C++ or Java (Orlikowski and Baroudi, 1991).

But there is a trend towards rapid, more ad hoc construction of temporary IS elements (exemplified by the Microsoft ‘.NET’ strategy) and the imperative to solve the development and delivery conundrum has grown in urgency. Methods allowing a contingent, varied response are required. Perhaps the social constructionist paradigm offers an insight into continuing failure, namely that what is happening in an ISD project is far more complex than the simple translation of a description of objective, physical actions and words into instructions for a computer. It is the emergence and articulation of multiple, indeterminate, sometimes unconscious, sometimes ineffable realities and the negotiated achievement of a consensus of a new, objectivated reality in an explicit form, such as a business or data model, which is amenable to computerisation.

THE MODEL OF KNOWLEDGE TRANSFER AND CREATION

This section presents knowledge transfer as a set of processes within a model, which are performed in order to develop, gain or pass on knowledge. Each knowledge transfer process is defined and described. Maxims and insights, which would allow ISD project managers to assess and manage the preconditions for effective knowledge transfer within this process, are drawn from the literature and the preceding analysis and grouped and integrated as candidates for a checklist of ‘good health’. This article does not attempt to order these “guidelines”. They are presented here simply as illustrations.

Derivation of the Knowledge Transfer model

The model in Figure 1 below has been derived directly from the sociology of knowledge, in particular the work of Berger and Luckmann (1967). This seminal work proposes a series of process which describe how the “intersubjective” gap is overcome and how socially constructed realities, which comprise the knowledge of any social group, are shared and achieve day-to-day objectivity and persistence. The vehicles of language and symbolic behaviour embody permanent solutions to the permanent problems of a given collectivity.
Overview

The model connects all the significant knowledge processes in a temporal sequence, although it suffers from the usual limitations of models. Consider the following ‘Salem’ walkthrough as an illustration:

- I know (1) that witches have certain characteristics.
- I externalise (2) this by telling someone.
- They internalise (4) this and it becomes part of their own personal knowledge (1).
- They combine this knowledge with other knowledge they possess, of people who have the same characteristics as witches but are men, to create new knowledge (6).
- They externalise (2) and discuss this and it becomes a new, agreed and objectified (3) concept of warlocks, which can be internalised (4) (learned and understood) by others.
- The town elders then agree that there are indeed warlocks and that they should be treated as witches: this is legitimation (5).
- After decades, nobody questions this anymore. Warlocks have always existed and always will: this is reification (7).
Personal Knowledge

Personal knowledge is the total of an individual's perceptions about the social and physical world in which he/she is a participant. The classical understanding of knowledge is 'justified, true belief', but in recent times has been extended to include physical skills, competence and those mental, interpretive models we have of the world, which give us 'the capacity to act' and decide. If we ignore these facets of knowledge, we will miss a number of important insights into how to manage knowledge transfer.

Sample Guidelines

1. Ensure that all required repositories of knowledge, human, textual and technological, are involved in ISD projects.
2. The more complex the knowledge (defined as the number of operations required to solve a task), the greater the difficulty in knowledge transfer (Zander and Kogut, 1995)
3. The larger the number of people required to gain coherent knowledge of a "whole", the greater the difficulty in knowledge transfer (Zander and Kogut, 1995)
4. The greater the causal ambiguity of the knowledge, the more difficult the knowledge transfer (Szulanski, 1996)

Process 2 - Externalisation

Externalisation is the expression of knowledge in a symbolic form into the physical world, such that others can absorb it (Berger and Luckmann, 1967) This can happen in several ways, either in a written form, speech acts, or through diagrams or gestures. It can also occur in a variety of contexts, such as meetings, workshops, interviews, the coffee room or pub. These contexts may have an impact upon the meaning of whatever is externalised.

Sample Guidelines

1. The presentation form, or the physical instantiation of the knowledge, may affect the transfer of the knowledge. "The knowledge that somebody has about something can be communicated more effectively when appropriate representations are used" (Sparrow, 1998, p75).
2. Formal models, such as those used in computer science, do not lend themselves to wide dissemination of knowledge and require a joint tradition of development between business and ISD staff (Stage, 1991).
3. An appropriate mixture of diagram and text should be used to maximise dissemination and systemisation of knowledge, whilst allowing an appropriate level of detail to be achieved (Stage, 1991)
4. Where physical automation of processes is the objective, the physical motions may be acted through for a more effective form of knowledge transfer (Sveiby, 1997)

Process 3 - Objectivation

Objectivation refers to the creation of objective, social knowledge that represents a social group's, rather than an individual's, knowledge of a business process or situation (Berger and Luckmann, 1967). Having "objectivity" does not mean that this knowledge is "physically real" in any way, but that it gives the knowledge an "objective" existence independent of any individual. It transcends individual knowledge and allows communication and common understanding to occur as manifested in physical symbols such language, behaviour, artefacts or naturally occurring objects which are endowed with social significance.
Sample Guidelines

1. Establish the levels of organizational objectivation (through examining 'standardisation' and 'codification' (Zander and Kogut, 1995)) prior to the ISD design process and develop a strategy for increasing objectivation if required.
2. Ensure that all parties have a common understanding of concepts, for example through the publication of a glossary (Davenport and Prusack, 1998)
3. In cases of doubt, always explicitly define ambiguous terms in interviews or meetings (O'Dell and Grayson, 1998)

Process 4 - Legitimation

Legitimation is a "second order objectivation of meaning", a process whereby objective and externalised knowledge is authorised and meanings are validated as "correct" or "standard" (Berger and Luckmann, 1967). Where no religious or utopian vision provides legitimacy, it is provided by tradition, leadership or rational discourse and agreement. The last of these often requires the participation or approval of an authorised person or group and a clear, accepted and often documented process of authorisation. Unless Legitimation occurs, the reliability and authenticity of knowledge is always open to question.

Sample Guidelines

1. If there is no clear source of business legitimation for requirements, the time spent seeking compromise and negotiating will increase
2. Greater user involvement during development will increase the levels of solution legitimacy at implementation (Scarbrough and Corbett, 1992)
3. The lower the levels of objectivation and codification in business processes, the greater the need for explicit legitimating authority (Sillince and Mouakket, 1997)
4. Awareness and perceived legitimacy of power exercise will affect users' response to professionals and their acceptance of the solutions professionals proposed (Markus and Bjorn-Andersen, 1987)

Process 5 - Internalisation

The successful completion of the knowledge transfer process is the absorption of knowledge by a recipient. This depends upon the capability of the knowledge recipient to internalise, or absorb the knowledge that has previously been externalised and objectified (Berger and Luckmann, 1967). A major determinant of internalisation efficiency is the absorptive capacity of this person, the most important constituent of which is prior related knowledge of the conceptual constructs and patterns within which new concepts can be embedded (Cohen and Levinthal, 1990). Lyytinen and Robey (1999) emphasises the particular importance of learning in ISD projects.

Sample Guidelines

1. Prior related knowledge affects absorptive capacity (Cohen and Levinthal, 1990). Szulanski (1996) conducted extensive empirical research confirming that absorptive capacity is the major determinant in effective internalisation.
2. Learning is enhanced through purposive training (Argote, 1999)
3. Learning will be better in organizations which value knowledge (Lyytinen and Robey, 1999), and systematically support it (O'Dell and Grayson, 1998)
4. The earlier the buildup of absorptive capacity, the better the learning rate (Cohen and Levinthal, 1990)
Process 6 - Knowledge Creation

The active creation of reality is performed daily by all human beings in organizational contexts and can be constituted from an understanding of explicit organizational knowledge combined with the particular background, logical and analytical ability, experiential and psycho-social knowledge of an individual. The sophistication of knowledge creation can be viewed as a spectrum, ranging from the mundane development of assertions and conclusions by logic, guesswork and intuition through to the radical creativity and purposive innovation associated with paradigm shifts.

"Rather than being highly structured and routine, many daily tasks are fluid and contingent, requiring workers to develop local strategies and forms of collaboration...." (Clement and Halonen 1998, p1090)

Sample Guidelines

1. Use experienced, creative systems designers and your best, most experienced business people as stakeholders! (Cooper, 2000)
2. Clear management guidelines for a project, such that the boundaries for establishing new business processes and exploring new technological possibilities are set (Cooper, 2000)
3. Establish a close connection between the source of the need for innovation (ie the user) and the supplier (ISD staff) (Kanter, 1996)
4. Encourage an organization which supports idea creation (Nonaka and Takeuchi, 1995; Kanter, 1996) through appropriate rewards and recognition

Process 7 - Reification

Reification is “the apprehension of human phenomena ...as if they were things..” (Berger and Luckmann, 1967, p106). This is how much of human social reality, although not physically real, seems to take on an existence beyond humans and becomes “alienated” from them. Reification is the process by which, for human institutions, the abstract becomes concrete in its presence and palpable in its apprehension. Reification is particularly relevant in ISD projects: where alternatives to existing business operations cannot be imagined, the benefits of new systems are limited.

How do we measure or perceive reification? It will be present in business where one hears the expression “We’ve always done it this way” – that which is not invented here will not be used here (O’Dell and Grayson, 1998)

WHERE DOES THE MODEL LEAD US?

This model gives us a simple and clear (but theoretically based and comprehensive) structure by which to organise our understanding of the processes of personal and social knowledge creation, and the sharing, learning and authorising of that knowledge. It also shows how ultimately we can become prisoners of the reality we have constructed.

Each process can work well or badly and many of the relevant factors have been isolated and identified. To operationalise this research within the previously defined context of knowledge transfer failures in Information Systems Development projects we need to provide an accessible method for checking the knowledge transfer factors in the ISD context and proposing appropriate solutions to improve knowledge transfer. The next section describes a simple software tool which was developed that encapsulates the model into a series of MS-EXCEL spreadsheets and macro commands. The knowledge transfer factors are paraphrased as survey questions which give an assessment of that factor. The responses can be examined individually, or aggregated in a number of ways. This
management tool should be used by someone who has both the incentive and the authority to influence knowledge transfer conditions. This would typically be a project manager, or a senior systems analyst.

A TOOL FOR MANAGING ISD KNOWLEDGE ENVIRONMENTS

The use of a tool and methodology based on the social constructivist model of knowledge transfer would consist of three steps:

1. An initial knowledge transfer health check, or audit, which allows a project manager or analyst to capture the relevant data regarding the preconditions for effective knowledge transfer.
2. An evaluation of the results of the health check, which will give an indication of how the preconditions satisfy the requirements of effective knowledge transfer.
3. The development of strategies which will be suggested to address the preconditions for knowledge transfer which are perceived to be weak.

In order to make the model, and therefore the conceptual distinctions, available to non-theoretical users such as ISD project managers, the expressions from the sociology of knowledge have been translated into approximate everyday equivalents. For example, externalisation becomes ‘knowledge sharing’. Whilst these equivalents are not precise, it is more likely that the tool will be considered to be more acceptable if everyday terminology is applied.

Figure 2 Model overview and tool entry point

Figure 2 is a sample of how the Knowledge Transfer Tool reflects the model of social constructivism. By clicking with the mouse on a process icon, the user is led to the analysis questions for that process.
Figure 3 (below) shows the guidelines, drawn from a variety of sources, for externalisation ("Knowledge Sharing"). Apart from coming under a general category such as ‘learning’ or ‘sharing’, the guidelines are sorted into sub-categories. These generally are the capability and motivation to perform knowledge transfer acts, and are the two major, most common dimensions of knowledge transfer. A summary report is generated from the data input and poor scores are matched to improvement suggestions.

The tool, as described here, has been applied twice in the context of large systems development within large Australian public sector organisations. Both projects developed knowledge environment management strategies relevant to information systems development and delivery from the tool. The tool was also applied in the context of a large strategic planning exercise, where it was used to measure the organisation’s cultural and behavioural receptivity to forms of knowledge management technology.

The project managers have found the framework provided by the model has increased their understanding of the whole knowledge environment within which the project operates and of the processes which need to be understood and managed if the project is to be successful. They have found the guidelines easy to understand and assess, and have been able to overlay use of the tool onto the information systems development methodology used for their projects.

LIMITATIONS OF THE METHODOLOGY AND TOOL

The methodology, as described here, is trying to indicate, in the first instance to a non-specialist, where there may be weaknesses in the conditions for the creation and sharing of knowledge and the sorts of strategies which may improve things. The effective use of the strategies still requires management skill and authority. The assessment of what is a ‘good’ or ‘poor’ score also requires investigation. The tool itself is quite basic and can be enhanced in many ways. In particular the interrelationships and relative influence of the factors is not well understood. If I have enough trust, does this mean I can get away with lower levels of competence, or can the participants sit further away from each other? Szulanski (1996) for example concludes that prior related knowledge (i.e. competence) is more important than other factors, such as motivation, in the internalisation of knowledge.
CONCLUSION

Finally, what is new about this approach, and how might it help information systems professionals? At a conceptual level, the model clarifies the difference between the approach taken by modern writers about knowledge management and the knowledge activities often undertaken in systems projects: the modern conception of knowledge management is founded on principles of social or collective human understanding of organizations and their processes, but most organizations continue to attempt to implement systems which ignore these social constructions, attempting to engineer systems as if organizations and processes were constructed of components or objects which exist outside their social context. Until now, this social conception of organisational knowledge has been associated more with philosophical argument than practical tools for diagnosing and improving knowledge transfer.

The tool described here, however, translates the concept of social construction of knowledge into a simple, practical tool which can be used to assess the knowledge transfer health of a group. This tool identifies critical social processes in the effective transfer of knowledge, and presents them in the familiar form of an audit checklist. The checklist differs from those presented in the general KM literature in its grounding in theory and the extent to which it is able to integrate the propositions of observers of knowledge transfer processes across several organisational functions. Finally, this research has focussed on integrating general purpose knowledge transfer guidelines, but it may well be that there is a sufficient corpus of research directly appropriate to knowledge transfer in ISD projects to justify derivation of factors from ISD research alone.
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Informed Traders in Electronic Markets – Mining ‘Living’ Data to Provide Context Information to a Negotiation Process

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ABSTRACT

Electronic business is much more than an electronic exchange. It includes the negotiation of deals between parties engaged in business transactions. Negotiation is the process whereby two (or more) individual agents with conflicting interests reach a mutually beneficial agreement on a set of issues. In negotiation the exchange of information is as important as the exchange of offers. Current e-business developments do not take in account this factor. This paper presents an agent-based framework for mining online data streams, which supports the identification of the above-mentioned information on negotiator’s demand, combining the output of the data mining agents into a meaningful and valuable recommendation to the negotiator.

INTRODUCTION

The advent of e-business technologies brings more companies and consumers in trading relations over the Internet. Electronic markets are getting an increased share in trading a range of goods and services, spanning from raw materials to sophisticated technologies and communication bandwidth. Compared to conventional business mediums, e-markets have the potential to provide more liquidity and flexibility of trading operations by providing a space and facilities for geographically dispersed parties to handle market transactions (both synchronously and asynchronously). The expectation is that these distributed markets will be more efficient, reducing the transaction costs. As the assets traded in such markets need to be described digitally, the effectiveness of a market depends to the way digital media is used to represent the artefacts. Figure 1 illustrates the potential of the digital media representation in providing extensive product information. Such presentation consists of structured attribute-value information (in this example, accessible through a details on the model query) and data for constructing 3D models and tools for interactive manipulation of such models (in this example, such tools include viewing manipulation – rotating, panning and zooming, and information retrieval manipulation, like active spots which bring text description of the visual object and retrieving information about the dimensions of different parts and sections of the product. The ability to extract the necessary information and knowledge about the product, and the ability to compare such knowledge is one of the key components of informed market traders.

Informed traders on the Internet should be able to extract information about the companies that produce the products, parties that offer it, including various discount deals, aggregations and other dimensions of trading flexibility. Informed trader should also have additional information about the context of the deal that surrounds the assets in focus. The context of the deal includes a broad range of information. The following simple example illustrates the idea. Deciding to get laptops for the employees of a relatively large division, such as a faculty in a university is not a trivial task. The price and quantity are only part of the parameters for negotiation. The management of the organization may consider the other services provided by the company and their integration in the package, the prospects...
of the company on the local market, the plans for research and development in that product family. For example, if such scenario is considered at the Australian market in August 2001, and the decision needed to be made between two vendors – "Dell" and "Gateway", the knowledge about the plans of Gateway to withdraw from the Australian market could influence the decision making in favour of Dell. Without knowing this additional information, a very good ('closing down') price deal from Gateway could influence a buyer towards their products.

Timely information discovery is extremely important in negotiation. Currently, most kind of assets traded via electronic markets are homogeneous items whose only negotiable factors are quantity and price. In automated electronic markets the majority of traded assets will have negotiable properties that are not measurable in numbers or discrete structures, but rather complex structures containing

Figure 1. Example of different product presentation derived from a digital media representation (based on Dell's products web service in Australia).
combinations of numbers, discrete and continuous descriptors (Veit et al., 2000). Negotiation support in such automated electronic markets will require the supply of condensed, meaningful and reliable information for decision making out of the so-called “living” data - data that is coming to the ‘negotiation table’ on a daily, hourly and even smaller time basis, from different data sources especially those available via the global network. In the context of the electronic markets “living” data can be split into two groups: negotiation subject data – data that is directly related to the subject of negotiation (e.g. attributes (and their change) of a deal, transaction records); and negotiation context data – data that is indirectly (in some cases, implicitly) related to the subject of negotiation (e.g. news, events, communication transcripts from virtual worlds, and other relevant data). The paper continues with background to the negotiation process, and the interplay of negotiation subject data and negotiation context data, considering the information discovery process. Further it presents an analysis of these two streams, the specifics of each one, and the architecture of a multi-agent negotiation system, which utilises the two sides of the coin.

NEGOTIATION AND “LIVING” DATA

Negotiation is the process whereby two (or more) individual agents with conflicting interests reach a mutually beneficial agreement on a set of issues. The term bargaining is often used in the literature to refer to negotiation between just two individuals. The theory and practice of negotiation has been studied for several years. Notable early contributions to the formal theory of bargaining include John Nash's bargaining solution (Econometrica (18), 1950), and the Rubinstein Alternating Offers Model (Osborne and Rubinstein, 1990). The formal theory of bargaining remains an active area of research in the game theory/microeconomic community (see ESRC Centre for Economic Learning and Social Evolution, http://else.econ.ucl.ac.uk/-about.shtml). A notable early contribution to the practice of negotiation is (Raiffa, 1982). The early work on the formal theory of bargaining describes the behaviour of rational individuals with well-defined preferences over all relevant outcomes of the bargaining process, when the individuals have access to various types of information. The practice of negotiation is also the subject of scientific scrutiny (Plott, 2002). More recently the multiagent community has extended this work on the theory and practice of negotiation to support interaction between rational autonomous software agents (Rosenschein and Zlotkin, 1998; Krauss, 2001).

The individuals involved in a negotiation operate in accordance with a set of rules called the negotiation mechanism. Negotiation mechanism specifies how the negotiation will take place, i.e. what each of the negotiating individuals may or should do as the negotiation proceeds, and when they should do it; when offers made are binding and what happens if such commitments are broken. The key components of negotiation include the players, issues, information, time, mechanism and links between the current and other negotiations. (Faratin, 2002) describes tactics for the manipulation of the utility of deals, trade-off mechanisms that manipulate the value rather than the overall utility of an offer, and manipulation mechanisms that add and remove issues from the negotiation set. Further research in electronic markets has produced negotiation mechanisms for those markets (Bichler, 2001). The open research issues identified by these researchers include multi-issue negotiation mechanisms, combinatorial negotiation mechanisms (that support simultaneous negotiation on a number of items) and mechanisms for the sequential sale of related items. In the past two years work in this area has expanded rapidly and taxonomies are being developed to classify the mechanisms (for example, see the “London Classification”, http://enegotiations.wu-wien.ac.at/).

The data sources in this paper include the vast amount of publicly available data sources on the Internet. In the context of mining “living” data the negotiation mechanism imposes time and resource constraints on the data mining system. In this research the algorithms that govern the data mining process, supporting negotiation, are becoming part of the negotiation mechanism.
Negotiation strategies and contextual information

Given a negotiation mechanism, an individual will develop a negotiation strategy that aims to ensure the negotiation proceeds in the individual's interests—whether an agreement is reached or not. Early negotiating agents in agent-mediated electronic commerce used several simplistic fixed strategies (Klusch, 2001). For example, the Kasbah agent in MIT Media Lab's virtual marketplace experiment (Maes et al., 1999) uses three predefined strategies, corresponding to linear ('anxious'), quadratic ('cool-headed') and exponential ('frugal') functions to generate proposals and/or counterproposals.

A negotiation strategy should generally rely on information drawn from the context of the negotiation. The significance of information to the negotiation process was analysed formally in the seminal paper by Milgrom and Weber (1982) in which the Linkage Principle, relating the revelation of contextual information to the price that a purchaser is prepared to pay, was introduced. Their analysis is limited to single-issue negotiation using conventional auction mechanisms. The information generated during the negotiation process should assist each player to gauge and accommodate the interests of their opponent (Benn et al., 1999). "Good negotiators, therefore, undertake integrated processes of knowledge acquisition that combine sources of knowledge obtained at and away from the negotiation table. "They learn in order to plan and plan in order to learn" (Watkins, 2002). During a negotiation, an agent may actively acquire such contextual information that it may, or may not, choose to place on the negotiation table. It includes information that can be extracted from: (i) the results of previous negotiations; (ii) the behaviour of the negotiating parties and; (iii) general sources.

Contextual information and data mining

The analysis of contextual information in support of the negotiation process includes the following data mining tasks.

Mining deal profiles information

Mining deals profile information is based on analysing historical data about deals struck or being struck. The data about the deal is mostly of a "case-based" type, i.e. the deal is described in terms of attribute-value pairs, with the possible presence of weights. The number of attributes, however, may vary across deals, leading to significant pre-processing times for the data from different deals to a common format. The potential problem with using historical data to predict future outcome of a deal is that using previous data to make assumptions about the future has the (high) risk of being wrong. For example, many of the assumptions about the behaviour of on-line buyers turned out to be incorrect.

Mining information about companies

Mining information about companies, whose products and/or services are on the negotiation table involves a large variety of data mining techniques. There are two main classes of data sources about companies on the Internet (and World Wide Web in particular) – on-line data bases (for example, see aussie.com.au) and company website(s). If nothing available, the overall strategy in mining information about companies may start with identifying some initial 'hooks' for the data mining algorithms –information that can be retrieved from the on-line database records. A first step information to start with can be the URL to the company Web site (as illustrated in Figure 2a) or the name (email address) of a contact person (as illustrated in Figure 2b). This stage to some extent is equivalent to the construction of an initial knowledge base, similar to the approach taken by (Ghani et al., 2000). Information about companies can be mined in a 'preventive' manner. For example, for those companies with URLs present in the on-line database, a data mining bot can visit different company websites and extract features that can be useful during negotiation. Simple features like 'links-to' and 'mentioned' can help in identifying relations between companies. Text mining and data mining techniques can be combined for discovering associations, propositional and relational rules. For example a useful association rule can state “companies in computer-software-and-services have
Pricewaterhouse Coopers (20.9%) or Ernst & Young (14.3%) as their auditor" (Ghani et al., 2000). In our case the names of the two companies (Pricewaterhouse Coopers and Ernst & Young) would become the input for text mining bots as illustrated in Figure 3. The retrieve-extract-mine approach is illustrated in Figure 4 with mining some components of company reputation based on the court cases in which a company was involved. Extraction of such components like the outcome of the court case can be performed at the level of combination of keywords spotting. Particular focus is analysing the information about other competitors and their relation with the party in consideration. On the other hand similar techniques are used for discovering unexpected information about the opponent from the competitors sources. Unexpected information in our case is defined as a piece of (contextual) information that is relevant to the negotiation process, but it is unknown to the agents, or contradicts their existing beliefs (expectations). This is a novel element in the negotiation systems. To find unexpected information about specific issue and from specific source the data mining system takes in account the existing knowledge possessed in the knowledge base on that issue.

**Figure 2.** Structured record, retrieved from an online data base of companies (aussie.com.au)

**Figure 3.** Discovering information about companies from Internet resources.
Mining opponent’s profile

Mining opponent’s profile aims at extracting patterns directly and indirectly related to the opponent. This can be specific information about how the opponent values the various issues considered in the negotiation, or more general information similar to what is extracted in the mining information about companies section.

Negotiation sequence mining

Negotiation sequence mining aims at extracting behaviour patterns of the negotiating parties - information that can be extracted from past and present behaviour of the negotiating parties. The approach considers the analysis of the sequence of actions on the ‘negotiation table’ for both parties. Depending on the nature of negotiation this can include actions like price changing, aggregating offers, changing negotiation subject, bringing context information on the table and other activities that parties perform during the negotiation. Such analysis allows forming a view on the opponent’s current negotiation strategy.

URL: http://www.austlii.edu.au/au/cases/cth/high_ct/

Search query: “Broken Hill Proprietary Court Cases”

Event discovery and impact tracking

News reports are a source of information about what’s happening in a society. News analysis allows spotting current ‘hot spots’ in the society. Information extracted from news feeds can provide measures for importance and impact of different events as the context in which negotiation is taking place. News can be modelled as diverse and continuously changing data streams, which, however, interact and influence each other. Some of the news can be market sensitive (for example, the news for the problems, faced by Ansett), when others are expected to have a relatively low impact on the market. Event detection (Franz, et al., 2001) is based on the notion of peak news topics (Montez-y-Gómez et al., 1999) – a topic with one-time short-term peak of frequency of occurrence. Such peak means a sharp rise of the importance of the event. Further, after that peak the event may very soon disappear from the news stream, or may appear in one or more consequent peak news topics. For instance, the Golden Jubilee of Queen Elizabeth became a frequent topic in Australian news and
disappeared after the celebrations were completed. Such peak topics usually influence other topics in the news streams. They can induce other topics to become in focus or vice versa – they can temporary 'delete' some topics from the news streams. As news are reflections of events, it is assumed that associations and causal relations of cross influence measured between topics in the news streams are used to infer possible associations in the real world. Algorithms for mining contextual information from news topics use probabilistic models of the news texts, where topics are represented as a graph of keywords and associations are calculated based on correlations between such graphs.

"Gossip" mining

As people and agents are the participants in negotiation, trust and reputation are other key elements of contextual information in negotiation, together with information about people types. Contextual information about the deal is being extracted also from the transcripts generated on virtual community discussion boards and chat rooms. Simple frequent keywords spotting techniques – keyword in context analysis, are used to identify more information about opponent's reputation, relation to other players, or to discover opportunities, which have not been discussed on the 'negotiation table'. Presented approach includes evaluation metrics and mechanisms for reputation rating and propagation of that rating; incorporating estimates from different sources and; selection rewards and penalties that affect individual trust estimates. These mechanisms employ data mining techniques similar to (Domingos and Richardson, 2001) for network evaluations of negotiating parties, for identifying possible influences and interactions.

'SMART DATA MINER' AS PART OF NEGOTIATION SUPPORT SYSTEM

The above-described components of the approach to discovering and supplying context information are being implemented as part of the overall architecture of a negotiation support system – the curious negotiator. The curious negotiator is designed to complement and complete the work in an existing project in electronic markets (funded for three years from 2002 by the Australian Research Council), which is investigating the evolutionary mechanisms in such markets (Debenham and Simoff, 2001). e-Markets focusing on business conducted in electronic exchanges. The set of actor classes that unify the existing project and the curious negotiator is based on (Wise and Morrison, 2000).

![Diagram of the curious negotiator](image_url)

*Figure 5. The initial design of the curious negotiator (includes Negotiation agent, Mediator, Observer and the Smart data miner). The avatars, used to denote software agents in the diagram, are adapted from MIT project “BodyChat” and Bonzi Buddy (www.bonzi.com).*
The curious negotiator is a multiagent system of competitive agents (Saunders 2001) supporting multi-attribute negotiation where the set of issues is not fixed (Gerding et al, 2000). The overall goal of this design to exploit the interplay between contextual information (Gomes and Jéhiel, 2001) and the development of offers in negotiation conducted in an electronic environment. The curious negotiator is a multiagent system containing three types of agents: negotiation, mediation and observer agents. Negotiation agents apply the negotiation strategies in the negotiation process (Krauss, 2001). The term negotiation strategies here is used in a rich sense; it includes strategies for developing the set of issues in an offer as well as identifying, requesting and evaluating contextual information including determining what information to table as the negotiation proceeds. The impartial mediation agents assist two or more negotiation agents. The role of observer agents is to observe and analyse what is happening on the ‘negotiation table’ and to look for opportunities particularly from failed negotiations. The initial design of a ‘curious negotiator’ includes two negotiation agents, one mediation agent and one observer agent, as illustrated in Figure 5 (above).

Managing context information discovery during negotiations

The curious negotiator is a general-purpose negotiation architecture designed for multi-issue negotiations; it proactively acquires and exploits contextual information in the negotiation process. Curious Negotiator deals with multi-issue negotiation with an open negotiation set using an alternative offers mechanism. After the process commences, each agent receives an offer, checks the set of issues in the offer for consistency, evaluates the offer and determines a response. All of this is done using the process knowledge and information that can be gleaned from the context and from the opponent. The construction of the response can reasonably be expected to be achieved within a certain time, and so the whole business of gathering information to determine the response is in general time constrained. This is illustrated in Figure 6.

An offer may contain apparent inconsistencies such as “the item has a full and unconditional warranty for twelve months” and “once the item has been supplied and delivered to the purchaser the vendor is not responsible for any subsequent transportation charges”. The determination of a consistent offer is concerned with the removal of such apparent inconsistencies. This is a complex problem even if the terms of the offer can be represented in Horn clause logic due to the amount of common and background knowledge required.

Figure 6. High-level view of guiding the information discovery process in an e-market
Addressing the time-constraints of the data mining process

To meet the time constraints the Smart Data Miner is designed as a multi-agent system itself. Rather than following the "classical" sequence (Han and Kamber, 2001), the data mining process in the Smart Data Miner is organised as a concurrent process supported by a number of specialised data mining agents as illustrated in Figure 7. There is a number of data pre-processing, mining, result presenting and visualising agents. The data exchange handles all the internal data and information extracted from this data, notifying the other agents of what is available in the format that they can process. Predefined source monitoring agents operate as data collectors, responsible for monitoring company web sites, bringing relevant text news and image data, retrieving data from stock markets and other signals. Pre-processing agents operate as specialised data filters and re-formatters. They convert signal data to particular format that a data mining agent can understand and pack it in a "ready-to-use" format, adding information about the format, size, time/date stamp and other service information. Each data mining agent implements particular machine learning algorithm (the idea is an analogy of the approach taken by (Witten and Frank, 2000) in the development of their class library). Such schema permits to realise combined and/or hierarchical data mining strategies, when the output produced by one data mining bot becomes an input to another data mining agent. In the example of a context mining shown in Figure 7, the initial data set, a Web page, supplied by the Web scanning bot, is pre-processed by the pre-processing agent in a structured form (particular format, understood by data mining agents). In this example, the new data set is clustered by a data mining agent that implements a back propagation neural network algorithm (NN miner in Figure 7), which produces a table of weights for each node. Such table is stored back in the data exchange with notification of its availability. The model can be used directly by a negotiation agent or can become an input of another data mining agent, in this case an Apriori miner (an association rule miner which implements a version of the Apriori algorithm (for more details about the different versions of the Apriori algorithm see (Han and Kamber, 2001)). Upon a request from a human agent a rule presentation agent displays distilled rules. In a similar manner, a bitmap visualising agent provides an output from the table of weights in a form comprehensible for the human agent. In this case, each node is displayed as a square in a colour determined by interpreting the node weights as RGB values; thus nodes with similar weights are displayed in similar colours.

Figure 7. Smart Data Miner architecture as part of the negotiation support system
In the context of providing negotiation support, such concurrent data mining system is capable of mining text data from news feeds as well as text and numerical data from financial reports and web pages. The Web scanners in this case are the so-called ‘information bots’, or information agents, that filter news and that watch on-line information for changes in it (for example, NewsHub, NewsTrawler, NewsGuard). The output of the bots, left in the data exchange, is preprocessed through finer filters and passed as an input to the data mining agents.

The Smart Data Miner integrates two different approaches in data mining – the data driven and the hypothesis-driven approach. In the data-driven approach the initial ‘kick start’ of the data mining process is not initiated by the negotiation agents. For example, a news header monitoring agent analyses the news header received from a Web site and stores the taxonomy that represents this news header in structured form, as illustrated in Figure 8. The data-driven approach does not require specific request and can be handled in a “pre-fetched” mode.

NY Times
Web site

HAVANA, May 4 - A top official has dismissed any chance for improved relations with the United States.

Figure 8. Combining data- and hypothesis-driven text mining process in the Smart Data Miner.

In hypothesis-driven approach, the negotiation agent provides a request to the Smart Data Miner for specific information, as illustrated in Figure 9. For example, this can be a set of keywords for news from Caribbean region or a change in the Board of Directors in a large multinational corporation. This request triggers a news text mining bot, to find the URL from the classified headers and to retrieve related article. Further such hypotheses can be either refined during the exploration, partially or completely reformulated or finally rejected.
CONCLUSION

The Smart Data Miner that supports the negotiation agent, is expected to operate under time-constraints and over dynamically changing corpus of information. In real world negotiations, the corpus of contextual information is dynamically changing. They will need to determine the sources of information, the confidence and validity of these sources and a way of combining extracted information (models). Some of the information can be pre-fetched, before actual negotiation. All transactions, including complex requests for information and combination of results, are managed as business processes. There are a number of challenges that the Smart Data Miner architecture is addressing, including critical pieces of information being held in different repositories; non-standard nomenclatures; radically different data types and models; possible duplicative, inconsistent and erroneous data; and possible high rate of change of the models representing data content. The mining and discovery procedures include: (i) mining the opponent’s profile information (this is a broad group of methodologies in which adapt and further develop: user-centric and site-centric data mining methods, methods for mining social networks in electronic communities for information about opponents reputation, text data mining methods, including discovering unexpected information about the opponent from competitors sources, methods for topic detection in communication transcripts); (ii) mining deal profiles information — these methods analyse the preconditions of negotiations, and the dynamics of change in negotiation issues; (iii) event sequence mining — will extract behaviour patterns of negotiating parties from the ‘utterances’, sequences of key events that can change negotiation (based on past experiences and current situation on the ‘negotiation table’). These information seeking procedures can reveal unexpected information, that is, a piece of (contextual) information that is relevant to the negotiation process, but is unknown to the agents, or contradicts their existing beliefs (expectations). The complete integration of contextual support into the negotiation process is a novel addition to negotiation systems. To find unexpected information about specific issue and from specific source the data mining system will take in account the existing knowledge (beliefs) that the negotiation agent posses on that issue and will try to challenge that knowledge.
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with the 6th International Conference on Knowledge Discovery and Data Mining (KDD-2000), Boston, pp 29-36.


ABSTRACT

The supply chain process of procurement is now getting the "e" treatment. Many companies are looking at e-procurement to increase efficiencies and decrease the bottom line. Eprocurement is evolving as one of the shining lights in the evolving e-business story and this paper will look at a research survey of Australian organisations to determine what is driving and hindering e-procurement. A model of e-procurement drivers and barriers are presented with an analysis of the views of 38 organisations. The main outcomes of the survey show that cost based factors are driving eprocurement whilst technology issues are the main barriers to e-procurement.

Key Words: Procurement, Survey Research, B2B, Supply Chain Management

INTRODUCTION

The trend towards globalisation and increased competitiveness across markets has meant that many businesses are looking at solutions to increase efficiency. Businesses have previously focussed on workforce levels and streamlined internal operations to achieve efficiencies. Increasingly businesses are now looking at the supply chain and more specifically procurement to provide additional efficiencies. Globally, businesses spend over $20 trillion (Aberdeen, 2001) on procurement and any reduction will have a significant affect on their bottom line. Strategically a superior supply chain (Cooper et al, 1997) will increase a business's responsiveness and competitive advantage. There has been a plethora of hype associated with the potential of business to business transactions over the internet and there is a promise that e-procurement will play a role in the realisation of these benefits. But very little research has been conducted on the role e-procurement plays in the Australian marketplace. This paper examines the procurement process from a business perspective and identifies the drivers and barriers in the adoption of e-procurement in the Australian marketplace.

B2B e-Commerce

Business to business (B2B) is the term used to describe a range of procurement functions that incorporate internet technology (Diba, 2000). Many research organisations predict massive growth in the B2B market. Bowles (2002) sees the global B2B market growing to US$968 million in 2002 and then US$1551 million in 2004 but these figures pale into insignificance when considering other market analysts predictions; Gartner: $US2.9trillion by 2003 AMR: $US5.7trillion by 2004, Forrester: $US7.29trillion by 2004(Regan 2001, Hersch, 2000). Whilst these predictions should be accepted with caution there does seem to be a major change in how procurement is being conducted in organisations. B2B promises (McGarvey, 2000) to drive costs down and streamline procurement operations.
Metcalfe et al (2001) predicted that European companies could achieve a 50% productivity increase through internet enabled B2B processes by 2010. The B2B business model falls under the broad category of electronic commerce. The term “electronic commerce” has evolved as innovative applications of the internet and similar technologies are applied to existing business functions. The Office for the Government Online (OGO, 1999) defines electronic commerce as:

“any electronic communication that facilitates the exchange of goods, services or other assets between suppliers and buyers.” (OGO, 1999)

The supply chain and supply chain management has become the focus for software vendors developing large software suites that span entire organisations. Definitions of supply chain management are varied and can be based on the process, management philosophy or management process (Tyndall et al, 1990). Mentzer et al (2001) defines the supply chain as:

“a set of three or more entities directly involved in the upstream and downstream flows of products, services, finances and or information from a source to a customer.” (Mentzer et al, 2001)

Just as the supply chain definition can have different focuses so can the extent of the supply chain. It has now evolved from the original “direct supply chain” to the “extended supply chain” and then to the “ultimate supply chain”. These evolutions provide organisations with greater potential to utilise their supply chains for strategic purposes but at the same time provide increased complexity (Cooper et al, 1997). In developing a supply chain model Mentzer et al (2001) includes purchasing, logistics and procurement as inherent supply chain processes and goes further by extolling the advantages of superior supply chains being cost control, improved customer value and competitive advantage.

e-Procurement

Companies have been selling products and services to each other as long as recorded history. For most large manufacturing companies the purchasing of materials and services can represent 55 to 75 percent of the cost of goods sold (Monczka et al, 1998). Due to the increasing expenditure on external goods and services, companies are now focussing on the supply chain and more specifically procurement to increase efficiency and reduce costs (Aberdeen, 2001). The internet has been viewed as an avenue whereby many of these efficiencies can be achieved. The use of electronic communication in this definition could include phone, fax, EDI and the internet. This broad definition is further refined when defining e-procurement.

“the use of electronic technologies to streamline and enable the procurement activities of an organisation.” (OGO, 1999)

Just as electronic commerce is evolving the business activities that are classified as part of the e-Procurement process are also evolving. It can include activities such as: advertising tenders; electronic submission of tenders; electronic ordering; internet sourcing via third parties; electronic mail between buyers & sellers; electronic mail in contract management; research into supplier markets and integration of procurement within the financial and inventory systems. Information systems that support e-procurement can be classified into four major segments; buy-side applications, sell-side applications, e-marketplace applications and content applications (IDC, 2001a). But as software vendors struggle to position themselves for a share of the e-procurement application market a range of new functionality and terms to describe their solutions are appearing (Konicki, 2002). The major vendors in the e-procurement market include the leading ERP vendors (SAP, Oracle, Peoplesoft) and a number of specialist procurement vendors (Ariba, Commerce One, i2). The Australian market is expected to grow to $99 million in 2005 (IDC, 2001b).
**e-Procurement Drivers & Barriers Model**

An Aberdeen report (Aberdeen, 2001) divides procurement and e-Procurement technologies into three categories:

- **Indirect Procurement**: This includes the procurement of non-production goods and services such as office supplies, printing, advertising and casual labour.
- **Direct procurement**: This includes the procurement of raw materials, parts and assemblies used Supply chain (i.e. organisation & management of raw materials, parts and assemblies).
- **Sourcing** (i.e. identification, evaluation, negotiation of products and supplies for both the indirect and direct supply chain).

There is a plethora of literature espousing the benefits of an e-procurement solution (Aberdeen, 2001; NOIE, 2001; NOIE, 2000a; NOIE, 2001b; IDC, 2001a; Konicki 2001).

A review of literature revealed a number of success factors related to an e-procurement solution implementation rather than e-procurement in general. These are summarised below (Table 1).

*Table 1. e-Procurement Success Factors*

<table>
<thead>
<tr>
<th>Factor</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understand your procurement profile</td>
<td>Office for Government Online, 1999; Aberdeen, 2001</td>
</tr>
<tr>
<td>Know what you spend</td>
<td></td>
</tr>
<tr>
<td>Build a strong business case</td>
<td>Office for Government Online, 1999; NOIE, 2001; Aberdeen, 2001; Gap Gemini, 2000</td>
</tr>
<tr>
<td>Technology is not a strategy</td>
<td></td>
</tr>
<tr>
<td>Adopt widely accepted Internet standards</td>
<td>Office for Government Online, 1999; NOIE, 2001</td>
</tr>
<tr>
<td>Complement and leverage supply chain</td>
<td>Office for Government Online, 1999; Aberdeen, 2001</td>
</tr>
<tr>
<td>Supplier Participation</td>
<td></td>
</tr>
<tr>
<td>Tight integration with FMIS</td>
<td>Office for Government Online, 1999; Gap Gemini, 2000</td>
</tr>
<tr>
<td>Systems and applications integration</td>
<td></td>
</tr>
<tr>
<td>Adopt modular approach to build success</td>
<td>Office for Government Online, 1999; Aberdeen, 2001</td>
</tr>
<tr>
<td>Start with low hanging fruit</td>
<td></td>
</tr>
<tr>
<td>Re-engineer poor business processes</td>
<td>Office for Government Online, 1999; Aberdeen, 2001</td>
</tr>
<tr>
<td>Begin by Benchmarking</td>
<td></td>
</tr>
<tr>
<td>Drive from Top</td>
<td>Aberdeen, 2001; Gap Gemini, 2000</td>
</tr>
<tr>
<td>Executive-level sponsorhip</td>
<td></td>
</tr>
<tr>
<td>Supplier buy in</td>
<td>(Gap Gemini, 2000)</td>
</tr>
<tr>
<td>Have a plan</td>
<td>(Aberdeen, 2001)</td>
</tr>
<tr>
<td>Have a champion</td>
<td>(Aberdeen, 2001)</td>
</tr>
<tr>
<td>Support from trenches</td>
<td>(Aberdeen, 2001)</td>
</tr>
<tr>
<td>Measure for continuous improvement</td>
<td>(Aberdeen, 2001)</td>
</tr>
</tbody>
</table>

These benefits would be identified as drivers for any implemented solution. They include:

- Price reduction
- Improved contract compliance
- Shortened Proc cycle times
- Reduced administration costs
- Enhanced inventory management
- Improved visibility of customer demand
- Improved visibility of supply chain capacity
- Reduced op & inventory costs
- Shortened proc cycle times
- Negotiated unit cost reduction
- Increased accuracy of production capacity
- Enhanced decision making
- Improved market intelligence

A recent survey (TomorrowFirst, 2000) of fifty of the leading United Kingdom companies identified benefits of e-procurement as; better resource usage, adding value through leveraging, eliminating uncontrolled buying. The majority of the respondent companies (76%) believed that the implementation of an e-procurement solution was critical to the success of their business in the future. Governments around the world have also recognised the potential benefits of an e-procurement solution. In Australia both the federal and state governments have established web sites to facilitate e-procurement (OGO, 2001; PRC, 2001; NSW, 2000). These sites include strategy documents, resources, research, links and tools related to e-procurement.

Whilst drivers provide a measure for success it is important to consider the possible barriers companies may experience when adopting an e-procurement solution. A summary of these barriers as identified in the literature appear below (Table 2.):

<table>
<thead>
<tr>
<th>Factor</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of Supplier e-procurement solution</td>
<td>PWC, 2002; Gebauer et al, 1998; Boston Consulting, 2002</td>
</tr>
<tr>
<td>High cost of technology</td>
<td>PWC, 2002</td>
</tr>
<tr>
<td>Lack of legal framework</td>
<td>PWC, 2002</td>
</tr>
<tr>
<td>Lack of technical expertise</td>
<td>PWC, 2002</td>
</tr>
<tr>
<td>Lack of e-Procurement knowledge</td>
<td>PWC, 2002; Gebauer et al, 1998; Boston Consulting, 2002</td>
</tr>
<tr>
<td>No real business benefit identified</td>
<td>PWC, 2002; 1998; Boston Consulting, 2002</td>
</tr>
<tr>
<td>Data exchange standards lacking</td>
<td>PWC, 2002</td>
</tr>
<tr>
<td>Lack of bus relationships with suppliers</td>
<td>PWC, 2002</td>
</tr>
</tbody>
</table>

The identified drivers and barriers focus on different aspects of the procurement process. They can be classified as having a; Cost focus (C), Strategic focus (S), Supplier Relationship focus (R), Internal Organisational focus (I), Technological focus (T), Enhanced internal company efficiency focus (E), or External focus (Ex). A summary of the drivers and barriers derived from the literature and their corresponding focus appears below (Table 3.).
Table 3: Drivers and Benefits e-Procurement Model

<table>
<thead>
<tr>
<th>Driver</th>
<th>Barrier</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Price Reduction</td>
<td>C</td>
<td>T</td>
</tr>
<tr>
<td>Negotiated Unit Cost reduction</td>
<td>C</td>
<td>T</td>
</tr>
<tr>
<td>Improved Visibility of Cust Demand</td>
<td>S</td>
<td>T</td>
</tr>
<tr>
<td>Reduced Administration Costs</td>
<td>C</td>
<td>T</td>
</tr>
<tr>
<td>Improved Market Intelligence</td>
<td>S</td>
<td>C</td>
</tr>
<tr>
<td>Reduced Operat'l &amp; Inventory Costs</td>
<td>C</td>
<td>I</td>
</tr>
<tr>
<td>Enhanced Decision making</td>
<td>S</td>
<td>I</td>
</tr>
<tr>
<td>Improved Contract Compliance</td>
<td>R</td>
<td>Ex</td>
</tr>
<tr>
<td>Shortened Procurement Cycle Times</td>
<td>I</td>
<td>T</td>
</tr>
<tr>
<td>Improved Visibility of Supply Chain</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>Increased Accuracy of Prod Capacity</td>
<td>E</td>
<td>I</td>
</tr>
<tr>
<td>Enhanced Inventory Management</td>
<td>E</td>
<td>I</td>
</tr>
</tbody>
</table>

Inadequate Technological Infrastructure
Lack of Skilled Personnel
Inadequate Tech Infrastructure of partners
Lack of Integration with Business Partners
Implementation Costs
Company Culture
Inadequate Bus Processes to support e-Proc
Regulatory and Legal Controls
Security
Co-operation of Business Partners
Inadequate e-procurement Solutions
Upper Management Support

Taking the drivers and barriers from the literature we classified them according to their primary focus and then used them in the development of the model depicted in Figure 1. Cost is the primary focus of drivers whilst technology is the main focus of barriers. From Table 2 and Figure 1 a master list of drivers and barriers was developed and used in the survey research.
METHODOLOGY

The primary objective of the study was to survey a range of information systems professionals and seek responses to issues including the importance of drivers and barriers to the adoption of e-Procurement practices. The first part of the study as presented in this paper provides an analysis of the views of 38 IS professionals. The best method for gathering data was determined to be a survey of those information systems professionals listed as working within a cross-section of the Australian marketplace. A leading Australian ERP vendor user group provided their member contact database. This database provided contact details of 166 information systems professionals that have worked on large information systems from 1995. The initial survey instrument was developed based on the fields that were identified in the literature and used email and Web based survey as the delivery platform. Several studies (Stanton, 2001; Dillman, 1998; Comley, 1996; Mehta, 1995) have compared email and Web based survey methods versus mail information collection methods and have proposed that email and Web surveys compared favourably with postal methods in the areas of cost, speed, quality and response rate. The use of an email directing the respondent to a web site was used with the initial web direction being sent to the user group members. It was necessary to preen the email address book to remove and amend email that had bounced back.

RESULTS

Survey Instrument

The survey instrument had 30 questions covering three areas, demographics, e-procurement practices and e-procurement drivers and barriers. Both open and closed questions were used along with Yes/No and five point Likert scale responses. The drivers and barriers were formulated from the literature (Table 3.) and used a Likert rating for importance to the adoption of e-procurement. Open-ended questions also sought responses from the sample allowing for qualitative data to be collected. The original email listing contained 165 potential respondents representing many of Australia's major companies. A number of emails were undeliverable due to members of the sample moving positions, having incorrect email addresses, having changed email addresses or automatic out-of-office responses. There were 2 unusable replies leaving a total of 38 usable responses. The overall response rate once removing the undeliverable addresses was 21%. The response rate is presented in Table 4.

<table>
<thead>
<tr>
<th>Issue</th>
<th>Number</th>
<th>Undeliverable</th>
<th>Answered</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>First email prompt</td>
<td>166</td>
<td>5</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Second email prompt</td>
<td>161</td>
<td>1</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>40(2 unusable)</td>
<td></td>
<td>38/158=21%</td>
<td></td>
</tr>
</tbody>
</table>

Demographics

To gain an understanding of the demographics of the sample the respondents were asked to identify their position within the company, the industry sector, and the organisational size as indicated by company revenue. It was important to assess the level of procurement expenditure and respondents were asked to estimate this amount. A summary of these findings appears in Table 5 and Table 6. The respondents were predominantly high in their organisational structure being either an IS or business manager. The company respondents reflected a broad range of industry categories in the Australian marketplace. Manufacturing, Public Service and Utilities were well represented. Company revenue
indicated that respondents ranged from very large companies to small to medium enterprises (SME). The majority of the sample could be classified as SME. A criteria used by the Australian Government to define SME’s in relation to procurement, are companies with annual revenue of less than $250 million. In terms of the level of procurement expenditure, companies in the sample tend to be those with large procurement expenditure. The largest procurement expenditure was predominantly in the Mining, Oil and Gas industry sector while the smallest was a Public Sector organisation. A significant number of companies (No. 9, 24%) did not respond to this question.

Table 5. Demographic Breakdown of Sample (N=38)

<table>
<thead>
<tr>
<th>Position of Respondent</th>
<th>%</th>
<th>Industry Sector</th>
<th>%</th>
<th>Company Revenue ($AUDmillions)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIO</td>
<td>18</td>
<td>Manufacturing</td>
<td>26</td>
<td>Large(&gt;1000)</td>
<td>35</td>
</tr>
<tr>
<td>IS Manager</td>
<td>36</td>
<td>Public Service</td>
<td>22</td>
<td>Large-Med(750-1000)</td>
<td>13</td>
</tr>
<tr>
<td>Support &amp; Services Manager</td>
<td>16</td>
<td>Utility</td>
<td>18</td>
<td>Med-Large(500-749)</td>
<td>16</td>
</tr>
<tr>
<td>Procurement Manager</td>
<td>16</td>
<td>Mining Oil &amp; Gas</td>
<td>10</td>
<td>Medium(250-499)</td>
<td>18</td>
</tr>
<tr>
<td>Business Manager</td>
<td>14</td>
<td>Chemicals</td>
<td>10</td>
<td>Small(&lt;250)</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Education</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Health Services</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>Total</td>
<td>100</td>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 6: Procurement Spend of Respondents (N=38)

<table>
<thead>
<tr>
<th>Procurement Expenditure ($AUDmillions)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large(&gt;1000)</td>
<td>8</td>
</tr>
<tr>
<td>Large-Med(101-1000)</td>
<td>36</td>
</tr>
<tr>
<td>Med-Large(11-100)</td>
<td>25</td>
</tr>
<tr>
<td>Medium(1-10)</td>
<td>7</td>
</tr>
<tr>
<td>Small(&lt;1)</td>
<td>4</td>
</tr>
<tr>
<td>Not answered</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

**DRIVERS**

Respondents were supplied with a list of e-procurement drivers and were asked to identify the 5 most important and then rank them. (5 – most important, 1- least important). A summary of the results is displayed in Table 7.
Table 7: e-Procurement Drivers

<table>
<thead>
<tr>
<th>e-Procurement Drivers</th>
<th>Focus</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price Reduction</td>
<td>C</td>
<td>3.70</td>
<td>1.3</td>
</tr>
<tr>
<td>Negotiated Unit Cost reduction</td>
<td>C</td>
<td>3.32</td>
<td>1.5</td>
</tr>
<tr>
<td>Improved Visibility of Customer Demand</td>
<td>S</td>
<td>3.22</td>
<td>1.5</td>
</tr>
<tr>
<td>Reduced Administration Costs</td>
<td>C</td>
<td>3.21</td>
<td>1.5</td>
</tr>
<tr>
<td>Improved Market Intelligence</td>
<td>S</td>
<td>3.17</td>
<td>1.7</td>
</tr>
<tr>
<td>Reduced Operational &amp; Inventory Costs</td>
<td>C</td>
<td>2.87</td>
<td>1.1</td>
</tr>
<tr>
<td>Enhanced Decision making</td>
<td>S</td>
<td>2.75</td>
<td>1.1</td>
</tr>
<tr>
<td>Improved Contract Compliance</td>
<td>R</td>
<td>2.72</td>
<td>1.3</td>
</tr>
<tr>
<td>Shortened Procurement Cycle Times</td>
<td>I</td>
<td>2.71</td>
<td>1.3</td>
</tr>
<tr>
<td>Improved Visibility of Supply Chain Management</td>
<td>R</td>
<td>2.70</td>
<td>1.4</td>
</tr>
<tr>
<td>Increased Accuracy of Production Capacity</td>
<td>E</td>
<td>2.63</td>
<td>1.3</td>
</tr>
<tr>
<td>Enhanced Inventory Management</td>
<td>E</td>
<td>2.30</td>
<td>1.3</td>
</tr>
</tbody>
</table>

The drivers that are scored highly include Price reduction (3.70), Unit Cost (3.32), Customer Demand (3.22), Administration Costs (3.21) and Market Intelligence (3.17). All standard deviations are about 1.5 Likert points and show a consistency in the results. Respondents had the opportunity to identify other e-procurement drivers that they considered important. Identified were; enhanced service delivery, leveraging the business group, reduce “maverick” purchases, and better management information reports. The results indicated that the main e-procurement drivers were cost related and were tactical in nature. This is possibly due to the maturity of the e-procurement solutions within the respondent companies. Companies in the early stages of e-procurement would tend to identify drivers that were cost related, as they are easier to measure and quicker to realise.

More strategic drivers such as improved visibility of customer demand, market intelligence and enhanced decision making even though they were rated highly are more difficult to quantify. The drivers that were ranked the lowest were closely related to the supply chain. This would be expected as analysts predict that some of the major benefits with e-procurement would be attained in relation to indirect procurement. All drivers were ranked by at least one company as being most important.

**BARRIERS**

Respondents were supplied with a list of e-procurement barriers and were asked to identify the 5 most important and then rank them. (5 – most important, 1- least important). A summary of the results is displayed in Table 8.
Table 8: e-Procurement Barriers

<table>
<thead>
<tr>
<th>e-Procurement Barriers</th>
<th>Focus</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate Technological Infrastructure</td>
<td>T</td>
<td>3.3</td>
<td>1.4</td>
</tr>
<tr>
<td>Lack of Skilled Personnel</td>
<td>T</td>
<td>3.2</td>
<td>1.4</td>
</tr>
<tr>
<td>Inadequate Tech Infrastructure of Business partners</td>
<td>T</td>
<td>3.2</td>
<td>1.5</td>
</tr>
<tr>
<td>Lack of Integration with Business Partners</td>
<td>T</td>
<td>3.2</td>
<td>1.1</td>
</tr>
<tr>
<td>Implementation Costs</td>
<td>C</td>
<td>3.1</td>
<td>1.5</td>
</tr>
<tr>
<td>Company Culture</td>
<td>I</td>
<td>3.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Inadequate Business Processes to support e-Proc't</td>
<td>I</td>
<td>2.9</td>
<td>1.5</td>
</tr>
<tr>
<td>Regulatory and Legal Controls</td>
<td>Ex</td>
<td>2.8</td>
<td>2.0</td>
</tr>
<tr>
<td>Security</td>
<td>T</td>
<td>2.8</td>
<td>1.3</td>
</tr>
<tr>
<td>Co-operation of Business Partners</td>
<td>R</td>
<td>2.8</td>
<td>1.1</td>
</tr>
<tr>
<td>Inadequate e-procurement Solutions</td>
<td>I</td>
<td>2.7</td>
<td>1.6</td>
</tr>
<tr>
<td>Upper Management Support</td>
<td>I</td>
<td>2.3</td>
<td>1.2</td>
</tr>
</tbody>
</table>

The top four barriers are Technological Infrastructure (3.3), Skilled Personnel (3.2), Partner Infrastructure (3.2), Implementation costs (3.2) and Culture (3.0). The standard deviation for the barriers varies from one to two likert points. The means of the top barriers seem to indicate that the complex technological issues both within and between organisations in the procurement process are crucial. The ratings of cost issues, upper management support and inadequate e-procurement solutions would indicate that companies are willing to pursue e-procurement solutions but are hindered by external factors, business partners and lack of skilled personnel. However this may also be an indication of the e-procurement maturity of the sample. It would have been valuable to correlate the level of e-procurement in each company against the identified barriers. Do the barriers gain or lessen in importance depending on the maturity of the e-procurement solution implementation? Companies who at the stage investigating e-procurement solutions would tend place greater emphasis on technological issues rather than the “soft” barriers as company culture, business processes, and cooperation of business partners. This is an area for further research.

DISCUSSION

As the respondents were members of the leading Australian ERP software user group and that this ERP vendor has a presence in 45% of the leading IT users in Australia (BRW, 2000) it is reasonable to assume that the companies sampled represented some of Australia’s leading companies. These companies were members of a leading ERP system user group and therefore by implication had made major organisational and financial commitments to the implementation of information systems to support their business processes. Whilst the current state of play shows that internal and external technological integration problems are hindering e-procurement it would be expected that the development of ERP based solutions could overcome many of the technological and integration barriers associated with e-procurement. It would be desirable to further ascertain issues that would move organisations forward in their adoption of e-procurement. It would also be interesting to see if there are differences between indirect and direct practices. There seems to be an interesting contradiction in the results where the particular ERP system used by the sample incorporates functionality to support e-procurement yet the sample is showing strong barriers existing to e-procurement. One possible explanation lies in the nature of many B2B e-commerce applications. Organisations must have strong existing processes in-place that can be ported to B2B solutions, also...
B2B by its nature involves solutions that extend beyond organisational boundaries. Put simply, it is not enough to have e-procurement functionality yourself; your trading partner must also be able to support e-procurement. This extended solution is showing in many of the barriers. There are identifiable and quantifiable benefits to support the introduction of an e-procurement solution. One of the major barriers is the lack of skilled personnel. Research indicates that the majority of “e-projects” are retarded due to this lack of skills (Stuart, 1999). But again as mentioned previously the strength of the identified barriers and drivers could be dependent on the maturity of the companies in regard to their e-procurement solution. Future research should attempt to categorise the e-procurement maturity of the respondents in an attempt to identify if there is a transitional nature to drivers and barriers. Further analysis should also occur with barriers and drivers being cross-tabulated by industry sector, company size and procurement expenditure.

CONCLUSION

The research identified a number of barriers and drivers for e-procurement and then assessed the strength of these factors in the Australian marketplace. Cost based issues are driving many of the respondent organisations into e-procurement with a myriad of technological issues providing barriers to e-procurement adoption. This study was the first stage of a wider research study on e-procurement in the Australian marketplace. Several additional study areas emerged including the extent that drivers and barriers change of the life cycle of the e-procurement solution and the extent that e-marketplaces will impact upon direct and indirect procurement. The emergence of Supplier Relationship Management (SRM) and associated systems should also be studied within an Australian context to see if trends from overseas are effecting Australian organisations.

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The Problems in IT Supply Contracts – Some Suggested Strategies

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ABSTRACT

The purpose of this paper is to consider, in the light of a recent Supreme Court decision in RACV v UNISYS, the legal risks inherent in IT supply contracts and to suggest strategies aimed at minimising or reducing such risks.

INTRODUCTION

The provision, development and implementation of IT systems has inherent risks. The risks include cost overruns, delayed delivery, non performance, failure to meet expectations, business disruptions and legal wranglings to name a few. There is little significant case law in this area and the dearth of case law does not necessarily reflect an absence of problems or disputes, rather it signifies the practical and economic risks in pursuing rights within the legal system. Because court cases are extremely expensive and demanding on time and resources, inevitably commercially confidential settlements are reached. There is a real need for the suppliers of IT and their customers to control and manage the attendant risks. The purpose of this paper is to consider some of the risks associated with IT supply contracts, to examine (in light of a recent Supreme Court case) some of the relevant legal issues in IT supply contracts and to suggest solutions or provide guidance in practically managing the risks that come with IT supply contracts.

THE RACV CASE

The issues confronted by this paper are perhaps best undertaken by first looking at a court resolved dispute in the area of IT supply contracts. The case of RACV Insurance Pty Ltd and Anor v Unisys Australia Ltd was recently decided (2001) by a judgement of Hansen J in the Supreme Court of Victoria. The case is long and complex but for the purposes of this paper the case will be considered in brief overview. To give readers an idea of the length and complexity of the RACV case, the case took more than 6 years to complete, it took more than a month in court time, the court book (of evidence, disclosed documents, interrogatories, discoveries and law considered) spanned nearly 19,000 pages, the court transcript spanned more than 3000 pages and the delivery of the final judgement amounted to nearly 150 pages – is there any wonder why there is a dearth of case law in this area and that settlements are frequently reached?
THE ESSENTIAL FACTS OF THE RACV CASE

In 1993 RACV decided to move much of its insurance handling procedures into electronic format. It called, in writing, for proposals that would provide online access by its customers within specified time frames. The time frames varied between 2 and 20 seconds depending on the nature of the access.

A number of IT suppliers responded to the call. Ultimately Unisys became the successful supplier and a contract to design, supply and install a work flow management system based on the imaging of documents was entered into and the parties signed what was essentially a ‘standard form’ Unisys contract at the end of 1994. The contract did not contain any reference to the specified time frames mentioned in the call for proposals.

The system created by Unisys was ready in March 1995 but, despite the fact that RACV accepted the trial testing, it had major performance and functionality problems when it was finally integrated. The problems were severe enough to warrant a redesign by Unisys of the system and a return by RACV to its paper based system.

In 1996 the revamped system was again tested but it did not conform to the time frames required by RACV as indicated at the time of the original call for proposals. The revamped system was not capable of attaining the required time frames. Further; the revamped system did not meet storage requirements alleged to be critical for the quick retrieval of document images.

A dispute ensued that could not be resolved by the contracting parties. RACV brought the contract to an end and, in December 1996, sued Unisys claiming a breach of section 52 of the Trade Practices Act (C'th) 1972. Claims based on breach of contract and negligent statement were also pleaded, but as events transpired, never activated.

Unisys argued that it had honoured the written contract by meeting the required functionality specification and those functionality specifications did not require or compel the adherence to time performance criteria.

Section 52 of the Trade Practices Act provides that a corporation shall not, in trade or commerce, engage in conduct that is misleading or deceptive or likely to mislead or deceive. RACV essentially took the line that in its call for proposals it had clearly indicated the required time frames and that, both in the negotiations leading to the contract and after the contract was signed, Unisys had represented that its proposed system would meet the required specifications in circumstances where it (Unisys) knew or should have known that it was not capable of meeting those required specifications.

The misleading conduct claim revolved around alleged representations made by Unisys in its initial response to the call by RACV for proposals, in subsequent correspondence and conversations between the parties and in system demonstrations and brochure information.

As previously mentioned, RACV’s time performance requirements became pivotal to the resolution of the case. In response to RACV’s claim, Unisys argued that its initial written proposal (July 1993) (which was prepared in response to RACV’s calls for proposals) excluded any commitment to response times and that, given the exclusion, the parties proceeded to enter the contract and deal with each other on that basis. The court rejected the argument by Unisys because, looking at the documentation, the exclusion was found in the section concerning problem response times post implementation of the system and not in the section concerning online user response time requirements.

The court found in favour of RACV. It found that the representations had in fact been made by Unisys in circumstances where Unisys had no reasonable grounds to make such representations and that RACV had relied upon those representations to its detriment and that RACV would not have entered into the contract had the representations not been made.
The action by RACV was claiming damages from Unisys. Under the Trade Practices Act the purpose of damages is to put (as far as that is possible) the aggrieved party back into a position as if the contravention had not taken place. Whilst the Unisys 'standard form contract' contained a provision 'capping' a damages payment to a specified maximum limit, such a provision may be effective in a breach of contract or negligence based claim but generally will be not effective in a claim based upon the provisions of the Trade Practices Act.

Having decided the case in favour of RACV the Victorian Supreme Court ordered Unisys to pay RACV damages in the amount of approximately $4.5 million plus associated legal and court costs.

SOME LEGAL CONSIDERATIONS

Having provided an overview of the RACV case and before moving to a discussion of how customers and suppliers involved in IT supply contracts can more effectively manage the risks surrounding such contracts, mention must be made to some pertinent legal issues. It is suggested that a basic knowledge of contract law fundamentals will reduce the risks attendant in IT supply contracts.

It is not possible within the ambit of this paper to cover all legal issues and as a consequence the issues canvassed will be those of contractual terms, exclusion and indemnity clauses together with the so called 'consumer' provisions of the Trade Practices Act.

CONTRACTUAL TERMS

When you consider the RACV case, the problems raised within the case largely stemmed from the fact that the precontractual representations made by Unisys did not form part of the final written contract. As a result disagreements ensued as to the fundamental terms of the agreement that was entered into. Were there precontractual promises and, if so, were they part of the contract? On the face of it, the problem is easily solved by the parties ensuring that the representations are added to and become part of the contractual terms. The difficulty facing the customer is to clearly identify what achievable promises or representations are required or have been made that are to be included as contractual terms. Representations may well cover things as diverse as compatibility and interoperability, performance, maintenance and the exercise of reasonable care. It should not be forgotten that representations are not a one way street and similar principles apply to protect the supplier. The supplier, armed with details as to the nature of the request or requirements of the customer, should ensure that the contractual terms match what is promised, that the terms are achievable and that a term in favour of the customer can only be actioned by the customer if the supplied IT has been properly used as instructed.

If the precontractual promises and agreements are put in place, as suggested, then the contract should provide an appropriate mechanism for action in the event of default. Given the time, effort, risk and cost involved in court proceedings, recourse to the courts should not be the first port of call. A term could be included in the contract providing for certain agreed steps to be taken in the event of an alleged default. An example would be a clause that required a customer to provide written or email notice to the supplier of the nature of an alleged default with opportunity being provided to the supplier to remedy the default within a reasonable time. Only in the event of the non remedying of the default would a party be able to resort to other action.

Again, that other action need not necessarily be court action. Provisions could be included in the contract allowing for the independent mediation, negotiation, or commercial arbitration of the dispute. There are many bodies that now provide such services. If such a provision is to be included it must be clear in terms of what is to be done, how the costs and expenses of the claim are to be met (in what proportions), where the dispute is to be sent, the time frame for resolution, and whether or not the umpire makes a final determination.
EXCLUSION CLAUSES (LIMITATION OF LIABILITY CLAUSES) AND THE TPA

It is not uncommon for IT suppliers to include in the contract a term that purports to limit, cap or even exclude liability in the event of some default such as breach of a contract term or negligence. The problem for the customer is that by signing a contract with the exclusion clause in it, the customer is (at least in theory) agreeing to the terms and conditions in the exclusion clause.

Given that the purposes of these clauses is to deny a right or rights to customers that they would otherwise have, it comes as no surprise that the Courts, no doubt for public policy reasons, have not looked altogether kindly upon such clauses. If the clause is to be effective it must be clear and the breach or default that is alleged must be covered by the wording of the clause itself. If the wording of the clause is capable of more than one meaning or if an ambiguity is present, the clause will be interpreted in favour of the customer.

Further, even if there is only one meaning and there is absolute clarity, the courts still will be unlikely to enforce an exclusion clause if it attempts to defeat the whole purpose of the contract. An example would be a clause that states that a supplier has no liability or responsibility if the goods or services delivered are completely different in nature to the contracted goods or services or if there is a complete non performance by the supplier.

A customer, aware of the existence of the exclusion clause, should consider the deletion or amendment of the clause and be aware that the mere existence of the clause may arm the consumer with greater bargaining power.

One final point must be noted in this area. Under the Trade Practices Act certain promises, by law, are deemed to form part of ‘consumer’ contracts for the supply of goods or services and these promises cannot be excluded, restricted or modified by an exclusion clause. The essential guaranteed provisions relate to the passing of good title, the goods being of merchantable quality, the goods matching their description, the goods being fit for purposes specified and services being rendered with due care.

The deemed provisions mentioned above provide a valuable safety net for consumers. Whilst IT supply contracts will usually be a combination of goods and services and therefore fall (as a mixture) within the words ‘goods’ and ‘services’, to qualify for the protections the customer must still satisfy the definition of ‘consumer’. A customer will be a consumer if the goods did not exceed $40,000 and the customer did not acquire the goods for the purposes of resupply or for the purposes of using them up or transforming them (in trade) in a process of production or manufacture.

Given the $40,000 limit, the consumer deemed provisions may or may not have an effect upon the IT supply contract. If the provisions do not apply, the customer should, as a minimum requirement, ensure that the contract contains terms providing at least equivalent protection to that which the Trade Practices Act would have otherwise provided.

INDEMNITY

It is a real possibility with IT supply contracts that if such things as non performance or delays occur then such alleged defaults by the supplier will cause not only loss to the customer but also flow on losses to the clients or users of the customer. Because of the default by the supplier, the customer may well be in default with third parties. In such circumstances the customer would face the real possibility of a claim from its clients or users in circumstances where the supplier should, in equity, be responsible to meet or answer the claim. The customer’s clients or users will generally have no direct access to or redress against the supplier because there is no contractual relationship or sufficient other relationship between the supplier and the customer’s clients or users.
It is suggested that, given the above scenario, the customer should include what has come to be known as an 'indemnity clause' (a form of undertaking or guarantee) in the IT supply contract. The indemnity clause would, in effect, state that any third party loss or damage sustained by the customer as a result of default by the supplier will be met by the supplier. It should not be forgotten that an indemnity clause does not absolve the customer of responsibility to its clients or users, rather it simply attempts to shift the risk.

An indemnity (like contractual terms) are not a one way street and an indemnity can equally flow from the customer in favour of the supplier to cover third party loss by the supplier. It is not difficult to see that non payment when due by the customer to the supplier could have real legal consequences to the supplier in the nature of action by third parties. The general principles that applied to the interpretation and construction of exclusion clauses generally apply equally to the interpretation and construction of indemnity clauses.

STRATEGIES FOR MANAGING THE RISKS

It does not matter whether you view an IT supply contract from the perspective of the customer or the supplier. Risks do exist and those risks start from the moment that precontract negotiations commence and do not end until the contract is discharged by proper performance by both parties. Whilst it is too much to ask for all risks to be eliminated, minimizing or managing the risks is obviously a desirable course of action.

WHAT ARE SOME OF THE LESSONS TO BE LEARNT?

1. There is an obvious need for the customer to be well prepared and to know (given the needs, capabilities and requirements that are peculiar to the customer) exactly what he or she wants to achieve within a known, available and sustainable budget and time frame. Similar principles apply to the supplier. Apart from the supplier knowing its own business objectives, the supplier must be aware of and vigilant to the customer’s wants and needs to ensure that those wants and needs can be met profitably and within the suppliers capabilities.

2. The customer must have an awareness of market forces, market prices, market reputations and market qualities in order that appropriate and meaningful comparisons can be made. An obvious part of that awareness involves a sound knowledge of the business needs of and capabilities, products and services offered by the customer’s most likely or preferred suppliers. Knowledge and awareness can lead to negotiating power. Again, similar principles apply in reverse to the supplier.

3. A sound understanding of the basic principles of contract law is essential. Whilst in the contract there is an obvious need to address basic issues such as price, delivery time, quality, deliverables and specifications, other less well know issues (such as contractual terms covering all precontract representations, indemnities, exclusion clauses and the provisions of the Trade Practices Act) should be at least considered for inclusion into the contract.

4. One of the fundamental lessons to be learnt from the RACV case is that the supplier must not, in any way (by words – spoken or written, by conduct, by suggestion or by inference) make any false or misleading representation in the precontractual negotiations. Customers are likely to act upon or rely upon such representations and are likely to enter the contract on the strength of the representations. The supplier must not make unattainable or embellished claims in any written proposal, demonstration, conversation, discussion, brochure and the like. Further, a representation can even exist by omission – that is not saying something and by silence creating a misleading or deceptive impression. It must not be forgotten that even qualifications expressed in the written contract that contradict or are at odds with such
representations may not be sufficient to override or displace such false or misleading representations.

5. The corollary to point 4 above, is that the customer, and indeed the supplier, should ensure that all the promises and representations made in precontract negotiations are properly qualified and then adequately and clearly expressed as terms in the final written contract.

6. Within the contractual terms consideration should be given to the inclusion of an alternate dispute resolution clause and that clause should clearly outline the nature of the alternate dispute resolution procedure and how, when and by whom that procedure can be activated.

7. It is not uncommon for calls for proposals to contain a provision that essentially states that a supplier’s response to the call will be deemed to constitute an offer by the supplier to the customer which the customer is free to accept if it so chooses. Further negotiations beyond the point of acceptance in a sense become less relevant because the contract is already in place. It is suggested that suppliers who respond to such calls for proposals must take great care to ensure that the response is qualified to ensure that it is not an offer but rather a tool to implement further negotiations (the so called ‘invitation to treat’).

8. The contract should be in place before the work starts to do otherwise can lead to real problems. If the supplier and the customer agree to start work ‘now’ with the legal details to be tidied up later, they have in reality already reached an agreement the terms of which are not entirely certain. Whilst such a course is not recommended, if work is to start early there is a minimum need to create in point form the essential agreed terms and to include (amongst the points) a statement that outlines what happens if there is ultimately a problem in reaching a final contract.

9. If a supplier makes future representations as to things such as maintenance, implementation dates and performance, the supplier must have reasonable grounds for making the same. As a security device against future claims, it is suggested that it would be wise for the supplier to internally document the basis upon which the representations have been made. The documentation could consider previous ‘similar’ contracts effected for other customers by the supplier.

10. From a customer perspective, standard form contracts provided by a supplier will rarely meet the needs or requirements of the customer. Standard form contracts will usually not meet the objectives of the customer. At best such contracts might provide a list of items to be considered and negotiated.

11. Previous mention has been made to the need for the customer to clearly communicate, in detail rather than in generalities, its needs and requirements. To achieve this end it is suggested that the customers call for proposals should number the requirements and require the tendering suppliers to address the requirements numerically. Further; the customer could provide, at the call for proposals stage, a draft contract for consideration by the supplier. The provision of a draft contract by the customer has a number of advantages to the customer. Firstly, it largely eliminates the use of ‘supplier standard form contracts’. Secondly, the draft provides a starting point which will set the general perimeters for the final contract. Thirdly, it allows the customer to more easily make comparisons as to the merits or otherwise of the various supplier responses and, finally, it makes it less likely that the supplier will request the inclusion of ‘standard form clauses’ that otherwise could be seen as unreasonable.
CONCLUSION

The foundations of a sound business relationship involving IT supply contracts (and indeed any contract) start from the first moment of negotiation between customer and supplier. If the parties get it right the path ahead will be smoother. Both the customer and the supplier should act with knowledge from within and without. The customer and the supplier should act with a sound knowledge of the risks, the potential problems and with an understanding of the essential laws that govern the contract.

If the strategies outlined previously are achieved, the whole process and course of the IT contract is likely to produce a much more satisfactory result from the perspective of both the customer and the supplier.

CASE REFERRED TO

RACV Insurance Pty Ltd and Anor v Unisys Australia Ltd [2001] VSC 300.

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STATUTES CONSIDERED