Chapter 1
Thesis Context and Research Methodology

1.1 Introduction

This chapter describes the motivation, approach and major stages of the research undertaken and reported in this thesis. There have been four major outcomes of this research: a deeper understanding of globalisation and the eEnabled Business, development of an eTransformation Roadmap, an eTransformation Methodology and a Business Process Modelling tool to assist in eTransformation. Each of these will be discussed in this Chapter in terms of the research activities and research methods that surrounded their creation.

1.2 Motivation

This Research work commenced with an interest in the emerging use of the Internet for business purposes. One of the key reasons for looking at this field was the researcher’s existing interests and background in Web technologies. Another key reason was that it had become clear in 2000, when this research work commenced, that the Internet and Web were having a profound effect on how business was conducted throughout the world. A new type of organisation was made possible through Information Technology and the Internet referred to as an eBusiness and it became the central theme of the research work presented here.
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Large corporations have used Information Technology and the Internet to increase their effectiveness and competitiveness in a global marketplace. Small to Medium size Enterprises (SMEs) are increasingly being exposed to the competitive pressures from globalisation and will need to become more competitive to survive. Similarly, SMEs can gain benefits from becoming eBusinesses as has already been achieved by some large corporations. Small to Medium size Enterprises are a significant portion of the Australian economy, thus it is important to ensure that Small to Medium size Enterprises remain effective and competitive in a globalised marketplace.

The University of Western Sydney where this work was conducted is located in the economically fastest growing economic region of Australia. It has a population of 1.8 million, almost 10% of the total Australian population. The region contains 72,000 businesses and generated $58 billion in business turnover in 2000. A significant number of the top 500 companies in Australia are located in Western Sydney such as Western Sydney Area Health Service, Crown Relocations, Smorgon Reinforcing and NSW Department of Housing. A large proportion of the Western Sydney businesses are Small to Medium size Enterprises. These businesses are becoming more exposed to globalisation. They will benefit greatly from changing the way they do business to take advantage of a wider globalised marketplace. This will allow the region to boost its global competitiveness and lead to sustainable jobs and investment in the region. For these reasons businesses, Local Government and State Government have recognised that the region needs to develop and follow a strategy towards the use of Information and Communication Technology.
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This research work has directly related to that effort and findings of this research project are in use by businesses, Local and State Government bodies with the aim of increasing the competitiveness of the region’s businesses. In addition a number of further research initiatives have been spawned off by the work conducted in this research project including three new PhD research projects, which are focusing on specific components of this research work and expanding on the findings made.

1.3  Problem Statement

It is important that Australian Small to Medium size Enterprises remain competitive in today’s globalised marketplace as they constitute a large portion of the Australian economy. Initial investigations that were later reinforced through a structured survey revealed that Small to Medium size Enterprises were lagging behind large corporations in terms of Information Technology and Internet uptake. The following problem statement has been used to guide this research work:

*How can a Small to Medium size Enterprise (SME) eTransform to be competitive in a globalised, rapidly changing, digital world?*

There are two components to this question; firstly the nature of competitiveness in a globalised environment and secondly, the issue of how an organisation can eTransform to become competitive in a globalised, rapidly changing digital world.

1.4  Research Methodology

Different research problems require different research approaches (Singleton and Straits 1999). Two main categories of research approaches are quantitative and
qualitative. A quantitative approach would entail identifying certain aspects or variables in relation to the question stated. The aim would be to isolate the variables and then see their effect on the system being investigated. A measurement scale would be developed so that all results could be compared. Then measurements could be carried out on an experimental subject, and repeated if required or compared to other experimental subjects. This has the benefit of being clearly able to see numbers and statistics of results. However, because the measurement tool has to have a scale and certain limits it cannot take into account factors outside of the scale created. Alternatively, a qualitative approach could attempt to examine the situation from a more open-ended perspective. A qualitative approach could use interviews, focus groups or other methods to gather information from the experimental subject. Analysis of the data captured would attempt to isolate the cause and effect within that system. This is a more flexible approach and has the ability to capture unexpected outcomes during the analysis that might have otherwise been missed. Qualitative analysis does not normally allow intervention so it mainly involves observation and interviews. Thus the phenomenon that is to be investigated will need to have occurred or to occur during the time of observation or else it cannot be captured.

Another way of viewing research methods is by classifying them into research strategies (Singleton and Straits 1999): experimental research, survey research, field research and action research. These research strategies are described in Table 1.1.
Experimental research Experimental research offers the best approach for investigating the causes of phenomena. An experiment will involve the systematic manipulation of an environment and then observing whether a systematic change occurs. This approach requires that a situation can be created by the researcher so that they can repeatedly carry out the experiment on various subjects.

Survey research This research approach is suitable for identifying the frequency of certain characteristics amongst groups or populations. It allows a researcher to relate various characteristics to explain a phenomenon. The aim is often to generalise the data to the whole group but this can be very difficult to prove with confidence.

Field research The researcher immerses themselves into a naturally occurring set of events to gain firsthand knowledge. The aim here is to gather information without influencing the environment. The difficulty with this is determining when and what observations to record. Also an opportunity has to be available and accessible to conduct the observations.

Action Research Action research (Kock, McQueen et al. 1997; Kock 2003) is often identified by its dual goal of improving the organisation participating in the research, and at the same time rigorously generating valid and consistent knowledge. The action research practitioner is expected to apply positive intervention to this environment and observe the changes in the environment and the researcher themselves.

Table 1.1 Research Strategies

Globalisation has created a dynamic and rapidly changing marketplace in most industries. This means operating a business in that environment is now a more complex process than before. Many factors internally and externally influence the forces being placed on an organisation. It is unlikely that experimental research would be viable in such an environment, since it would require a degree of control of the environment. Testing would be conducted in isolation which means it would be difficult to relate the results to the real world.
Survey research would capture characteristics of organisations after they had changed in some way. The results would be based on the feedback given from organisations that would have their own view and interpretation of the change undertaken in their organisation. It would not allow the change taking place to be viewed first hand.

Field research would allow first hand observation of change in an organisation. However because there can be no participation by the researcher it would be difficult for the researcher to place themselves in a situation where organisational transformation was occurring in exactly the way they wanted and at the right time.

Action research allows for an open approach similar to field research thus being able to capture information that cannot often be predetermined. It also provides for intervention with the entity being researched and then examination of the outcomes. Action research promotes the researcher to actively participate in some form of change in a system. Then the researcher can examine the change in the system as well as the change in the researcher themselves. In this way a change can be triggered by the researcher and then the outcome of that change examined. Both the researcher and system learn through the change that occurs.

Action research has both its supporters and critics (Kock 2003), some researchers feel that real research results can only be achieved through quantitative data. However Action Research supporters argue that some systems are too complex to be broken down into measurable variables. They also argue that an experimental
environment is not likely to be representative of a live system and as a result conflicting research data can emerge (Avison, Lau et al. 1999; Avison, Baskerville et al. 2001; McKay and Marshall 2001). Ned Kock (1997) who investigated the effects of groupware of business process improvement used several iterations of action research to gather data. In a paper that he published (Kock 2003) he expanded on his choice of action research and its suitability for use during research being conducted towards achieving a PhD. Regardless of the potential difficulties action research was highlighted as a method that can achieve accurate results from live complex systems.

Action research was chosen as the research strategy in this work, primarily because of its ability to deal with complex systems and its capacity to allow intervention to promote change in an organisation.

1.4.1 Action Research

Action research aims to study a system where the researcher is an active participant in the research (Myers 1997). Investigations that require action research often need the researcher to act as catalyst for a change to occur (Baskerville 1999). There are two changes that the researcher needs to be aware of during the investigation; the first is the change in the research subject. The second is the change in the researcher themselves; being an active participant in the research may require the researcher to change their approach during the course of the research. Any changes made and the driving force behind those changes needs to be noted.
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The changes in the research subject and researcher are often captured as observations and potentially through documentation that might be generated in the research work itself. These observations are qualitative in nature and require the researcher to examine those using qualitative techniques.

The steps involved in action research are: Diagnosing, Action Planning, Action Taking, Evaluation and Specific Learning (Kock, McQueen et al. 1997). These steps are shown in Figure 1.1.

![Figure 1.1 Action Research Cycle](image)

A short description of each of the action research stages (Kock 1997) is shown in Table 1.2.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosing</td>
<td>Identifying and defining the problem that is to be solved.</td>
</tr>
<tr>
<td>Action Planning</td>
<td>Identifying alternative solutions for the problem identified.</td>
</tr>
<tr>
<td>Action Taking</td>
<td>Selecting one of the solution paths from previous stage and implementing it.</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Observing the outcome of the implemented solution.</td>
</tr>
<tr>
<td>Specific Learning</td>
<td>Using the observations gained in the Evaluation stage to create a model describing the overall situation being researched.</td>
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</table>

Table 1.2 Description of the stages in action research
Action research is considered to have been started by Levin (Kock 2003) in his investigation of group dynamics in studying social psychology. Though originally it was considered a research tool in the field of social science and education, researchers such as Peter Checkland (Kock 2003) started to use action research for Information Systems purposes, and this brought action research closer to the concept of system theory (Kock 2003). Action research is currently an accepted approach for use with Information Systems (Baskerville 1999).

1.5 Structure of this Research Work

The overall context of this research work was to use action research, there were three action research cycles involved in this research project. Each action research cycle involved the researcher becoming involved in identifying an area of the organisation that could be changed. Once identified a plan to change the processes in that part of the organisation are made and then instigated. Observations are recorded of the change in the business. In addition any change in the researchers’ understanding or appreciation of the situation being researched is also noted. At the conclusion of each stage the specific learning is used to support the development of a new diagnosing stage in the following action research cycle. By conducting the research in this way it allowed the outcomes of one research cycle to be used as the basis for the following cycle. This would allow the research to evolve based on the research outcomes from each previous cycle; this would potentially allow the research to follow a path that could not have been predetermined. Action research is well suited to this evolutionary approach.
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The action research approach used in this research work differs from the approach traditionally followed in the course of obtaining a PhD. Figure 1.2 shows the different phases of each approach.

![Diagram of Traditional Research Approach versus Action Research Approach]

**Figure 1.2 Traditional Research Approach versus Action Research Approach**

1.5.1 Literature Review: Globalisation and Competitiveness in the Digital Age

The first activity undertaken during this research work in 2000 was a literature review. The literature review focused on globalisation and the increasing use of the Internet by organisations.

The research material available at the initiation of this Work can be broadly categorized into two types (1) theoretical possibilities; proposing ‘potential’ uses of Internet technologies or (2) case studies reporting on existing eBusinesses. Since part of my investigation would involve experimentation with a commercially operating business it seemed prudent to focus more on case studies of existing
eBusinesses. The analysis of these case studies led to the identification of several key success factors of an eBusiness.

1.5.2 Action Research Cycle 1: eTransformation Roadmap

The first action research cycle led directly from success factors identified in the literature review that form the basis for an eBusiness. Having identified the key characteristics that an eBusiness should have, the next step was to determine the transformation an organisation would undergo to gain those characteristics.

The work of Nolan (1979; Nolan and Croson 1995) has shown how the use of information technology evolves in an organisation. This led to the investigation as to how the use of IT in an organisation could be measured and represented. The first step in this cycle was to gain a background in the measurement of IT sophistication through literature. Also, an opportunity became available to participate in a large research project that was investigating a complementary area; they were investigating the IT sophistication of businesses in the Western Sydney region. I decided to join this group as it offered many advantages. The advantages gained by being part of larger research group were, the scale of research activity that can be undertaken and also being able to exchange ideas with an informed peer group. Similarly during the analysis phase the combined effort of team of researchers enabled more in-depth analysis than what can be done by an individual researcher.

There were several alternatives available to gather information from Western Sydney businesses, including; interviews, focus groups, survey and case studies. Each of
which has its own strengths and weaknesses. A mail out survey was chosen as a suitable method to sample a large group of businesses, across industries throughout the region. There are a number of limitations in using this approach such as the low response rate to mail-out questionnaires (Singleton and Straits 1999). The questions also need to be simple to answer and minimise ambiguity wherever possible. The benefits of survey methods are that they allow a much larger group to be sampled than would be possible with interview techniques (Bouma 1996).

The research group decided to use a survey to gather information from Businesses in Western Sydney region. I made a major contribution to formulation of the questions used and the layout of the questionnaire. The development of the questions involved investigation of survey research methods, existing questionnaires and publications related to IT sophistication.

A survey sample size of approximately 4,500 was established which was a combination of statistical calculation and resource limitations. The survey was mailed out and followed with a reminder after the due date of the survey to boost the responses. The final response rate was approximately 13%.

During the construction of the survey instrument a key concern was how the data would be analysed. It was at this point that investigation into measurements of Information Technology usage began. Rather than only counting number of computers in an organisation it was decided to investigate how technology was used to support business processes. Thus the survey looked at the People, Processes and Technology being used by Western Sydney businesses.
The analysis of the survey results led to the development of eTransformation Roadmap. Each of the businesses surveyed was mapped to the eTransformation Roadmap. This allowed the region itself to be viewed in terms of the steps required for the region to become eEnabled.

1.5.3 Action Research Cycle 2: eTransformation Methodology

Using the knowledge gained from the eTransformation Roadmap, it became clear that SMEs need a method to follow to allow them to advance along the eTransformation Roadmap. The research methodology to investigate how this could be achieved was a direct application of action research. I reviewed literature relevant to transformation of organisations to ensure the work conducted built upon existing work by other researchers. Using that material as background an approach was developed to transform the business processes of an organisation, with the aim of advancing them along the eTransformation Roadmap.

Advance Metal Products was the industry partner in this action research cycle. Advance Metal Products is a medium size enterprise in Western Sydney and would likely have characteristics like other SMEs in the region and most likely even in other regions. I actively participated in the transformation of some of their processes. Advance Metal Products was using Information Technology to support some of its business processes. For instance, the manufacturing process was fully integrated and controlled via software from quotation to delivery. In other areas opportunities for
improvement were possible for instance in customer relations. This was chosen as the area to investigate.

Using action research with an operating business gives insight to the complexity involved when trying to enact change on an operating business. Through discussion, observations and interviews it was possible to capture the issues that are significant during the change process. These later provided the basis for the eTransformation methodology that was developed.

A major learning outcome of this action research cycle was that eTransformation cannot be done as a project, it is a process. Another outcome identified was that frontline people in an organisation need to take the ownership of the business processes and transformation for the eTransformation to be successful.

Some of the findings of both the eTransformation methodology and eTransformation Roadmap were published in Cutter Consortium journal (Ginige, Murugesan et al. 2001).

1.5.4 Action Research Cycle 3: eTransformation Business Process Modeller

In the previous action research cycle it was established the importance of engaging frontline people in the eTransformation process. The aim of this cycle was to investigate how this can be achieved. Using the outcomes from the previous action research cycle and further investigation into web based collaborative environments a
framework was developed. The framework developed brought together the need to capture business process models and the capabilities of online collaborative environments. The aim being to allow frontline people in an organisation to collaborative capture Business Process Models through an online web based collaborative tool. A product that could carry out this collaborative functionality did not exist, so a prototype was developed. The prototype was then used in a live work environment to determine its usability/feasibility as an asynchronous collaborative process modelling tool. It also showed the suitability of the prototype within the overall context of eTransformation.

The people that participated in this action research cycle were part of an administrative group within the University of Western Sydney. This group was following the eTransformation methodology that had already been developed in this research work. It was decided to work with this group because they resembled an SME in terms of the functions they were performing. The administrative staff group carried out several tasks that involved the processing of applications and assigning of staff. They also carried out payroll and other staff support activies. These logistical processes would also be part of any Small to Medium size Enterprise.

1.6 Summary of Research Approach

By following this staged approach I have been able to provide a holistic approach to eTransformation for SMEs. Due to the relatively new nature of the research field it would have been difficult to predict the path that has to be followed before commencing the research work thus an open-ended research approach was selected.
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It would also have been difficult to isolate specific factors in an operating business to analyse these independently. A business is a complex system that has many factors that affect its operation. It would be best to examine the system as a whole rather than attempt to isolate sections of it.

Through examination of eTransformation from a holistic point of view it has allowed the big picture of eTransformation to be shown. This in turn has given business, Local Government and State Government a view of globalisation and its potential impact on the region of Western Sydney. This research work has also greatly contributed to the Advance Enterprise Information Management Systems (AeIMS) research group and has allowed it to expand its research efforts. Similarly this Research work has laid the foundation for a further research to focus on specific aspects of the work uncovered in this work. The overall research approach is summarised in Figure 1.3.

![Figure 1.3 Overall Research Approach](image-url)

Figure 1.3 Overall Research Approach

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1.7 Structure of the Thesis

This thesis is comprised of seven chapters.

• Chapter 1 gives the thesis context and research methodologies used during the research project.
• Chapter 2 outlines the initial literature review conducted on globalisation and eBusiness. It discusses the paradigm shift that has occurred due to digital technology becoming readily available. Then a review of traditional business structure is compared to eBusiness structure. A discussion of the new eBusiness structure as a threat or opportunity is given. Key success factors for eBusinesses are identified and specific examples of existing businesses are used to reinforce them.
• Chapter 3 discusses the background to the eTransformation Roadmap. It also describes the process that was taken to develop the Roadmap.
• Chapter 4 discusses the action research cycle with Advance Metal Products and how it led to the development of the eTransformation methodology. It gives the background to organisational change and the benefits and drawbacks of incremental and radical change. It then discusses how a compromise can be reached between the two.
• Chapter 5 describes how the importance of business processes within an organisation was established from the previous action research cycles. It then gives a review of business processes and Business Process Modelling (BPM) with respect to eTransformation. From that research a framework was developed to empower frontline employees to participate in the Business Process Modelling needed in eTransformation.
• Chapter 6 describes how the framework outlined in the previous chapter was used to create a prototype. It allowed frontline employees to capture Business Process Models. This prototype was deployed and used by a test group. The evaluation and specific learning gained from the prototype are discussed in this chapter.
• Chapter 7 concludes the thesis and discusses further work that needs to be conducted.
Chapter 2
Globalisation and the eEnabled Business World

2.1 Introduction

The Internet has changed almost everything; business is no exception. The use of the Internet, Web and Information and Communication Technologies (ICT) has revolutionised traditional markets and businesses and is now in the midst of intense global competition, even Small-to Medium-size Enterprises (SMEs) now need to compete in a global market. Never before have businesses, especially SMEs, faced such intense global and open competition. They are now required to meet new and challenging demands by customers and business partners.

These changes have put pressure upon many businesses, including SMEs, to transform their business operations to meet the needs and demands of the eBusiness world by making use of the Internet, Web and ICT. The eBusiness environment has also offered many new opportunities for improving, enhancing and empowering internal processes, and business-to-business (B2B), business-to-consumer (B2C), business-to-employee (B2E) and business-to-government (B2G) interactions and transactions.

The eEnabled business processes speed up and streamline information flow, enable information and knowledge sharing, and thereby create new opportunities for the expansion and development of new linkages among various business partners around
the globe (Ballou, Gilbert et al. 2000; Cross 2000). They enable participants in a business process: end-users, suppliers, manufacturers, marketers and others, from geographically distributed locations to be part of the process. The tidal wave of eBusiness is widespread and its impact is well recognised.

This Chapter reviews the world of the eEnabled business and sets the background for this research work. It covers the background of globalisation and eBusiness. It then goes on to establish a set of key objects of an eBusiness and describes examples in the existing business world.

2.2 Paradigm Shift: Business in the eEnabled world

Traditional enterprises are facing threats from a new form of an organisation, the eEnabled Business. An eEnabled Business uses Information and Communication Technology (ICT) as its nervous system adapting to the marketplace in a ‘sense and respond’ (Bradley and Nolan 1998) fashion. In the past, traditional enterprises have reacted to changes by ‘downsizing’ or ‘re-engineering’; however such strategies may no longer be appropriate as the technologies and marketplace are in constant transition. We live in a rapidly changing world where there is little time between, the conception of an idea to implementation (production) to marketing.

Traditionally, enterprises relied on organisational knowledge to solve their problems. Organisational knowledge was built-up through people who had worked on a particular problem and solved it. Thus that person became the source of a solution for that particular issue. This individual’s interaction with others in the organisation
would allow the information to disseminate. However, today’s problems are appearing faster than ever, placing considerable strains on traditional enterprises (Baets and Galliers 1998; Levine 2000). This phenomenon also extends to threats and opportunities in the marketplace.

There are many enterprises that are not dealing effectively with the rapidly changing marketplace, not adjusting to new demands and consumer needs as fast as their competition. For example, traditional enterprises such as ‘Borders’ and ‘Barnes & Noble’ were overtaken by Amazon.com, a new eEnabled enterprise (Schwartz 1999). Such takeovers are also common in other businesses. The new eEnabled businesses have lower overheads and are able to get products and services to the marketplace faster than their traditional competitors. They are able to achieve this through their innovative business model that is based on Information and Communication Technology. This new form of business has been called various terms such as eCommerce, eBusiness, Cyber–Corporation, eEnabled Business, On-line business, Virtual Enterprise and Virtual Organisation. There are specific interpretations for all of these; however, they all share certain common aspects such as a high reliance on IT, the Web and the ability to ‘sense and respond’ to market changes. The term eEnabled Business will be used in the rest of this chapter. This term closely represents the concept of integrating information systems across all business processes in an organisation.

An eEnabled business operates in such a way that gives it advantages over traditional business mode of operation. An example of this is Hewlett-Packard (HP) which was able to reduce the time needed to supply computer monitors by 25% and at the same
time also reduced the number of people needed in the same supply chain by 50%. This was achieved by integrating their supply chain through an Information Technology system. Each of the participants were given access to the supply chain system and had the ability to see HP’s demand forecast. Thus enabling them to plan for the upcoming demand. (Hammer 2001)

Similarly the overarching concepts presented in Sauer and Yetton’s book “Steps to the Future” (Sauer and Yetton 1997) present a view that the IT enabled organisation has many benefits over traditional businesses. There is emphasis that Information Technology is more significant than a support role and rather is an enabler of change. Information Technology is a driver and enabler of change and needs to be integrated in any organisational transformation effort. The presence of Information Technology gives performance improvements through the distribution of information. Information can be channelled in a greater way than has been possible before. The SABRE system used in the airline industry is sighted as one example. This single information system links all the major airlines and allows passengers and travel agents to tap into the availability of seats on any given flight. For any airline to compete they would need to be part of the SABRE system. Similar examples of the benefit of an eEnabled business are discussed in section 2.7.

In the following section traditional enterprises are compared to an eEnabled Business followed by a discussion on whether an eEnabled business is a threat or opportunity to the traditional enterprise. Then the operational models of two prominent eEnabled Businesses. From this examination and other literature a set of factors that are
typical of an eEnabled business. Each factor is described and several examples of operating organisations demonstrating those factors are given.

These factors are intended to be used to gain a better understanding of these emerging organisations. This endeavour into uncharted territory addressed some aspects and raised more questions. Some of these questions have been dealt with in this work and others will need to be addressed in future research. It is important to note that when dealing with research problems arising in the field of eEnabled Businesses, one has to take a multidisciplinary approach. A multidisciplinary approach is needed because an organisation is a complex system that contains people, processes and technology, which all work together. It is not possible to isolate and examine only one of these components as it would not represent the real-life system. Instead, it is important to view the system as a whole and this requires appreciation of social, technology and business factors.

2.3 Traditional Enterprise versus eEnabled Business

In recent years, the rise of eEnabled Businesses has been marked by significant innovation particularly in the structure of their business processes. These enterprises tend to not just use the Web as a selling channel but as an invisible assembly line that links them to their suppliers and customers (Margretta 1998). Web based technologies are the foundation of these enterprises. This is further reinforced by the latest generation technology components such as server technologies, database engines, high-speed telecommunications and electronic tracking systems.
Some change is occurring within the traditional enterprise; however the more significant change is taking place elsewhere. A grass root movement is taking place and is represented by eEnabled Businesses, which uses the Web and ICT to conduct the same functions of a traditional enterprise in a more cost-effective manner. What is more important than the technology itself is the way in which business functions are structured and executed. Technology is at the heart of these processes as opposed to a hierarchical structure (of the traditional enterprise) which deals well with routine activities.

2.3.1 The Traditional Enterprise

A hierarchical organisation structure has been dominant in the traditional enterprise from the time of the industrial revolution. Its characteristics are (Tapscott, Lowy et al. 1998);

1. Slow to change but extremely strong in what it was able to do.
2. Strict market boundaries are adhered to.
3. Problems are solved through organisational knowledge.
4. Information follows a paper trial through many departments.
5. Departments have strict boundaries of operation.
6. Decisions are made from the top-down and imposed on all.

Production is guided by a ‘make and sell’ mentality where a product would go through a development cycle; a certain amount of the product would be made and then sold. The longer the production run of a product the lower the cost of each individual product. It would be very difficult to introduce customisation during a production run. The source of information for changes is gathered through bug-reports or customer feedback. Additional product features may also be included in
the new production run. Employment and moving up the hierarchy is based on time and experience. The predominant characteristic of employees is independence and specialisation (Barabba 1998).

### 2.3.2 The eEnabled Business

The eEnabled Business is a very flat vertically integrated system with little hierarchical control. Rather than a central command passing instructions down the hierarchy, an eEnabled Business is like a living organism that depends on independent separate cells working collectively to keep the organism alive (Gates and Hemingway 1999). Decisions are made by those closest and most able to deal with the situation. Ghoshal has stated “…those closest to the customers or most knowledgeable about the technology were usually far better placed to respond to fast-changing environmental demands or market opportunities” (Ghoshal and Bartlett 1997). They also receive the responsibility and reward for making those decisions. Employment opportunities/career advancement is based on performance and capability. Production mentality is based on ‘sense and respond’ were the customers request is taken and a specific product is made for that customer, i.e. “sell custom made products online, then manufacture them” (Barabba 1998). This is almost like a customised device for every purchaser. Information flows through the company along a digital causeway, from orders to production to delivery. Price is based on demand at the time of order; “dynamic pricing is the inevitable result when supply and demand are allowed to battle back and forth freely” (Barabba 1998). Product innovations and changes are made almost on request. The predominant characteristic of employees would be interdependence, working in multifunction teams with
distributed decision making and continuous learning of both the individual and the organisation.

A table from Chapter 2 of Don Tapscott’s book “Blueprint to the Digital Economy” (Tapscott, Lowy et al. 1998) highlights the difference between traditional and eEnabled mentality of business operations, a summary is given in Table 2.1.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Make and Sell</th>
<th>Sense and Respond</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mindset</strong></td>
<td>Selling to well defined market segments.</td>
<td>Responding to unpredicted requests in an unpredictable environment.</td>
</tr>
<tr>
<td><strong>Process</strong></td>
<td>Mass production; repeatable procedures.</td>
<td>Mass customisation; modular products and services produced by modular processes.</td>
</tr>
<tr>
<td><strong>Information architecture</strong></td>
<td>Functionally managed; each function creates its own view of “what is happening out there” and its own processes for “how we do things around here”.</td>
<td>Enterprise management; a unified view of the environment and key processes, providing the information needed for a specific request.</td>
</tr>
<tr>
<td><strong>IT architecture</strong></td>
<td>Host centric. Shadowing the hierarchical top down management system.</td>
<td>Network centric. Shadowing the dynamic nature of people and teams.</td>
</tr>
<tr>
<td><strong>Organisation priority</strong></td>
<td>Efficiency and predictability; Control companies destiny by accurately forecast changes in market demand.</td>
<td>Flexibility and responsiveness; Manage change rather than try to predict it.</td>
</tr>
</tbody>
</table>

**Table 2.1 Make and Sell versus Sense and Respond**
Barabba (1998) notes that:

“Each economic age has its optimal organisational form – a structure that is most aligned with the means of wealth creation, dominant technologies and social context. The industrial age was epitomised by the command and control bureaucratic organisation which, in manufacturing, evolved into the assembly line. With the work broken down into small component tasks, the underlying principle relationship for the industrial age was independence. In the digital economy the basis of wealth is rooted in knowledge, a new human relationship is required. The underlying principle for the creation of knowledge-based products is interdependence.”

Barabba (1998) is highlighting that the hierarchical organisational structure that was suitable in the industrial age is no longer suited to the information age. Organisations need to adopt a new structure that caters to interdependence; a flat vertically integrated system would be likely to cater to this. This is another indicator that organisations need to undertake a transformation and move towards a new structure, one that is process based rather than department based.

2.4 Threat or Opportunity

Even though the dot-com crash of 2001 has whipped many eEnabled organisations out of existence, a good number have survived and are growing (Albrecht 2002; Schofield 2002). These eEnabled Businesses are still in an embryonic phase. Traditional enterprises still have ample opportunity to compete with the eEnabled
Businesses if they choose to rethink how they conduct themselves. It is almost a certainty within this century enterprises will have significant differences from their equivalents in the twentieth century.

Internet and Web technologies are creating opportunities to rethink business models, business processes and the types of relationships and interaction with their business partners and associates. eBusiness strategies may transform some of the established strategic concepts into new contexts in which they previously were not economically viable. For example, in the 1960s and 1970s business giants like IBM won the loyalty of major corporate customers through highly paid account executives who provided relationship management. Today that same concept using new technologies is being deployed to tailor support for individual consumers.

In the Australian based book “Internet Commerce Digital Models for Business” (Lawrence 1998) Lawrence et al sets out the threats and opportunities specifically for Australian businesses. From an eCommerce perspective, they point out that businesses in Australia should be transforming themselves to take advantage of Information Technology. They highlight advantages such the personalisation of products and services for each customer. The ease of communication channels between suppliers and partners making for richer relationships. In addition, the capacity to collaborate over the Internet for both team building and joint development of products. Also the introduction of intranets that streamline internal business processes, such as leave requests and requests for resources.
Lawrence et al also highlights threats in the digital age, such as lack of interest from consumers, impracticality of micro-payments, lack of standards and lack of bandwidth. Ghoshal and Bartlett (1997) highlights the importance of organisational culture to retain and attract appropriate skilled employees for an organisation. This is mainly due to the fact that people are more readily able to change employment than has been possible in the past. Similarly the selection of appropriate technology infrastructure is crucial to both the internal capabilities of an organisation and its ability to integrate that technology with suppliers, partners and customers. This selection of technology will be highly dependant on the decision made by employees or advisors to an SME so their skill and ability is critical to the success of an organisation.

An eOpportunity map based on David Feeny’s eOpportunity domains (Feeny 2001) shows the potential areas of opportunity for a business to enhance itself through innovative use of ICT. It identifies three layers of eOpportunity or domains: internal operations, marketing and sales, and customer service. A forth layer or domain ‘external enterprise operations’ was added as shown in Figure 2.1. This new layer was added because an eBusiness can gain benefits from its relationships with external entities and thus an important part of the eOpportunity map. For example, digital links with a supplier could create: reduced delivery times, lower cost of supplies or enhancing their capabilities. This new layer shows the relationship between an enterprise and its suppliers, distributors, partners and the government (Ginige, Murugesan et al.). In each domain, technology enables a radical new vision of what a business can accomplish, and how it can be accomplished. Every business should be considering opportunities across all the four domains. The significance of
each domain and what strategies can be used for each will vary widely across industry sectors and businesses. This combined with other factors make the business strategy an even more complicated process in this inherently high Tech world.

Figure 2.1 eOpportunity map

To help address some of the complexities in this high-tech world, lessons can be learnt from existing eEnabled businesses. By examining the manner in which eEnabled businesses approach information management, telecommunications and utilisation of computing power other businesses can understand the issues that they need to face. The following section outlines the operational mode of an eEnabled business and how it has been derived.

2.5 Operational Model of the eEnabled Business

Research in the field of eEnabled Businesses is fairly new, with a unique intersection of management of information technology and organisational behaviour theory. Therefore instead of attempting to create a theoretical model based on possibilities offered by technology, an attempt has been made to learn how existing eEnabled
businesses operate. By focusing on their present virtual forms and abstracting a set of key factors from their approach, it can act as a guide for other businesses.

The case studies that have been reviewed show that eEnabled Businesses are viable and not a creation of theoretical discussion or financial wizardry. It provides empirical proof that the eEnabled Business model (a) already exists (b) is viable and (c) is a future reality for all existing enterprises.

This bottom up approach is challenging a totally theoretical approach to designing the eEnabled Business of the future. The analysis of present eEnabled Businesses will provide us with an insight of how a virtual company can be established or managed better (to be more effective). The factors identified here will help establish a framework for further research into how a traditional organisation can transform into an eEnabled Business.

2.5.1 Not a Purist Model

Some of the earlier literature before the dot-com crash pervades a “purist” view which attempts to classify the eEnabled Business as the utopia of the future, managed totally through Information Technology (Lefebvre 1999). Theoretical constructs of the eEnabled Business of the future being a product integrator, with a dynamic workflow and value chain has not emerged as expected. What have emerged instead are organisations that are ‘bricks and clicks’ (Greenfield 1999) which draw on the traditional strengths and enhance them with ICT (Feurer 2000).
The fact that an organisation such as DELL is the type of organisation that has survived the dot.com crash helps substantiate this claim. DELL learnt early on that a pure virtual organisation would not work (Dell 1999). It discovered through experience that by having the suppliers of various components around the world it made it hard for them to guarantee the delivery and quality to its various geographical distribution points. Suppliers were then forced to setup a factory nearby DELL’s fabrication centres. Components are manufactured to DELL’s standard at that centre. Thus, DELL is able to ensure that the parts that were incorporated into its system met a certain base level of quality that would ensure reliability in operation. This was fundamental to maintaining overall customer satisfaction.

The problem with a purist model is that the enterprises are not homogeneous. Each enterprise is progressing through a different level of technological and managerial sophistication. This makes it difficult for organisations at dissimilar levels of sophistication to work seamlessly together, hence DELL’s action to have reliable suppliers nearby to their distribution sites. A similar scenario occurred with CISCO (Berinato 2001), where some customers were still faxing orders through. In addition, CISCO needed to enter into long term agreements with some suppliers for key components of their products, which is not inline with the concept of a pure virtual organisation. Though the pure form is not likely to exist, what DELL found is more likely to emerge; a combination of physical/digital entity, i.e. ‘Bricks and Clicks’ organisation.
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2.6  Examples of Existing eEnabled Businesses

The following are some examples of online business that have chosen the Web as their main medium for interaction with their customers. They also have eEnabled backend systems that enable them to provide their goods and services on much lower overheads than their competitors. This study gives an insight into their modus-operandi and factors that have led to their success.

2.6.1 Amazon (amazon.com)

Amazon.com is one of the first eEnabled Businesses to emerge. A key part of Amazon.com’s strategy was to have the customer’s needs at the centre of its on-line business. It entered a market, which was dominated by established and traditional enterprises of the likes of Barnes & Noble. In 1995, when it went online selling books, it sold US$16 million worth of books, with sales rising to US$600 million by 1998. A whole new market segment was created for cyber-books (Turban 2000).

The emergence of this new market-space and this new model of doing business online took traditional book sellers by surprise; two years later in 1997, Barnes & Noble launched its online bookstore (www.bn.com) and tried to re-capture some of the market share. In the design of the Amazon.com business architecture, a reversal of traditional value chain took place. Instead of the build and sell mentality, where the book sellers attempted to predict popular titles and keeping them in stock, Amazon.com used a sense and respond model where the clients’ needs were the core of all the processes. On the Web site it lists more than 10 million titles but only
keeps the most popular titles in its warehouses. Other titles are sourced from publishers, distributors or wholesalers. Through integrated electronic links, a Federal Express courier is automatically dispatched to pick up the books from the various sites and deliver them to an Amazon central point where they are bundled and delivered to the customer. The sourcing of the books, the dispatching of the courier and bundling is all controlled and optimised digitally. The customer is however not aware of any of this taking place.

The online customer needs were different from that of buyers of book from traditional bookstores and they drove Amazon’s focus (Kalakota and Robinson 1999):

1. They lived in remote or international regions.
2. They were interested in a bargain (especially for volume purchases).
3. They were pressed for time (no time to go out to physical stores).
4. They did not mind if there was a reasonable wait for delivery.

To expand its customer base and to increase its revenue Amazon.com (in 2001) expanded its product range to include toys, music, film and software. The experiences of its customers were positive: they were able to quickly locate the book(s) they wanted; buy them at anytime, from anywhere; pay online and get the books delivered to their doorstep. Further they were able to make up their mind by reading some of the reviews and purchase the items in their eShopping basket by a click of a button. It has taken out the pain of travelling and searching through the limited range of a traditional bookstore. In addition, due to the cost saving of not owning buildings and physical assets, Amazon.com could pass the savings to the customer. Holding low inventory is a major contributor to the savings by having a
streamlined operation and process flow, Amazon.com met similar timelines as that of its competitors, but it didn’t need to hold much stock as its competitors. A measure of this is ‘inventory turnover’, it expresses how many times a year 100% of an organisations stock is replaced. In 1996, Amazon.com’s annual turnover rate of its inventory was 42, in great contrast to 2.1 for Barnes & Noble (Turban 2000). All this was possible by having an integrated supply chain and a focused Web presence, which could sense and respond to market demands.

2.6.2 DELL (www.dell.com)

DELL computers became an eEnabled Business, before the term eEnabled Business was even coined. The company has always operated under three commandments;

1. Avoid building up stock
2. Always listen to the customer
3. Never sell indirect

These management directives may be common sense in our contemporary literature, however in 1984, this line of thinking would have been unorthodox. DELL’s management used earlier forms of technology such as telephones to sell direct. To keep their inventory low they kept close to their customer’s needs and progressively made systems available to them that solved their problems.

In 1996 the process of improving the effectiveness of the three commandments (listed earlier in this section) led the organisation to its first stages of ‘webification’. Soon after the introduction of www.dell.com the company was making US$1 million
a day in sales, in 1998 this rate was US$12 million a day (Dell 1999). This was not
an accident, with the introduction of the Web service, the customers were consulted
in the type of features they found desirable, with customisation, on-line quotes and
purchasing have been on top of their list. In parallel, changes were made in the
internal operations of DELL with the introduction of an Intranet, a Web based
system which channelled appropriate information instantly to whoever needed it.
The company used a performance indicator ‘Inventory Velocity’ to keep inventory
supplies as short as possible, by increasing the speed of a transaction such as the
purchase of a machine and the delivery to customer.

For example, when a system is ordered by a customer, it is configured at a DELL
factory. It is then picked up by a courier who also arranges the pickup of any non-
DELL accessories from other manufacturers to fulfil the request. This whole process
relies on the close relationships DELL has with its supplier manufacturers and on a
reliable standard of quality. Most importantly, the money has been paid by a
customer upfront and the product is then configured, saving DELL millions of
dollars in inventory. This is in complete contrast to traditional computer
manufactures who only take payment for a computer system after it has been
delivered.

2.6.3 Case Studies of SMEs in Australia

The National Office for the Information Economy (NOIE) in Australia reviewed
small business adoption of eCommerce technology in Australia in a report in 2001
(NOIE 2001). This report was a distillation of 34 case studies on small businesses in
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Australia and highlighted several key aspects of how small business approached eCommerce their success/failure and future plans. One key finding was that the investment made towards eCommerce was proportional to the size of the organisation.

Most organisations were not able to maximise the impact of their eCommerce investment because some of their suppliers or customers were not connected to the Internet at the time. However, at the time of the report, many of these customers and suppliers were starting to connect to the Internet.

A key financial benefit came from efficiencies in using the Internet to conduct electronic transactions which resulted in improved productivity or lowered costs. Other efficiencies were derived from reduced in time and money spent on communication, by having a website and using e-mail instead of telephone, fax or face to face discussions. This in turn increased turn around time for orders and queries. Another benefit from their website was improved customer satisfaction and relationships with other businesses.

Most of the small businesses used an external professional website developer to create their website. Most however, were dissatisfied with the result and had to engage a different website developer to create another website that conformed to what they wanted.

Some organisations found that the use of the Internet for procurement completely transformed their supply chain to become more cost effective. Linking to key
suppliers or customers was highlighted as a key benefit from introducing eCommerce technology, either increasing productivity or reducing costs. At the time of the report the future plans were for some of the organisations to start integrating their online sales to their internal supply chain management system. They hope this will provide even greater financial benefits.

The small businesses acknowledged that eCommerce as a channel that was evolving and that the best way to keep track of its evolution was to be involved.

2.6.4 SaskTel

SaskTel is a government owned telecommunications carrier in the Canadian province of Saskatchewan (Thorp 2003). They were able to see a wider view of the importance their electronically stored information. They understood that roles, responsibilities and information ownership would be under constant change with the ever advancing information technology. Thus they developed a long term Intranet project, its aim to change the channels for business information sharing. In particular they focused on customer service operators and decided to measure their performance based on number of problems solved per customer rather than the number of calls per day. Using these driving forces the organisation was able to redesign its processes and implement an Intranet system that has reduced paper flows, and increase the rate at which information reaches the appropriate people. This has results in higher customer satisfaction.
2.6.5 Harris Technology

In a book by Lawrence et al (1998) they discuss the impact of eCommerce in the Australian marketplace. Harris Technology is a Small to Medium size enterprise that was profiled; it was a retail store originally located in North Sydney which continually expanded its eEnabled capabilities. At the heart of the Harris Technology operation was the Quotations, Inventory, Distribution, Sales (QUIDS) system. It provides live access to Harris Technologies stock and pricing information. The same information presented to staff is also presented to potential customers through the website. This gives customers a very useful tool to determine whether product is available, and allow the customer to choose to pick up a product in person or have it delivered. This is an example of how Harris Technology has used technology to link its supply chain from the warehouse all the way to the customer through an integrated digital system. Further claims are made that small companies can overcome the main advantages of large companies such as economies of scale and access to resources. Further, the value chain is becoming digitally based and organisations need to reach out to their customers and suppliers digitally. This enables new economies and modes of operation for both small and large organisations.(Lawrence 1998)
2.7  Key Aspects of an eEnabled Business

The following key aspects of an eEnabled business have been derived from the case studies above and the work of several authors (Bradley and Nolan 1998; Margretta 1998; Tapscott, Lowy et al. 1998; Gates and Hemingway 1999; Schwartz 1999).

1. Focused Web Interface
2. Digital Nervous System
3. In-house IT infrastructure
4. Just In Time operation
5. De-coupled Information from Technology

Each of these key aspects is discussed in more detail below.

2.7.1 Focused Web Interface

More than simply a Website with contact details, a focused Web Interface must provide customers with a solution to their problems. Web designers need to understand the customers and what type of information they will need when making a decision to purchase a product. That information needs to be readily available, accurate and reliable. The specific structure of that information is also dependant on the type of customer trying to be reached by the company. Overall the Web presence must help a customer in the way which a sales person helps a customer find a solution by providing information about a product or service (Schwartz 1999). This varies enormously based on the product and customer base, however fundamentally the product should be presented simply and the site should answer questions that customers might have.

There is still more work to be done past this point. The site must also have the capacity to be personalised to suit the customer. Buying a product/service that is
freely available means that any number of suppliers could be contacted. What needs to be done is for a customer to return to a site to conduct more business. It can be as simple as sending an e-mail to a customer when a new product line comes out, or one-click purchasing as introduced by Amazon.com (Quintner 1999). Other customers may prefer to have an interface to an organisation’s website customised for them depending on their individual needs. “The most successful Internet-only companies will be those whose business models are driven by Net-enabled customisation, speed and community” (Martin 1999). Some customers may not be currently on the Web as implied by the NOIE report (NOIE 2001), however, the Web is growing and youth of today in the developed world are Web literate and they will expect services to be available on-line for their convenience.

There are certain expectations of the operations of systems from within the enterprise and from the customer end.

Within the Enterprise

The website should be designed along the principle of open systems, standards hence easy to reconfigure by personnel who are familiar with technological standards. Speed of access in the other hand is related to the engineering of all components in the systems and how well they fit together, a well engineered system should be fast in its processing of information.

Customer End

The website should be fast from the customer end, download time should be minimised as much as possible, and the time lag between various steps of ordering
kept to a minimum. There is an expectation from the side of the customer that when they are making a selection the system should provide them with information as quickly as possible.

Examples
In the case of DELL, there has been a focused effort to conduct business over the Web. This direction has been set from 1996 when they decided to establish a Web presence. They focused on utilising the Web for ordering of PC systems, this was the main customer access point for facilitating the purchase of a PC. Most importantly they have integrated their Web presence to their backend IT systems. Information about a purchase is instantly registered and processed within DELL’s accounting systems and relevant orders to suppliers are dispatched (Margretta 1998). Their approach is ‘just in time’, and the customer is in control of the processes without the potential intimidation of a sales person. The customer is able to track the progress of their order right up until it is delivered.

DHL (Lawrence 1998) provides customers with the ability to organise and track shipments via their website. In addition calculating freight charges and opening an account with DHL can be handled by the website. DHL estimates that the website has reduced the number of telephone calls to customer service by 3000 a day.

A chapter in Don Tapscott’s book “Blueprint to the Digital Economy” is written by Lloyd Darlington (1998), Chief Technology Officer of the Bank of Montreal discusses the banking industry. He pointed out that the banks considered relationships with customers were paramount. They also considered banking over
the Internet to be the way of the future. The two issues combined resulted in the banks considering that their Web interface and functionality was of primary importance. Their ability to offer services and functionality that was easy to use over the Internet was the goal.

### 2.7.2 The Digital Nervous System

Computing started off as a centralised process centre with dumb terminals connected. The PC moved the processing to the individuals desktop. Then the increase in Local Area Networks (LANs) and the Internet have brought back the concept of centralised processing as either client server or Internet based service.

This move back to centralisation is, however, not without its problems. Politics is a big player as people want to keep information for themselves in terms of their own personal power agenda. Islands of knowledge are kept on certain servers or PCs not remotely available to other departments that might need it. Attitudes and systems like this will be the major blocking point for an eEnabled Business structure to be implemented.

The current battle is not to centralise but to allow the flow of digital information to create a digital nervous system which is made possible by using the Web (Ghoshal and Bartlett 1997; Tapscott, Lowy et al. 1998; Gates and Hemingway 1999). The digital nervous system can be described as the true integration of IT systems end-to-end of all external and internal business processes (Lucas 1996). Integrated means there is nil (or almost no) paper work involved, all trails of orders, procedures pass
through an electronic causeway. For any product or service the request must start digitally either from the customer directly or a customer representative (or other business). This request will then flow in a unique way dependant on the industry. This flow will be transparent to the customer and provide him/her with a product/service in a timely, quality manner. Another way of putting it is simply at no point in the process is there a break from the digital flow pathway.

When this is achieved what it actually allows is the possibility to have parts or all steps in the production geographically or chronically decoupled. For example, a PC is ordered by a customer. A parts list is generated for that particular order however the supplier of the mainboards is out of stock. This is all done electronically since one supplier is out of stock the system simply moves to the next suitable supplier of mainboards. The key benefit being that the administration is taken care of automatically, there is no need to wait for human action.

**Examples**

Part of IBM’s “smarter organisation” was the integration of “information silos” that had developed in the past (Harreld 1998). The capabilities of network computing meant each department with its own IT system could now be integrated. This provided access to information across departmental boundaries. This allowed the flow of information across departmental boundaries, encouraging a digital flow of information in the organisation.

BHP has used Electronic Data Interchange (EDI) to gain effectiveness in its transactions with the ANZ bank. It has also used Electronic Transfer Gateway
(ETG) as a method of transferring documents to its suppliers, customers and trading partners. Both these technologies have provided BHP with financial and efficiency benefits (Lawrence 1998). In 1998 BHP was investigating the use of the Internet to facilitate more links with customer, suppliers and trading partners. The results of the pilot project were shown to be successful; showing that the digital flow of information was a benefit to the organisation.

Freedom Furniture (Lawrence 1998) uses GENTRAN software to allow electronic connections for make payments or order placement. This eliminates the voice communication that would normally be required with customer service.

A research project (Nievelt 1999) which investigated 300 organisations across Europe and North America during 1983 to 1998 gathered information about how IT affects the economic performance of individual businesses. It has highlighted the importance of many of the same characteristics as the digital nervous system as shown by this quote;

“IT applications play an equally significant role (to supporting existing applications) by reinforcing or modifying a business’s structural characteristics; by improving coordination (e.g. groupware), communication (e.g. e-mail) and integration (e.g. electronic data interchange). Coordination enables many concurrent, often interdisciplinary activities, thereby, for example, reducing the time needed to deliver products to market. Communication provides the internal capabilities to produce information and feedback rapidly.”
Integration can link a business electronically with its suppliers and/or customers.” (Nievelt 1999)

Through a custom built business exchange application Frito-Lay (a major US snack food company) (Venkatraman 1999) was able to exchange structured data, images and memos with one of their trading partners McCormick & Co (a food industry company). This ability enabled both organisations to maintain lower inventory levels and place more confidence in the interoperability of data being exchanged by the two organisations.

A report (Weill and Broadbent 1999) of 27 firms and their firm wide IT infrastructure has highlighted that an organisation with separate incompatible IT systems impedes the ability of that organisation to respond quickly to competitor threats. The investigation highlighted that the type and extent of IT infrastructure was closely related to the strategy of the company overall. The following statement was made about IT infrastructure

“The purpose of building information technology infrastructure is to enable the sharing of information and expensive resources, the effective execution of business processes and connecting to customers and suppliers as part of the extended enterprise. This sharing can create cross business unit or cross functional integration to benefit from a combination of economies of scale, synergies and flexibility.”(Weill and Broadbent 1999)
2.7.3 In-house IT Infrastructure

The role of information technology has moved beyond just being a support activity to a critical activity in the enterprise mission. Developing this argument further, many companies experimented with outsourcing partially/fully their IT to outside entities, and in most cases it did not work (Willcocks, Fitzgerald et al. 1999). This was due to lack of commitment and understanding of local issues by outside entities.

Hagel has this to say about outsourcing:

“I do not, however recommend outsourcing the development of strategic applications. I talked to one company that was thinking about outsourcing its entire IT effort, and I asked them what would be left of their business! What would that company do if the vendor did a poor job or just walked away from the project one day?” (Gates and Hemingway 1999)

There must be at least one key individual who is well informed about IT and the operation of the business. Decisions about IT need to be made from both a technology and business perspective. This is difficult to achieve by someone outside the organisation. An example of this is from small businesses in Australia (NOIE 2001) that found the first website developer they dealt with disappointing and needed to repeat the process with a second website developer. Potentially they gained knowledge through the first interaction of the website to make the second a success or perhaps the second website developer was more professional. If outsourcing is to be used it needs to be managed to ensure the company gets what it needs. A business benefit needs to be the reason behind a decision to outsource; rather than a lack understanding of the technology being the motivation to distance the organisation from a difficult problem.
Examples

A survey (Willcocks, Fitzgerald et al. 1999) of 1000 medium to large organisations found that IT outsourcing was not managed properly. Many organisations had not evaluated their own internal capabilities or how the outsourcing would benefit their organisation. Service levels and costs were also not evaluated to any degree by a third of the organisations. Many organisation had not correctly evaluated how the IT outsourcing would benefit their organisation and as a result cost savings were not achieved. This was derived from a questionnaire sent to 1000 medium and large organisations in the United Kingdom (UK) in 1994. The sample was selected from the contact database of Business Intelligence, a UK based research organisation. Senior mangers from the IT areas of the organisations were the target of the survey and it elicited a response of 16.2%. Prior to the written questions a telephone survey was conducted with relatively open-ended questions to gauge the parameters of the questionnaire. The results of that fed into the written questionnaire that was finally sent out.

2.7.4 Just-In-Time Operation

Stock should be kept to a barest minimum as this has significant ramifications for cash flow for an organisation. The mechanics of ‘make and sell’ which required large amounts of items to be kept in stock for future sales simply won’t be competitive in the globalised world. The rate at which new materials, functionality or other product innovation become available make large stock piles a bad idea. Sense and respond is based on providing each customer with what they need when they need it. This is
apparent for all industries, just like craftsmen of the past were predominately replaced by assembly lines. The benefits of ‘sense and respond’ where products are made to order provide efficiency in cash flow and warehousing costs that are simply too great to ignore (Turban 2000).

Technology and customer needs change rapidly. If production is geared to make and sell, a business may find itself with an abundance of obsolete stock. The traditional concept of having a standing order of a specific product and a specific quantity being delivered regularly is being left behind in preference for competition and choice. Being able to meet the demands of customers and maintaining pace with competitors is vital to survival. Having products and services that are provided Just In Time, allows the maximum flexibility.

Examples
In the book “Blown to Bits” (Evans and Wurster 2000), two examples are given of the effects of competition and drive towards Just-in-Time operation. IBM’s reaction to competition from DELL was to move the assembly of its PC systems to dealers allowing them to create systems to order. Similarly Toyota with its aim to improve efficiency developed a “kanban”\textsuperscript{1} (Narjarian 2003) Just In Time manufacturing system.

\textsuperscript{1} Kanban was developed in Japan and in The Toyota Automobile Corporation where it was developed and refined. The Toyota executives observed that when customers withdrew goods from the small stocks on supermarket shelves, the stocks are replenished in small quantities by a stock clerk who checks the shelves and replaces only the quantity which was taken. The first pull signal came from the customer who withdrew the inventory and told the stock clerk how much to replenish. The Toyota executives reasoned that this supermarket concept could be adapted for management of a factory on a simple visual basis. Since it is impractical to have roving "stock clerks" in a factory, a card is used to communicate to the production foremen the fact that a shelf was empty. The Japanese word for card is kanban; hence the name Kanban for a pull system.
A rapidly changing business environment led General Motors to adopt a strategy that would try to anticipate customers’ needs (Barabba 1998). This would be achieved by moving away from a build and sell approach to a sense and respond style. The overall aim was to bring the organisation closer to a Just in Time mode of operation.

### 2.7.5 De-coupled Information from Technology

As computing evolved from the mainframe era, decentralisation took place which has generated a new set of problems for today’s organisations. One of the most significant is the information problem that plagues many organisations. Duplication and nonconformity are spread widely, often information is locked within proprietary systems not able to be converted into new generation systems, causing organisations to either make a considerable effort or lose that component of information. Today’s Information Systems need to be accurate and provide consistent information throughout the organisation. Without this, decisions can not be made quickly or more importantly, accurately.

If a system is proprietary it should be upgraded to an open system where possible. The use of open systems ensures that there is an upgrade path available because it is not tied to a single provider of technology. Similarly programming or other development work in relation to software should take an overall object oriented approach. Object oriented design allows for easier reuse and manageability of software code. These approaches are recommended so that when an organisation needs to adapt to new business events its Information Technology systems can also...
adapt with the organisation. Boar points out “The malleability of architecture is ultimately a function of its design; therefore, you must select and integrate a design methodology that ensures architecture adaptability to create or react to turbulence.” (Boar 1999). Information remains the same but the technology can get faster, wider reaching, more stable and secure. The information itself needs to be separate from the technology used or the software that accesses it. In this way a new system or new technology can be brought in and interface with corporate information. There is a real advantage in the ability to use the latest generation technologies with organisational information. This is a far better approach than being locked into propriety information systems that do not offer upgrade or integration capabilities.

Examples

Oracle gives a description of computing in the information age, pointing out that businesses use many different operating systems (Lane 1998). However that the technology should not be the focus rather the data that is held in the different propriety systems is the valuable asset.

2.8 Business in the Digital Age

Information Technology is the nervous system of the eEnabled Business. It will be integrated across all functions and it will coordinate their workflow like a virtual assembly line. A virtual assembly line does not mean it is not in existence, rather it can be viewed in a different way to traditional assembly lines. A virtual assembly line has: people, equipment and physical space, these are the sae, the way the work together is what is changing with the increasing use of Information Technology in
the workplace. IT is the leverage that has enabled this change. (Hagel and Singer 1999; Martin 1999). All aspects will be renegotiated, relationships with manufacturers and customers and even within the realm of the enterprise value activities will be realigned constantly (Martin 1999). This is not only occurring with large organisation like DELL and Amazon.com but with small business in Australia as well (NOIE 2001). They are currently at the starting point of introducing Websites and transaction over the Internet. Feedback from these businesses has shown to be positive through gains in efficiencies in transactions and communication as well as increasing sales. This is driving them to continue advancing their eCommerce sophistication. Some are changing their procurement methods and supply chain management to gain even more efficiencies. They are starting to take on the key factors highlighted in this literature review. Primarily they are dealing with their focused Web interface, turn around time on orders and their IT infrastructure. The more sophisticated factors of Digital Nervous System and Decoupled Information and Technology are indicated in the future plans of these small businesses. They intend to link their online order system to their internal supply chain management.

The emerging virtual framework will mean that the eEnabled Business will exist within this physical world but also within the cyber world. It is a matter of time before most businesses will face competition from a newer breed of eEnabled Business. The sectors of the economy, which will face most of the competition, will be in the information industry, were global competition is instantly available through any Internet connection.
Essential eBusiness technology will be made up of three types of technologies,

1. Telecommunications technology which allow point to point communications via the Internet.

2. Processors will provide functionality for servers as well as coordinating production machinery and/or service delivery.

3. Software technology which will be made up of server/Web components and robust database technology.

It is essential that these technologies do not lock people within a proprietary framework and allow open systems approach, due to constantly changing configuration management.

2.9 Conclusion

An attempt has been made to analyse the operation of existing eEnabled Businesses and gain an understanding of their source of success. These success factors have been looked from a generic viewpoint not biased by current technology and hype. Existing traditional enterprises can look at the change occurring around them as a threat or opportunity. However it should be noted, that a ‘do nothing’ policy is not an option. Simply due to the cost and time savings that the eEnabled business mode of operation offers, traditional modes of operation will not be able to compete.

Organisations need to consider the information age and how it will impact on their organisation. Competition is going to increase and not necessarily from know competitors, Information Technology has allowed an organisation like Amazon to
grow dramatically in a short period of time and be a major competitor for an established business like Barnes and Noble. Information Technology has made that possible, for other organisations they can either look at how they can gain improved capabilities and performance using Information Technology or wait until one of their competitors does.

This chapter has looked at organisations that have used Information Technology effectively in their organisations. From that analysis a few key factors have been identified and explained: a focused Web interface, an in-house IT infrastructure, just in time (JIT) operation, decoupled information from technology, controlled by a digital nervous system are key enablers of an eEnabled Business.
Chapter 3
eTransformation Roadmap

3.1 Introduction

The previous chapter highlighted the characteristics of an eBusiness and the reasons why its operations are more effective than a traditional business. This chapter discusses the first cycle of action research undertaken and how it led to the development of the eTransformation Roadmap. The eTransformation Roadmap serves as both a measurement and planning tool. It gives a visual representation of the major steps towards becoming an eBusiness. Each step represents a particular level of sophistication with respect to an eBusiness. This allows an organisation to visualise its current position and plan its future path. This Chapter presents the eTransformation Roadmap and how it was used with an Information Technology survey of Western Sydney.

3.2 Traditional Business to eBusiness

Following an understanding of the characteristics of an eBusiness the next step is to investigate how an existing business could adopt those characteristics. Different businesses would have their own unique business processes in place, in some case those processes would be closer to an eBusiness than others. Further, different businesses have different levels of IT sophistication. The issue was how to view the
current organisation and then develop a plan for that organisation to move towards becoming an eBusiness.

3.3 People, Processes and Technology

The first step in measuring the Information Technology sophistication of an organisation is establishing a set of metrics. The metrics chosen were based on three building blocks: People, Processes and Technology (Ginige, Murugesan et al. 2001). These three building blocks show the technology available, the employees’ ability to use the technology and processes in place to take advantage of both. These characteristics could thus be compared to the global leaders in eBusiness. At this point it is important to point out that a successful eBusiness is based on more than just the factors of people, processes and technology. Aspects such as, market share, quality, competition, government regulations, culture and many others play a significant role. However, these aspects are beyond the scope of this research work.

The fundamental building blocks of an enterprise are shown in Figure 3.1 Business processes, people, Information Technology (IT) and infrastructure that support them.
In this thesis it is proposed that, IT sophistication of an organisation is determined by how a piece of information technology is used with appropriate process in an organisation. This is an attempt to go beyond measuring Information Technology sophistication based on the number of computers in an organisation. An isolated view of people, processes or technology on their own does not give the full picture of sophistication in regards to our needs for eTransformation. For example, if the skill of employees is considered in isolation, the organisation might be considered to have high level of IT sophistication because it has a highly IT skilled workforce. However, if the organisation does not have the technology available such that the skills of the workforce could be utilised, then those IT skills are not being used by the organisation. On the other hand, if an organisation has IT skilled employees and technology available but is using processes that don’t maximise the potential of both employees and technology. Then neither the people nor the technology is being used effectively by the organisation. Then the organisation should not be considered to have a high level of IT sophistication. For our purposes, only through the combination of skilled employees, using appropriate technology with processes that
are designed to use both effectively can an organisation be consider to have a high level of IT sophistication.

### 3.4 Business Processes

Business processes deserve special mention and further discussion because it is usually the most difficult component of an organisation to address. Buying more technology and training people is difficult; however, either of these can, to certain extent, be carried out independently. However, when a process changes it requires that both technology and people change as well. This makes changing processes more difficult than any other aspect. It also impacts on the culture of an organisation, because in some cases people can become adverse to changes if it is not managed properly (McCalman and Paton 1992). However, the aspect of culture is beyond the scope of this work.

Processes are an important part of an organisation, it is not possible to meet the new and emerging demands of the business world without changing an organisations processes. Business processes have been continually changing to cater for market pressures and demands, to meet the customers’ needs and to remain competitive amidst advances in technology. The impact of the Internet and communications technology is having a fundamental effect that can not be ignored. These pressures are changing the way a business needs to operate, which translates into redefining its processes.
Chapter 3  eTransformation Roadmap

An example of this is given by Turner (1998) who has suggested that the availability of information and the capability to communicate easily gave individuals and groups new ways to interact. This resulted in new ways that a business can operate and provided productivity gain to the business. Communication can come in many forms from e-mail, online repositories to integrated backend systems.

New processes need to be identified which can capitalise on these new capabilities. For instance, written business communication such as correspondences memos and technical reports that relied originally on physical transmission through postal or personal delivery was dramatically changed with the advent of the facsimile, and more recently by email, mailing lists and information access through intranets. This required everyone to use computers to access information and prepare correspondences and memos for electronic transmission. As a result, the typing pool has long gone.

Other internal business processes, at least in some enterprises, are also being transformed with more sophisticated business planning and scheduling tools that heavily rely on IT such as Materials Resource Planning (MRP), Enterprise Resource Planning (ERP) and workflow software packages (Tapscott, Lowy et al. 1998).

External business processes have similarly been changing with time and technology. Facsimile and e-mail allowed faster placement of orders and with it an expectation of faster delivery of goods or services. Further, the use of computers enabled preparation of quotes and placement of purchase orders to become easier and faster. This has had a significant impact on turn around time (Schwartz 1999).
In the last few years, the Internet and Web has had one of the most profound influences on external business processes (Upton and McAfee 1996). Customer service: response to enquiries, after sales service and other customer relations functions have been significantly improved by e-mail and the Web. The Website(s) of an organisation has grown from a simple brochureware site that provided basic business information and contact details to a more sophisticated catalogue based site where orders can not only be placed, but also tracked. Further, some innovative enterprises provide online, interactive facilities that enable their customers to customise the products and services they want (Schwartz 1999).

3.5 Introduction to IT Survey 2000

In 2000 an opportunity became available for me to join a major research initiative involving a major Information Technology survey of Western Sydney. This was an ideal opportunity to gain further insight into how the businesses were operating with respect to eBusiness. I participated in the creation, dissemination and analysis of a major Information Technology survey conducted in Western Sydney, Australia. At the time I joined the research group the specifics of the survey, other than investigation of Information Technology usage of Western Sydney had not yet been established. I joined and participated heavily in the background investigation, the survey structure, question creation, analysis structure and interpretation of the results.

- Background investigation - Involved researching techniques for measuring Information Technology sophistication.
- Survey structure - Involved investigating the structure of survey’s, quantitative analysis and techniques to maximise response rates.
Chapter 3  eTransformation Roadmap

- Question creation and analysis - The components of question creation and analysis are closely related. To create the questions it was important to consider the intended analysis that would be conducted once the results had been collected.

- Analysis structure – methods of analysing the Information and Communication Technology usage were investigated. Their aspects were discussed in the group and a method was developed to analyse the data.

- Interpretation of the results – This mainly involved putting the data through the analysis structure developed. I helped create several different graphical representations used to clearly show the results obtained.

The survey instrument was sent out to 4,356 organisation and 590 responses were received. The region that was under investigation was Western Sydney in Australia, the third largest economic region in Australia and has ten percent of the Australian population. In 2000 it had 72,000 businesses across 14 local government council areas. The aim was identifying how the region was using Information Technology for their Internal and External business process. The survey showed the technology present in a business, the skill of the people using the technology and the how the processes are organised around technology. The IT Survey was conducted with support from the NSW Minister for Western Sydney, Office of Western Sydney and Greater Western Sydney Economic Development Board. The information presented here in relation to the IT Survey its results and recommendations have been published by the University of Western Sydney (Ginige, Murugesan et al. 2001). A copy of the report was mailed to all the participants who responded to the survey and made generally available to all government and business bodies that were interested.

Another IT Survey of Western Sydney was conducted in 2003. The same survey instrument was used, with some minor modifications. This will allow the results
obtained in 2000 to be compared those from 2003. At the time of writing the 2003 survey responses were being analysed.

3.5.1 Methodology used for IT Survey 2000

Though mail-out surveys are widely used, there are a number of limitations, such as the low response rate (Singleton and Straits 1999). Actions were taken to minimise these. One method used to maximise responses was to include a cover letter from the Minister for Western Sydney. This was done to give a perception of the importance and significance of the survey being conducted. The cover letter was personally addressed to the CEO of organisation to emphasise the importance of the survey. The purpose was that even if the CEO did not complete the survey themselves they would delegate it to an appropriate person, again giving a sense of the importance of the survey. Since many of questions spanned a number of functional areas within an organisation it was indicated in the survey that it could be completed by various employees of the organisation as appropriate. A complimentary copy of the survey was promised to all those who responded to survey as well as being invited to attend a presentation that would be held to launch the report.

3.5.2 The Survey Instrument

The first step that was undertaken was to investigate similar surveys in existence. The other surveys that were investigated did give some insight into questions that could be asked. However none of the instruments investigated matched the needs of
this research project. Thus the group needed to brainstorm new questions to suit the hypotheses we had developed. A description of the sections developed is shown in Table 3.1. The questions in each section look at the people, processes and technology with respect to that section.

<table>
<thead>
<tr>
<th><strong>Section of Survey</strong></th>
<th><strong>Purpose of questions</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Detail of the organisation</td>
<td>To gather general information about the organisation for example: Name, industry, size.</td>
</tr>
<tr>
<td>IT Infrastructure</td>
<td>To determine the specific numbers of Information and Communication Technology devices in the organisation.</td>
</tr>
<tr>
<td>Network Infrastructure</td>
<td>To determine if they have the ability to share documents, e-mail or other inter-office communication.</td>
</tr>
<tr>
<td>Internet Infrastructure</td>
<td>To determine the ability and type of communication they use to communicate and share information outside of the organisation.</td>
</tr>
<tr>
<td>Website and electronic commerce capability</td>
<td>To identify the presence and capability of an organisation’s website.</td>
</tr>
<tr>
<td>ICT Industries in Western Sydney</td>
<td>Only relevant if the organisation is involved in the ICT industry. Attempt to determine how they interact with the region.</td>
</tr>
<tr>
<td>Future Plans</td>
<td>To determine their plans to introduce technology or increase its use in the organisation.</td>
</tr>
<tr>
<td>Budget</td>
<td>To determine the amount of funds an organisation intends to put towards growing its ICT and eBusiness capabilities.</td>
</tr>
<tr>
<td>Feedback</td>
<td>Questions about the survey instrument itself to gain feedback for future potential use.</td>
</tr>
</tbody>
</table>

Table 3.1 Description of the Sections in the IT Survey

3.5.3 Sampling

There are 72,000 businesses in the Western Sydney region; the sample that was selected covered 18 industries and 14 local government areas. The population is 1.8 million, approximately 10% of the total Australian population. The GDP of the
region is $36 billion (1999) and is the third largest economic region in Australia. To select the sample, the industries were grouped as small, medium or large representations. These relate to the number of organizations in a particular industry sector as shown in Table 3.2.

<table>
<thead>
<tr>
<th>Small representation (&lt;200 organisations)</th>
<th>Medium representation (200-1000 organisations)</th>
<th>Large representation (&gt;1000 organisations)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining</td>
<td>Agriculture, forestry, fishing</td>
<td>Manufacturing</td>
</tr>
<tr>
<td>Electricity, Water, Gas</td>
<td>Accommodation, restaurants</td>
<td>Construction</td>
</tr>
<tr>
<td>Communication</td>
<td>Transport, storage</td>
<td>Retail</td>
</tr>
<tr>
<td>Telecommunication</td>
<td>Finance, Insurance</td>
<td>Health and Community Services</td>
</tr>
<tr>
<td>Government, Admin, Defence</td>
<td>Property, Business</td>
<td>Wholesale</td>
</tr>
<tr>
<td></td>
<td>Computer Services</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Education</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cultural, Recreation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Personal and Other</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.2 Industries in Western Sydney

As seen from Table 3.2, there are a few industry sectors that have only a few organisations in the Western Sydney region. If a purely random sample was taken it would unlikely that any of these organisations would be present in the sample because of their limited presence. Accordingly these groups were then over-sampled to compensate and maximize response rate. The remaining organizations were sampled randomly with respect to the proportion representation in the region. Another way in which the sample group was viewed was based on the size of the
organisation. Organisations were categorised based on the number of employees present, as small, medium or large size organisations.

A sample size of 4,356 was considered adequate and also met the budgetary and logistical considerations. In the selection of the sample the following were addressed:

- Duplication across industries because a single business was classified in multiple industry classifications.
- Some organisations main activity did not match their industry classification
- Some organisations were sent a survey based on their location in a particular local government area but on receipt of the survey they indicated a different local government area.

After the questionnaires were sent out, we received 400 responses. To attract further responses, a follow-up reminder was sent. This increased the response by a further 50%, bringing the total number of responses to 590. This represents a response rate of approximately 13.5%.

When processing and entering the data several issues arose. For instance, responses to questions such as “Does your organisation use computers?” had a response of “no”, yet information would be provided about numbers of computers and their use. In these instances the data was rectified appropriately.

The sampling error in relation to the 590 responses at the 95% confidence limit is approximately ±4%. This means, if half the respondents agree and half disagreed on a specific issue, then in 19 out of 20 cases the true percentage of organisations agreeing would range from 46% to 54%.
3.5.4 Results of the IT Survey 2000

The raw figures as shown in Table 3.3 show that there is a great deal of use of Information and Communication Technology in the Western Sydney region.

<table>
<thead>
<tr>
<th>Size of the organisation (employees)</th>
<th>Use Computer</th>
<th>Have LANs</th>
<th>Connected to Internet</th>
<th>Have Web Sites</th>
<th>Those in IT related business</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small &lt;10</td>
<td>81%</td>
<td>32%</td>
<td>35%</td>
<td>28%</td>
<td>5%</td>
</tr>
<tr>
<td>Medium 10 - 100</td>
<td>96%</td>
<td>70%</td>
<td>69%</td>
<td>50%</td>
<td>9%</td>
</tr>
<tr>
<td>Large &gt;100</td>
<td>100%</td>
<td>93%</td>
<td>93%</td>
<td>73%</td>
<td>7%</td>
</tr>
<tr>
<td>Total</td>
<td>88%</td>
<td>53%</td>
<td>54%</td>
<td>41%</td>
<td>7%</td>
</tr>
</tbody>
</table>

Table 3.3 Computer Usage

Figure 3.2 Computer Usage
Of all organisations that responded to the survey, 89% have computers, the details are shown in Figure 3.2 and Table 3.3. All large, nearly all medium and just over 4 in 5 small organisations have computers. In terms of other technologies such as Local Area Networks (LANs), the figures show a much wider spread. The results are lower across all size organisations for Internet connection and Websites.

![Current Information Technology Applications](image)

**Figure 3.3 Current Information Technology Applications**

In regards to applications in use in the workplace, as shown in Figure 3.3, e-mail was ranked as most significant for large organisations, for medium size organisations it was both e-mail and accounting, while for small organisations it was accounting.
Skills in using IT applications were also explored, with the main area of skills prevalent being in office productivity as shown in Figure 3.4. E-mail and Web browsing were also strongly represented. Use of database, project management or statistical packages was much lower at approximately the 10% mark.

Table 3.4 LANs, Intranet and ERP Systems

With respect to LANs, Intranets and ERP systems, large organisation had the largest participation with 93% having a LAN, 57% having Intranet and 43% having an ERP
system. Medium size organisations followed with 71% with LANs, 34% with Intranets and 13% with ERP implementations. Small business had a much lower response.

![Figure 3.5 Usage of LANs](image)

**Figure 3.5 Usage of LANs**

Most organisations use of LANs has been in printer and file sharing as shown in Figure 3.5. Application and file storage are also had a high response. The lowest was accessing customer information or inventory.

Beyond the basic raw figures there was a deeper analysis of the responses to map how the ICT was being used in Western Sydney. To enable use to do this, the eTransformation Roadmap was developed. The following section describes the creation of the eTransformation Roadmap and it is followed by how it was used with the data collected from the IT Survey 2000.
3.6 The eTransformation Roadmap

A key aspect of IT Survey 2000 was how the data should be analysed. Simple measurements of percentages and numbers of computers or other equipment gives only a limited insight into how the organisation is using technology. Thus the eTransformation Roadmap discussed in this section was developed. The eTransformation Roadmap allowed the visualisation of the raw measurements gathered in the survey into a meaningful measure of how Information Technology was being used in the organisation. This section of the thesis discusses background and details of the eTransformation Roadmap, followed by how it was used with the results of IT Survey 2000.

The eTransformation Roadmap measures the eBusiness readiness of an organisation by looking at how people, processes and technology interact. The eTransformation Roadmap has two arms, internal processes and external processes. The sophistication of the interaction of ‘people, processes and technology’ will place an organisation at a position on both the internal process arm and external process arm. Both these arms join to form the point of convergence of internal and external processes and it represents a level of IT sophistication that allows an organisation to fully operate and participate as an eBusiness. The eTransformation Roadmap is shown in Figure 3.6.
Figure 3.6 The eTransformation Roadmap

The roadmap also identifies the steps an organisation needs to take in transforming itself into an eBusiness and guides the organisation in the transformation journey. Thus, the roadmap serves the dual purpose: i) mapping the current level of IT adoption by an organisation, and ii) guiding an organisation in its eBusiness transformation process.

3.6.1 Nolan’s Model of IT Sophistication

The inspiration for the eTransformation Roadmap came from Nolan’s model of IT maturity (Nolan and Croson 1995). The final version of Nolan’s model as shown in Figure 3.7 was created in 1988. On its own is limited because it does not take into account any newer technology such as Networks. Also, it is based on financial indicators which would also not be suitable for our needs. However, it did inspire the eTransformation Roadmap through its breaking down of technology into stages.
that had particular characteristics. This principle was used with the eTransformation Roadmap where stages would be represented by particular characteristics of people, processes and technology.

![Nolan’s Maturity Model]

**Figure 3.7 Nolan’s Maturity Model**

### 3.6.2 Background of the e Transformation Roadmap

Several different aspects contributed to the development of the eTransformation Roadmap. As described in the previous section Nolan’s Model acting as inspiration for the structure of the model itself. Another major contribution was from the literature review described in Chapter 2 which showed the key characteristics of an eBusiness. Thus these two ingredients gave a visualisation mechanism and an end goal of an eBusiness. However simply having an end goal target would not be enough for a business, they required something that would take into consideration
Chapter 3  eTransformation Roadmap

their existing eBusiness sophistication in terms of People, Processes and Technology. Thus the last contributing factor to the eTransformation Roadmap was the development of a mechanism to measure the existing IT sophistication of an organisation. This is the key component that was directly related to the IT Survey 2000 discussed in the previous section. An investigation into how Information Technology can be measured was conducted. Through the examination of several existing IT surveys (Newsted, Huff et al. 1998; McLennan 1999; Rubin 1999; Taskforce 1999) characteristics were identified that could be related to key aspects of an organisation’s IT sophistication with respect to People, Processes and Technology.

All these factors combined: Nolan’s Model, Literature Review and existing IT measurement tools contributed to the development of the eTransformation Roadmap. The characteristics of an eBusiness have been determined; however this does not take into account the existing infrastructure and sophistication of an organisation. Without that information it would be difficult to choose what should be changed in an organisation. The eTransformation Roadmap views IT Sophistication from both an internal and external perspective. This mimics how a traditional organisation often develops; first they had developed internal IT systems to improve their organisations. Then when the Internet became an increasingly significant part of the business world they added on some form of external IT system for the Internet. In most cases these two systems were completely separate. What the successful eBusinesses have shown is that there are benefits to be gained through the convergence of these two systems. The eTransformation Roadmap shows the path to
reaching convergence. It also acts as a measuring tool to determine where an organisation is on that roadmap.

The arms and building blocks were chosen looking at the way an organisation normally increases its’ sophistication of both internal and external processes. Then specific characteristics of each of those levels was determined, the following sections go into detail for each block in the eTransformation Roadmap.

3.6.3 Levels of the eTransformation Roadmap
The following Table 3.5 and Table 3.6 describe the characteristics which represent the sophistication for each box in the Internal and External processes. Each of the boxes has a particular set of characteristics in relation to people, processes and technology. Thus, an organisation can see how its characteristics place it on the eTransformation Roadmap. It also gives the organisation a visualisation of steps ahead between there current form and that of an eBusiness.

<table>
<thead>
<tr>
<th>Effective Individual</th>
<th>Technology that enhances a single person's ability, e.g. a PC and accounting software</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective Team</td>
<td>Technology that allows people to work together e.g. e-mail, shared drive</td>
</tr>
<tr>
<td>Effective Organisation</td>
<td>Technology that crosses the entire organization and enhances a core process of the organization e.g. ERP system, manufacturing control system</td>
</tr>
</tbody>
</table>

**Table 3.5 Internal Processes**
### Table 3.6 External Processes

<table>
<thead>
<tr>
<th>Basic Website</th>
<th>Displays the name of the organization and contacts details only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interactive Website</td>
<td>Provides up to date information about products and services of the organization</td>
</tr>
<tr>
<td>eCommerce site</td>
<td>Has the ability to accept orders and process monetary transactions for goods or services</td>
</tr>
</tbody>
</table>

The eTransformation Roadmap then shows another box which is labelled ‘Convergence’. If an organisation has reached this stage in the Roadmap the organisation has been able to link its external and internal processes. The people, processes and technology are available and being utilised effectively. This would indicate that an order is handled the same regardless if it comes through traditional or Web channels. The IT systems are all integrated allowing the process of providing goods or services to their customers to be controlled. This is currently the highest level of sophistication that is on the map but there is potential for more in the future. Examples of organization that have this highest level of sophistication are DELL and Amazon.com.

#### 3.6.4 Analysis of Survey Data with Respect to the eTransformation Roadmap

The survey data was overlaid using the eTransformation Roadmap to give a snapshot of the eReadiness of the region. Thus the whole region could be viewed with its capacity to operate and interact as eBusinesses. The results showed the readiness of Western Sydney and found that few companies were participating in eBusiness. In
addition, a few had the capability of being an eBusiness or linking to other eBusinesses.

It was discovered that organisations did indicate that they wanted to transform but felt they lacked the resources. These organisations were aware that a lot of hype existed in the IT industry. However, they felt they did not have the resources to distinguish real benefits from the hype of sales people. Some organisation tried using consultants to implement specific IT projects. However, the organisation would sometimes be disappointed afterwards when there was little support provided. This lack of support post installation was the area of most concern for these organisations. It has led to the development of an initiative in UWS called eTransforming Western Sydney. The group’s aim is to combine research in the area of eTransformation with practical co-operation with organisations to allow them to transform.

The results of the IT Survey 2000 data mapped to the steps of the eTransformation Roadmap are shown in Figure 3.8. Each graph represents a stage in the eTransformation Roadmap. The horizontal scale rates the level at which an organisation has taken on the characteristics of that particular stage of the eTransformation Roadmap. A ‘0’ is none of the characteristics a ‘5’ is all of the characteristics. The vertical scale is the percentage of businesses in Western Sydney. It quickly allows internal and external sophistication to be viewed. It is clear that the internal IT sophistication is leading the external IT sophistication. Organisations need to be aware of this and plan their IT investments to allow them to reach convergence as soon as possible while minimising expense.
Figure 3.8 Results of IT Survey 2000

An explanation of each of the graphs shown in Figure 3.8 is given in Table 3.7 and Table 3.8. If an organisation has scored a ‘4’ or ‘5’ they have most of the characteristics of that particular level of IT sophistication, thus each of the entries in the table below shows the sum of those top two percentages.

<table>
<thead>
<tr>
<th>Effective Individual</th>
<th>77% this means most business have the characteristics were individuals are supported in their work by Computer technology.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective Team</td>
<td>75% of businesses effectively use Information Technology for communication within a team.</td>
</tr>
<tr>
<td>Effective Organisation</td>
<td>43% have some form Information Technology that helps them manage their organisation across functional units and processes.</td>
</tr>
</tbody>
</table>

Table 3.7 IT Survey 2000 Internal Processes
Chapter 3 eTransformation Roadmap

<table>
<thead>
<tr>
<th>Basic Website</th>
<th>68% have some form of website presence.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interactive Website</td>
<td>44% have a website that provides some form of catalogue or in-depth information about products lines or services.</td>
</tr>
<tr>
<td>eCommerce site</td>
<td>24% have the ability to take and process and order online.</td>
</tr>
</tbody>
</table>

Table 3.8 IT Survey 2000 External Processes

As well as giving this snapshot of the Western Sydney region the research also highlighted that there is a need for a methodology and set of tools that will allow an organisation to independently transform. An organisation needs to be able to skill its own employees to have an appreciation of eTransformation and how to use the tools of transformation. SMEs can not afford to hire expensive technology experts to come in and fix their organisation. The development of the methodology and toolset is one of the key goals of the eTransforming Western Sydney research group.

The following chapter describes the eTransformation methodology which explains how to progress through the steps presented in the eTransformation Roadmap. The research in this area is continuing at UWS; several researchers and three PhD students are examining specific aspects of the eTransformation Roadmap, eTransformation methodology and other aspect surrounding organisational change.
Chapter 4
eTransformation Methodology

4.1 Introduction

The previous chapter discussed the research conducted in the Western Sydney region of Australia to determine its status and potential to participate in eBusiness. It discussed the eTransformation Roadmap that was developed to determine the position of businesses with relation to their capacity to be an eBusiness.

Organisations that want to advance themselves along the eTransformation Roadmap to become an eBusiness require a methodology to change their people, processes and technology to reach that goal. This chapter discusses the second action research cycle, the specific learning in the previous chapter which resulted in the eTransformation Roadmap has driven the diagnosing stage of this action research cycle. This chapter describes the issues related to organisational transformation and presents the eTransformation methodology which was developed. The eTransformation methodology is designed to help an organisation transform itself to advance along the stages identified in the eTransformation Roadmap. A detailed review of organisational change and Business Process Re-engineering was carried out. In addition, the outcome of an organisation change effort with an industry partner is given in this chapter.

This chapter begins with a literature review of existing issues and approaches to the transformation of an organisation. It is followed by a brief look at the role of
Chapter 4 eTransformation Methodology

Information Technology in transformation. Specific techniques in existence are then reviewed. This is followed by a description of the action research with Advance Metal Products an industry partner with the University in our research. The concluding part of this chapter describes the eTransformation methodology that was created as a result of the literature review and action research carried out.

4.2 Background to Organisational Transformation

Having established the need for business processes to change, the next challenge is how to approach this change effort. Current approaches to eBusiness transformation are often narrowly focussed on only a very specific aspect of business or information systems/technology. For instance, Business Process Re-engineering (BPR), change management and strategic information planning systems mainly focus on a limited view of the change process (Ghoshal and Bartlett 1997). BPR, widely used in the 1990s, focused on the processes involved in a business, but did not consider the culture and people involved. Change Management on the other hand focused closely on people, culture and what techniques foster change; but it did not consider the processes, support infrastructure or technologies involved. For successful transformation, there needs to be a combination of technical skills of process re-engineering and Information Technology with change management skills (Markus and Benjamin 1997). Other approaches and processes such as ISO9000, TQM and Balanced Score Card are useful for evaluating the processes and benchmarking performance; but they do not assist us in redesigning a business (Malhorta 1998).
Hammer in 1990 proposed clean sheet transformation in his paper “Re-engineering Work: Don’t Automate Obliterate” (Hammer 1990). This widely read paper suggests that the only way to succeed in reengineering is not to automate existing processes but to dramatically transform them. Existing processes need to be wiped and new process need to be designed using fresh innovative ideas combined with Information Technology. These new process need to be outcome-oriented not task oriented. In addition, the people who are closest to the process need to be placed in control to minimise the overheads in managing those processes. Hammer highlights that existing inefficient processes often have never been planned in the first place. They have been created in an ad-hoc manner because of the necessity at the time and then later become standard procedure. These procedures then become difficult to break because of habit. That is why Hammer promotes processes to be completely redesigned, to create an effective process that is relevant to the business’s needs.

Hammer in a revised book published a decade later in 2000 (Hammer and Champy 2001) co-authored with James Champy, has maintained his stance on dramatic re-engineering. They have also criticised companies that have used the terminology of re-engineering to simply reduce staff numbers rather than trying to improve processes. The book goes into much more detail than the original paper. Some of the key relevant aspects emphasised by the book are:

- Technology on its own will not solve any problems
- Companies should have process charts to show the major processes in an organisation
- Process names should be descriptive, e.g. Product Development: concept to prototype
• Process owners are central to successful companies, examining existing processes is the first step to successful redesign.
• Not all core processes can be simultaneously reengineered.

Davenport, another leading author in the re-engineering field, has proposed the concept of Process Innovation (Davenport 1993). He also proposes an approach described as socio-technical in its nature, this requires that technology, social aspects and organisation goals are taken into consideration when transforming an organisation. Davenport believes that continuous improvement and radical change need to coincide. Organisations need both stability to maintain morale and productivity. While at the same time watch their most important processes and identify opportunities to use radical process innovation to gain competitive advantage. He suggests some form of interlaced approach that tries to balance the radical with the incremental.

Gallier’s (1997) has argued that radical change is not necessarily required to achieve significant process improvement. Similarly massive change can not be sustained through the organisation on a continual basis. Gallier’s advocates change may be interlaced with radical change followed by a period of incremental change. IT is acknowledged as a key enabler and driving force for change (Grover 1993; Truex, Baskerville et al. 1999), but it needs to be guided by business needs rather than IT goals. The socio-technical approach sighted by Davenport is applauded by Gallier’s. This should be coupled with change that contributes to organisational learning, ensuring that stakeholders participating in the process increase their skills (Pettigrew 1998). Rigidity in the change technique is also something that is to be avoided when carrying out change in an organisation. As with existing processes, the change
process itself should not fall into the trap of “this is how we have always done it” syndrome.

Grover, Kettinger and Teng in an interview in 2000 (Grover 2000), discuss key issues in relation to Business Process Change. Grover et al. (2000) points out that about 50% of business change failures can be attributed primarily to shallow change. Shallow changes are small changes to an existing process that are conducted in isolation and do not contribute the vision of the business (Grover and Kettinger 1998; Grover 2000). Many organisations don’t pay adequate considerations to structural alignment, skill development, and procedural changes that affect the people and the organisation. “The real place to look for change is not the Internet but inside your company – at your own organisational culture and your attitude toward change (Kanter 2001)”. In addition, their stance is that there does not exist a single magic formula that allows change to be successful every time. Any change effort needs to be customised to the specific environmental variables of the project and always have a strong emphasis on the people involved (Brill and Worth 1997). Hammer’s early work that called for clean sheet change is examined and described as being unsustainable, rather incremental change needs to become part of the organisation’s culture. Change efforts should be multidisciplinary, strategically planned and customised to the specific nature of the change.

Bjorn-Anderson and Turner (1998) describes a transformation effort where change was driven by management’s holistic vision with a very intensive view on the people. All employees were guaranteed their jobs through the metamorphosis. All were invited to participate in the change and more than 50% did. Skills of
employees were paramount. Rather than business processes being developed, people were empowered and allowed to naturally develop their own business processes. Incentives were given in the form of share holdings, with an aim to have the company 25% owned by employees. The outcome of the change was not documented in the investigation but the initial results seemed pleasing.

A 1999 article in Information Week (1999) derived from a review of 300 IT executives describes the characteristics of successful transformation as:

- Rapid transfer of knowledge, both within companies and across the value chain
- Participation of IT at every juncture, an increased involvement of IT in business decision-making and within the culture of the organisation
- Increased speed at which decisions are made, about new products, new strategies, and new technology implementations
- People with a willingness to engage and act on new ideas and new realities
- Communications is heart of the concept both within and outside the business.

In an EAI Journal article, “CIO to CPO” (Schmidt and Howard 2001), the benefits of process over information is projected. Processes need to be measured, compared and discarded if they are ineffective, while championing new ones.

Davenport in a paper co-authored with Short (Davenport and Short 1998) proposes the process based organisation is the key to success. However, they have raised the fact that transitioning from an existing traditional structure to purely process based one can pose high risk. They have highlighted examples of companies with a hybrid approach keeping some of the traditional structure but assigning process responsibilities as a more suitable approach. They have also emphasised the
importance of people. People who will act as process owners need to be persuasive in their nature rather than relying on traditional authority.

### 4.3 Radical versus Incremental Change

The main contention between the above authors’ approaches to BPR is between radical versus incremental change. Radical change does seem to offer the greatest level of change but it has the potential to cause significant negative impact on the organisations and their people (Orlikowski 1993; Pettigrew 1999). It is also unlikely to be sustainable from a long term perspective; continuous major change could be very disruptive (Galliers 1997). Incremental change appears to offer a more sustainable approach. However, if the overall process is not challenged, it is questionable whether the incremental changes would truly bring significant benefits to the organisation.

The solution that seems most beneficial is not to strictly maintain either stance and rather use radical or incremental as appropriate for the situation. It would mainly involve continuous incremental change with an occasional radical change effort.

Human factors are highlighted by all authors as a significant factor in a change either radical or incremental. People’s attitudes and capacity for change need to considered at all times.
4.4  Information Technology’s Role in Organisational Transformation

Davenport and Short (1998) have stated that Information Technology is an important ingredient to a successful organisation. However, it should not play a leading role but rather provide support for any new process developed. New processes should be customer centred and supported by IT. Turner (1998) supports this view and argues strongly that IT is an enabler rather than a driver of change. Bjorn-Anderson (1998) has written an investigation of the metamorphosis occurring at Octicon. The metamorphosis had IT as supporting role only and the initial results seemed promising. In the article “CIO to CPO” (Schmidt and Howard 2001), Schmidt argues that the role of IT is to support business goals. Information Technology should not be implemented for the sake of having the latest in technology. Information Technology needs to support business initiative.

In many enterprises, the change or transformation is driven by either IT alone, or business alone without really identifying the synergy between them. Further, when significant changes are introduced through Business Process Re-engineering (BPR), it does not consider the people and stakeholders affected by the change or the culture of the organisation (Schwartz 1999). These kinds of problems are not new; they surfaced when any new technology or process was introduced to an organisation. What makes them different, and perhaps more significant in the context of eBusiness transformation is the rate at which new technological advances are taking place and being adopted by an industry. This considerably reduces the time an organisation has to understand, evaluate, and implement changes to transform its business operations.
Information Technology is also able to support the eTransformation process itself, helping those carrying out the eTransformation. The actual capturing and investigating existing processes can be enhanced by using Information Technology. This can be from the simply using software based Business Process Modelling tools up to full simulations. Similarly the implementation of change process can be enhanced, perhaps by having an online user’s guide or providing material that can be downloaded to help with the new process.

Information Technology also plays a role in terms of its capacity to integrate across traditional departmental boundaries. It is the enabling factor that allows information that is generated in one department to be instantaneously available to another department, this was not possible before the advent of networking and the widespread use of computers. For example, once a customer service operator receives and order, he or she enters that information into their terminal. That information is then automatically available to a stock or provisioning person who can gather the items for that order. They would then update the system that the goods have been packaged and then a delivery person would know to pick up those goods and where to deliver them. This would speed up the time between placing an order and receiving goods. This provides for a better customer experience and the ability to carry out more sales in a shorter period of time, and generally speaking making a more profitable organisation.
4.5 Problems Plaguing Organisational Transformation

Organisational or business process change is neither easy nor smooth. Many organisations have failed, damaging, rather than enhancing, their competitiveness. Major problems plaguing transformation include (Ginige, Murugesan et al. 2001) (not in any specific order):

- Lack of business-IT alignment  
- Incompatible IT systems  
- Lack of considerations to people aspects and organisation culture  
- Pace of change  
- Narrow focus and lack of vision  
- Misplaced eBusiness and IT priorities  
- Lack of direction and responsibility resulting from involvement of many department/players  
- Inappropriate training and handling of change management issues

This chapter so far has highlighted some of the overall issues and approaches that relate to organisational change. There is still a difference of opinion in regards to radical versus incremental change. Our approach to eTransformation recognises that both are needed, continuous incremental change with occasional radical change when required. The following section gives specific details of techniques that are available to carry out organisational transformation.
4.6 Existing Business Process Re-engineering Techniques

The following is a literature review into Business Process Re-engineering (BPR). This review contributed greatly to the basis of the research outcomes shown later in this chapter.

One key source of information came from a study conducted by Kettinger and published in 1997, in MIS Quarterly (Kettinger 1997). Kettinger’s study focused on Business Process Re-engineering (BPR) and identifying common aspects across various techniques. Kettinger conducted a very extensive review of Business Process Re-engineering techniques from major consultant companies at the time. From this review of more that 72 techniques he has distilled 6 stages that are common to most of the techniques;

1) Envision – Set organisation strategy and goals
2) Initiate – project plan, identify stakeholders and determine requirements
3) Diagnose – document and analyse existing process
4) Redesign – define and analyse new process
5) Reconstruct – reorganise, implement IS, train users
6) Evaluate – evaluate process performance

Each stage is further broken down into sub-stages, where Kettinger describes each sub-stage may be emphasised or ignored depending on the nature of the change taking place. Kettinger’s work was a major influence in this action research cycle and it contributed to the development of the eTransformation methodology that is described later in this chapter.
Davenport and Short give a 5 step mechanism for redesigning processes (Davenport and Short 1998):

1. Develop Business Vision and Process Objectives
2. Identify Processes to be Redesigned
3. Understand and Measure Existing Processes
4. Identify IT levers
5. Design and Build a Prototype of the Process

A synergy can be seen between these steps and the work conducted by Kettinger.

Some of the other aspects highlighted by both the authors are:

1. All core process should not changed at the same time
2. Processes should be Customer (outcome) focused
3. Review and change the whole process not automate the existing ones
4. Use IT to support (not drive) new process
5. People are crucial to any change effort
6. Persuasion and influence will work better than authority in the new process centred business world
7. People who use the process outcomes are best suited to controlling that process
8. A process owner is crucial to processes operating well

Based on the literature investigation into the approaches and techniques of organisational change action research was carried out with Advance Metal Products the industry partner involved in this part of the research. The outcomes of that research are reported in the next section.
4.7 Action Research with Advance Metal Products

One of the main driving forces that led Advance Metal Products (AMP) to ask UWS for help was the promise of a long term relationship. This is an indication that the organisation preferred to have a long term relationship with technology experts to allow their organisation to grow. This is different to the relationship with consultants at the time which were project based, with little or no post installation support.

Initial discussions held with AMP centred on their desire to become an eBusiness. These early discussions revolved around Digital Value Hubs (DVH) and B2B relationships. The aim then was to discover what would be needed for Advance Metal Products to become a DVH for the sheet metal industry. From our earlier work described in Chapter 2 and 3, it was clear that this task could not be carried out in one step.

Through discussion with the Managing Director of the organisation he outlined the organisations business plan and highlighted the importance of the sales departments’ activities to the organisation. As specified in the eTransformation methodology the first stage is Business Strategy, where the overall business plan is needed to guide any eTransformation. Thus it was decided to focus on a specific part of the organisation to carry research out. Two additional reasons for this were: firstly, to minimise the financial impact of the transformation and secondly, to allow visibility of the changes occurring and allow fine tuning or changes to be implemented during the transformation. Other aspects such as change management and the impact upon employees favoured a slow incremental transformation.
The component that was to be looked at first was the customer relationship part of the business. This was chosen because it would have the most impact on the external world and would also not cause too much disruption to the internal business. Another reason was that the industry partner at the time was not certain what impact the joint research work with the University would have on its internal operations. The first step taken was to develop a plan, during which it became apparent that a predefined methodology or template would significantly benefit this stage. Having a generic methodology that could be referred to would allow the development of a plan to be greatly accelerated. This will be shown later as the eTransformation methodology.

With the plan established initial contact was made with the Sales Manager to discuss the goals he had for the management of customer relationships. These discussions were to determine the scope of operations of the sales department. The conclusion reach was that the best way to do this was to use Business Process Modelling. This would allow the processes used by the department to be visualised and to see the interaction with the customers and other departments in the organisation. Thus through discussions with the manager a set of processes were identified. These processes were then modelled through further meetings and confirmed. The process models that were discovered revolved around the following processes;

1. Make quote
2. Answer query
3. Send quote
4. Receive order
5. Start job
Some of these process models are shown in Appendix D as an example of the Business Process Models created. From these process models it became apparent that much of the interaction of the sales department was through telephone conversations with customers. Through discussions with the sales manager it was decided focus on these telephone conversations and identify ways to enhance this part of the sales department’s role. A call monitor was developed to determine what type of queries and the amount of time spent on the telephone by sales people. Table 4.1 shows the results of the top reasons for telephone calls.
<table>
<thead>
<tr>
<th>Time on Phone (%)</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>33.3</td>
<td>Enquires related to Delivery Time</td>
</tr>
<tr>
<td>13.2</td>
<td>Capability Questions</td>
</tr>
<tr>
<td>12.7</td>
<td>Clarifications</td>
</tr>
<tr>
<td>11.4</td>
<td>Complaints</td>
</tr>
<tr>
<td>10.4</td>
<td>Setup Meeting</td>
</tr>
<tr>
<td>6.1</td>
<td>Requote</td>
</tr>
<tr>
<td>5.8</td>
<td>Request for quote</td>
</tr>
<tr>
<td>5.4</td>
<td>Update of production status</td>
</tr>
<tr>
<td>1.7</td>
<td>Purchase order query</td>
</tr>
<tr>
<td>0.1</td>
<td>Expressions of appreciation</td>
</tr>
</tbody>
</table>

Table 4.1 Call Monitor results (Data collected from Sep 2000 to May 2002)

Based on this information, a strategy was then discussed as to how to enhance this part of the organisation. The main aim was to determine how to deal with information that could easily be provided through some other mechanism that would provide the customer, with accurate information and not impact on the quality of service. It was then decided to break the queries into mundane queries and service queries. The mundane queries would be handled by some form of automated technology mechanism. The services queries that were often more complex and required more interaction would still be handled by the sales people over the telephone.

The Web was chosen as an ideal mechanism to handle mundane queries. The aim of the website was to provide information such as: delivery date, orders outstanding, basic quotes. AMP had a database driven system with all this information in it. It was assumed that it would be simple task to retrieve this information and present it through the Web in a secure manner. However, technical difficulties prevented this
aspect being available at the launch of the website. The website that was launched contained information that related to AMP’s capabilities and pictures of the type of products they are able to produce. The website proved extremely successful and the transformation effort was cited as a success. The website was able to address mundane queries about capabilities of Advance Metal Products. Future iterations of the eTransformation methodology will attempt to further address how some the other query types could be more effectively handled with technology.

This action taking component of the action research cycle highlighted many important aspects of transformation which have contributed to the development of the eTransformation methodology. Some the key aspects:

**Need for strategic leadership in choosing which problem areas to tackle which will benefit the organisation overall.**

The employees of an organisation often have a clear understanding of where bottlenecks or problems in a process exist. Managers are often aware of communication problems but may not be able to address those problems until the process is redesigned. For an external consultant to identify these problems it can take considerable amount of time. Thus, utilising the internal knowledge of people to select which process to transform is important.

**Need for input about process from frontline people.**

Once the process to be transformed is identified it is important to gather information from the people who carry out that process.

**Need for Information Technology expertise in redesigning process.**

Expertise in Information Technology is needed to identify what can and what can not be done with Information Technology. It is difficult if not impossible to
redesign a process to take advantage of Information Technology if an expert is not available.

**Time availability of staff.**

Redesigning a process cannot be conducted in spare time or as a side project. Dedicated time is needed to focus on the redesign of the process.

**Need for investigation to separate perceived problems from real problems.**

In some cases a problem may be perceived by management and/or employees but upon investigation it may not be a major factor in organisational effectiveness. To distinguish between perceived and real problems an objective viewpoint is needed before process redesign takes place.

**Identifying the importance of problem to overall organization and the potential benefit if that process was to be redesigned.**

This point is closely related to the previous one stated. Senior management needs to be conscious as to whether the redesign of a particular process will yield benefits for the business and its customers. This decision needs to be made before the redesign begins.

These identified factors combined with the earlier literature review highlight the need for a transformation methodology that could easily be followed by SMEs. A methodology is needed that can provide guidance in terms of the steps needed that an organisation can follow to redesign its processes. In particular, so that any change effort maximises the effectiveness of effort, time and money will be used on the right process to be redesigned. This was the prime motivation behind the development of the eTransformation methodology. It also highlighted the need for tools which people in the organization could use to help themselves. This is beneficial because
4.8 The eTransformation Methodology

The specific learning gained in this action research cycle is the development of the eTransformation methodology. Successful eTransformation calls for a holistic or systems approach; not a piecemeal approach. In a holistic approach, all aspects of the business processes and supporting IT and other infrastructure, as well as the linkages and interactions among them are identified, analysed, prioritised, implemented and evaluated.

The eTransformation methodology is holistic in its approach; it is intended to be used with the eTransformation Roadmap. The eTransformation Roadmap can contribute to the overall direction a business should follow and the eTransformation methodology provides the steps needed for a business to get there. The eTransformation methodology will:

1. Ensure that business drives the technological needs. Without clear business goals and models, technology alone will not yield the desired results.
2. Adapt businesses to the new eBusiness models and processes.
3. Use metrics to measure the success and effectiveness of the new approaches.
4. Continually revisit the business strategy and goals in the context of changes taking place in the business environment and opportunities offered by technological advances.

The proposed methodology provides an overall framework for eBusiness transformation, and incorporates pioneering work done, in most cases in isolation, in
the areas of BPR, change management and the new information engineering (Davenport and Short 1998).

The eTransformation methodology is made up of several stages, as shown in Figure 4.1, and is intended to be carried out in continuous cycles. A description of the purpose of each stage is given in the following sections.

![Figure 4.1 The eTransformation methodology](image)

### 4.8.1 Business Strategy

Developing a new or revising an existing, business strategy is the first step in the transformation process. It should drive and lead the change in an enterprise. An enterprise needs to arrive at appropriate business strategies, ranging from the near-term to long-term strategies. In deciding a business strategy, among other things, it should take into consideration, current and future market capitalisation and potential, competition, new business threats and opportunities, as well as experiences and lessons from earlier transformation and changes, if any. This would enable the
enterprise to come up with its overall vision and goals, which will in turn lead and guide the eBusiness transformation.

In formulating business strategies, input from employees should be taken into account and also their concerns, if any, need to be satisfactorily addressed in a way that the business strategy becomes a shared vision or shared ambition (Ghoshal and Bartlett 1997). The strategy needs to be clearly and concisely articulated for people to understand and to be able to contribute to the change/transformation process. It should enable employees (most directly affected by the change) to take the ownership for the business vision and goals and assume responsibility for achieving those goals. “The implementation and execution of the redesigned processes depends upon those who do the work. Hence, the participation, and more importantly, acceptance and ownership, at the grass roots level is essential for successful BPR” (Malhorta 1998). Thus, it is important that those front line stakeholders in a process be involved in its redesign.

4.8.2 Business Goals

The second stage identifies and prioritises the business goals (in the context of eTransformation) that are to be met within framework of the business strategy. The business goals need to be tangible and for each goal a set of appropriate performance measures is needed, such as key performance indicators (KPI). The defined and prioritised business goals will then drive with the implementation of the eBusiness transformation. When a new process is put in place the same or similar KPIs can be used to compare the performance and effectiveness of the new process. The KPIs
selected should be measurements that can be related back to the Business Strategy. For example if the Business Strategy has been determined to expand the customer base by a certain percentage. Then within this Business Goals stage a goal has been set to increase the number of prospects contacted per week. Thus the KPI should reflect this as a measure of the number of prospects contacted. Thus, whatever the initial Business Strategy it needs to be reflected in business goals and similarly in the KPIs’ selected. The measuring component is important to demonstrate the success of any individual eTransformation iteration and to also justify further eTransformation efforts.

4.8.3 Business Process Modelling

Following specification of business goals and the performance measures, specific business processes that influences and/or contribute to the achievement of those goals are identified. These processes, as they are currently being practiced, are modelled and analysed. The goal of process analysis and modelling is to show the various steps involved and the effort and time taken for each step. It would also reveal interactions among individuals, departments and/or customers and suppliers, and other processes, as well as the limitations and constraints. This part of the transformation methodology was investigated in more detail in this work with a specific emphasis on Business Process Modelling highlighted in the chapters ahead.
4.8.4 Business Process Re-engineering

When designing new processes, due consideration must be given to business, technology and human aspects, and contributed to by people with knowledge of the business processes, BPR, and Information Technology. For instance, if business people, without involvement of Information Technology personnel, develop a new process, potential enhancements that Information Technology can bring out may not be adequately addressed. On the other hand, if Information Technology personnel alone redefine the process, many aspects the business process and insights would not be fully considered. Thus it requires the combination of effort to select appropriate technology and process flow to achieve desired, or optimum, results. After a few iterations, an appropriate IT-enabled process and required IT and other support infrastructure need to be clearly mapped out.

4.8.5 Enhancing Business Processes Using IT

As mentioned in the previous section, there needs to be a synergy between the improvement of the process and the IT solution selected to achieve this. Neither technology nor the process should be considered independently. They are interdependent entities for an eBusiness. Similarly the IT solution selected should be appropriate to the process’s needs meeting its needs appropriately. This is also a stage where the eTransformation Roadmap is a very important part of this research. Through using the eTransformation Roadmap, an organisation knows its path to becoming an eBusiness. Thus, that information needs to be taken into consideration when selecting technology solutions, particularly in the case of convergence from the eTransformation Roadmap. Convergence requires that information can be extracted
and inserted into various data sources. This means that technology solutions that are likely to be in the organisation for the long term need to provide adequate access for the eventual state of convergence. The eTransformation Roadmap will show how far away this goal is and help in the planning of appropriate Information Technology solutions.

### 4.8.6 Change Management

Another critical factor determining the success of eTransformation is how change is managed. In fact, sound principles of change management need to be considered throughout the process. Reactions of all the stakeholders must be considered, especially the attitude of the employees towards the change. The change management process makes an assessment of the people affected by the new process, and considers the placement in the new structure and retrained them as required. The placement and training of the people should be part of the e-transformation process.

### 4.9 Conclusion

Businesses, irrespective of their size and type, need to re-look and modify or change, where needed, their business strategies, business models, and business operations and processes to remain competitive and survive in the new eWorld. The change process is, however, not an easy one. It is a difficult, continuing process. A holistic approach and a step-by-step, evolutionary methodology to eBusiness transformation is proposed. They make the transformation process visible and the effects of the
changes are assessable. This will lead to success and ensure that the transformation meets the desired objectives.

Creating a master plan is an important first step in the transformation process. The transformation and the changes associated with it must all be part of cohesive master plan developed by business, Information Technology, production and marketing executives. Those who successfully travel through the difficult but worthwhile eTransformation journey will likely become resourceful and responsive enterprises. They will be competitive and organised to respond quickly to a dynamic market. The eTransformation may be more difficult than initially perceived, take a great deal of effort and time to enact changes and transformation, may not yield quick returns and/or progress may be slow. It requires considerable effort and determination to make the successful transformation.

The work on eTransformation is a large area of investigation, much more than can be considered by a single researcher. This work has now formed a major part of the Advanced Enterprise Information Management Systems (AeIMS) group at the University of Western Sydney. The aim of the group is to become a world leader in eTransformation and to propel the local industries into the eEnabled world. The eTransformation methodology developed in this work is being used with other organisations in the Western Sydney region. Predominately it is being used for incremental process improvement. This is primarily because radical transformation will have a profound impact on the organisation and the leaders of the organisation need to become familiar with the eTransformation methodology before committing themselves to a radical transformation cycle.
Chapter 4  eTransformation Methodology

The following Chapters (5 and 6) focus on a key aspect of the eTransformation methodology, ‘Business Process Modelling’. This stage in the transformation methodology is responsible for mapping the business processes of an organisation. A novel approach is proposed to capture Business Process Models by empowering the frontline employees of an organisation.
Chapter 5
eTransformation Business Process Modelling Tool

5.1 Introduction

The need for businesses to become more eEnabled has been clearly been established. The eTransformation Roadmap and eTransformation methodology, described in earlier chapters are the product of the specific learning from the two earlier action research cycles. This chapter discusses the third action research cycle, focusing on a key aspect of the eTransformation methodology, Business Process Modelling as shown in Figure 5.1. During the specific learning stage of the previous action research Cycle it became clear that business processes played a crucial role in the eTransformation effort. Existing processes need to be examined, new processes need to be designed, people needed to be trained in carrying out those processes. This action research cycle is described in two chapters; this chapter covers the Diagnosing and Action Planning stages, and Chapter 6 covers the Action Taking, Evaluation and Specific Learning.

This chapter begins by exploring the significance of business processes and the role of Business Process Modelling in eTransformation. A detailed review was carried out into Business Process Modelling techniques and how Business Process Models can be captured. The review revealed that frontline people were critical to the model capturing phase, this led me to investigate how Business Process Models could be
captured from frontline people. A framework is proposed that would allow Business Process Models to be captured from frontline people over the Web in a collaborative discussion forum environment. This framework was used to create a Proof-of-Concept system (described in the next chapter) to trial the framework with a test group that was eTransforming some of its processes. This allowed us to see how the modelling system would work in the context of the eTransformation methodology.

![Diagram of Business Process Modelling](image)

**Figure 5.1 Business Process Modelling a key element of eTransformation**

5.2 Business Processes: the lifeblood of a 21st Century Organisation

To set a good foundation for this research, a clear definition of business processes is needed. The following three paragraphs, define ‘what is a business process’, as used in the context of this work, and is based on work by Yogesh Malhota (1998).

Business processes are a set of logically related tasks performed to achieve a defined business outcome. A process is a structured, measured set of activities designed to
produce a specified output for a particular customer or market. It implies a strong emphasis on how work is done within an organisation.

Processes are generally identified in terms of beginning and end points, interfaces, and organization units involved, particularly the customer unit. High Impact processes should have process owners. Examples of processes include: developing a new product; ordering goods from a supplier; creating a marketing plan; processing and paying an insurance claim; etc.

Three dimensions that are commonly used to describe processes are:

- **Entities**: Processes take place between organizational entities. They could be Interorganisational, Interfunctional or Interpersonal.
- **Objects**: Processes result in manipulation of objects. These objects could be Physical or Informational.
- **Activities**: Processes could involve two types of activities: Managerial (e.g. develop a budget) and Operational (e.g. fill a customer order).

There are other things beyond the boundaries of business processes that need to be considered to run an organisation like, leasing of premises, cleaning and legal issues. However, these do not normally fit into the scheme of business processes.

### 5.3 Effective Business Processes Show the Path to Success

Many authors have shown that understanding of processes is the key to business success. Davenport, in the 1980’s, was an early proponent of Process Innovation (Davenport 1993). Today, Schmidt’s emphasis on Chief Process Officers (Schmidt
and Howard 2001) has reiterated many of the same themes. Michael Hammer brings across similar sentiments in his book, *Beyond Re-engineering* (Hammer 1996). Each of these authors highlights the critical importance of process. The ability to visualise processes, modify them as needed and communicate that information throughout an organisation as rapidly as possible is one key element in being able to effect change in an organisation. Change being one of the main components in today’s globalised world needs to be addressed by all organisations. The ability to change and cope with the change is a significant factor in succeeding in business in today’s globalised connected world. Friedman (1999), author of the, *The Lexus and the Olive Tree*, has explained that, due to technology and transportation advances, the world has shrunk from a size medium to a size small. This is a good analogy of the effect that globalisation has had on businesses. Competition is now coming from markets that were traditionally considered too far away. More competition is necessitating more change at an increased rate. Being able to model and visualise current process and plan future ones, will become central to coping with the accelerating change. Schmidt and Howard (2001) pointed out “Adaptability is the key to effectively managing the enterprise business process portfolio and will likely become the defining characteristic of an Enterprise Application Integration (EAI) enabled organisation.”.

Hammer and Stanton (1999) stated that many companies have meet the challenge of integrating their processes and cutting out those process that are not adding value. However many of these companies have not fundamentally changed the way they operate to become ‘a true process enterprise’. They also point out that IBM, Texas...
Instruments, Owens Coming and Duke Power as being organisations that have become true process enterprises and gain a great benefit from doing so.

“They have appointed some of their best managers to be process owners, and they have given them real authority over work and budgets. They have shifted the focus of their measurement systems from unit goals to process goals, and they have based compensation and advancement directly on process performance. They have changed the way they assign and train employees, emphasizing whole processes rather than narrow tasks. And they have made subtle but fundamental changes to their cultures, stressing teamwork and customers over turf and hierarchy. They have emerged from all those changes as true process enterprises -companies whose management structures are in harmony, rather than at war, with their core processes -and they have reaped enormous benefits as a result.” (Hammer and Stanton 1999)

When process owners were introduced at Duke Power, an increase in meeting targets occurred, from 30-50% up to 98%. A process owner has the following characteristics:

- Power has to be shifted away from old functional departments and put into the hands of a process owner.
- The process owner has to have end-to-end responsibility for a process.
- The process owner must have real responsibility and be in a permanent role not just for a transition period.
- They must be able to design the process, measures its performance and be responsible for training people in the process.
- If the process owner is not a permanent role with authority then the old style functional departments heads will take over.
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The following quote describes the key aspects of a process enterprise:

“Just as important as having, smooth, efficient process is being able to redesign those processes on the fly. From order fulfilment to customer service to procurement, operating processes are rarely fixed anymore. They must change their shape as markets change, as new technologies become available, and as new competitors arrive.”

(Hammer and Stanton 1999)

Hommes and Reijswoud (2000) also highlight the key importance of business processes:

“Both experts in the field of Information and Communication Technology (ICT) and in the field of Business Engineering have come to the conclusion that successful systems (re)engineering starts with a thorough understanding of the business process of an organisation: a business process model”

The identification of key processes and their role in the overall organisation is vital to improved performance in today’s business world (Childe, Smart et al. 1997; Jeffcoate, Chappell et al. 2000; Rainer, Chaharbaghi et al. 2000).

Michael Hammer (1996), in his book Beyond Reengineering also highlights the importance of diverse contribution to enable effective change: “Information must be gathered from everyone in the organisation, especially from frontline employees,
who are best equipped to recognise inadequacies in current operations or significant changes in customer needs.”

The resounding theme, as emphasised by all these authors (Davenport 1993; Hammer 1996; Rainer, Chaharbaghi et al. 2000; Schmidt and Howard 2001), is that to improve effectiveness a business must understand its business processes, and that to gather information about business processes is best done through those that actually carrying out the business process. Business Process Modelling enables the capturing, visualising and communication of business processes.

5.4 Business Process Modelling Techniques

The majority of the businesses do not as yet adhere to one particular Business Process Modelling standard. Further, most modelling techniques used in the business world today would not originally have been developed for business modelling – they have been developed for military, computer programming or engineering environments.

The military’s goal in using process models was to visualise what is happening in each step of a process, so that it can be monitored and to ensure it meets military standards (not business ones). They developed and enforced the use of Integrated Definition (IDEF) models which comprises up to 14 different types (Bal 1998). There are three main types of models IDEF0, IDEF1 and IDEF3 representing different aspects of a process. While IDEF0 has the ability to clearly show decisions and actions, however it lacks an ability to represent the timing of an activity in
Chapter 5 eTransformation Business Process Modelling Tool

Business Process Models. This can be overcome by using the other types of IDEF diagrams; this would however introduce additional complexity to the model.

Computer programmers draw process models to follow the flow of a computer program, originally with simple Data Flow Diagrams (DFD) and more recently with Unified Modelling Language (UML) and Object Oriented Design. These were aimed at visualising and examining a computer program. Programmers have a need to understand what specific input and output occurs for a part of code. This information is valuable to a programmer; however, it does not readily translate to business needs.

An investigation made by Kawalek et al (1997) focused on the use of process models for the software development lifecycle. Their primary goal was to determine how models could be used at different stages of the software development lifecycle. They highlighted that different models are suitable to different applications. They also believe that business process modelling is a prerequisite to good processes. They go on further to discuss an approach to Business Process Modelling where goals are paramount to the resultant process model which then directly translates to the usefulness of the software application that is being developed (Doumeingts and Browne 1997). This coincides with the eTransformation methodology and the need for a process owner and goal to be set for the modelling effort.

There is a promising future for Business Process Modelling Language (BPML) being developed by the BPMI.org. BPML is an XML schema that allows business processes to be represented using XML mark-up. It acknowledges that the central
core to a business is its’ processes, but does not yet have a visual model representation. Simulation models is another approach, where the model can simulate potential process implementations (Irani 2000).
George Giaglis (2001) outlined different types of Business Process models and their purpose, as shown in Table 5.1 (Giaglis 2001).

<table>
<thead>
<tr>
<th>Types/views</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional</td>
<td>What activities are being performed and what data-flows connect them</td>
</tr>
<tr>
<td>Behavioural</td>
<td>When activities are performed, with sequencing, feedback loops, iteration, decision making, triggering conditions etc</td>
</tr>
<tr>
<td>Organisational</td>
<td>Where and by whom activities are performed, physical communication mechanisms and storage media</td>
</tr>
<tr>
<td>Information</td>
<td>The entities (documents, data, artefacts, products) produced or manipulated by a process, including their structure and inter-relationships</td>
</tr>
</tbody>
</table>

Table 5.1 Four Types of Business Process Modelling

Giaglis has conducted extensive work with BPM (Giaglis 1999; Giaglis 1999; Giaglis 2001) and developed a taxonomy of modelling techniques, shown in Table 5.2 (Giaglis 2001). This taxonomy classifies modelling techniques by the purpose for which they are used for BPM. Additionally it shows breadth in terms of the use of the process model, broken down as; Understanding & Communication, Process Improvement, Process Management, Process Development or Process Execution.
<table>
<thead>
<tr>
<th>Informational (Data)</th>
<th>Organisational (Where, Who)</th>
<th>Behavioural (When, How)</th>
<th>Functional (What)</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Flowcharting) (IDEF3) DFD Entity Relationship State-Transition IDEF1x UML</td>
<td>(IDEF0) (Simulation) System Dynamics RAD</td>
<td>(IDEF0) Simulation System Dynamics RAD</td>
<td>Flowcharting IDEF0 Simulation System Dynamics DFD (UML)</td>
<td>Understanding &amp; Communicating</td>
</tr>
<tr>
<td>(Simulation) DFD Entity Relationship State-Transition IDEF1x UML</td>
<td>(IDEF0) Simulation System Dynamics RAD</td>
<td>(IDEF0) Simulation System Dynamics RAD</td>
<td>Flowcharting IDEF0 Petri Net Simulation DFD UML</td>
<td>Process Improvement</td>
</tr>
<tr>
<td>Simulation DFD Entity Relationship State-Transition IDEF1x UML</td>
<td></td>
<td></td>
<td></td>
<td>Process Development</td>
</tr>
<tr>
<td>Simulation DFD Entity Relationship State-Transition IDEF1x UML</td>
<td></td>
<td></td>
<td></td>
<td>Process Execution</td>
</tr>
</tbody>
</table>

Table 5.2 Taxonomy of Business Process Modelling

Kawalek and Kueng (1997) also have classified BPM with a similar set of objectives:

- Facilitating human understanding
- Supporting process improvement
- Supporting process management
- Automating process guidance
- Automating execution support
Osterweil (1987) points out that different models are good for different things. For example, petri-nets are useful for the timing and order of steps in a process but less so for showing artefacts. The semantics used in a model should be extensive enough to allow the model to convey the appropriate information to the people using it.

Hommes and Reijswoud (2000) have conducted an examination of modelling techniques and their purpose. In this case the modelling techniques are compared on Quality Vs Framework Element, as shown in Figure 5.2. They have created a method to evaluate a process modelling technique set by various criteria. Yet again this is a very interesting field of research; however the factor to derive from this work is again that modelling techniques can have different strengths and weaknesses. They evaluated the framework with a specific modelling technique called DEMO.

Figure 5.2 Framework Element versus Quality property (Hommes and Reijswoud 2000)
In a comparison of modelling methods by Kosanke (1996), he emphasises that an organization undergoing business process re-engineering is often supported by process modelling. He also agrees with Hommes and Reijswoud (2000) that different methodologies cover different parts of the re-engineering stages. A selected group of modelling techniques are compared and categorised with respect to the stage in the lifecycle: identification, concept, requirement, design, implementation, operation, system change. The modelling methodologies are also examined for the view they give: Function, Decision, Organisation and Information.

Snowdon (2001), in his overview of process modelling, said, “To study and understand systems, one constructs ‘process models’ according to particular viewpoints and using particular modelling techniques. Further, models constructed from some viewpoints can form the basis for computer systems used to support a particular behaviour for an organisation.” In addition, Snowdon points out that the origin of process models comes from primarily a technical background. However, it is rapidly being adopted by the business world where one of the major uses has been in business process engineering.

Some of the major modelling techniques and the purpose they are best suited to are summarised in Table 5.3.
<table>
<thead>
<tr>
<th>Modelling Technique</th>
<th>Model Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDEF</td>
<td>Used by the US Air force to aid in its process of supplier development and evaluation.</td>
</tr>
<tr>
<td>IDEF0</td>
<td>It is a top-down hierarchical method that provides a description of functions and processes in manufacturing.</td>
</tr>
<tr>
<td>IDEF1</td>
<td>Similar to entity relationship models, and focuses on information resources. It captures both automated and non-automated information sources.</td>
</tr>
<tr>
<td>IDEF3</td>
<td>Shows sequence of activities of what the process actually does.</td>
</tr>
<tr>
<td>DFD</td>
<td>Is simple and easily understood by technical and non-technical people alike. Its weakness lies in its limited vocabulary, imprecise about details of sequence and concurrency and it does not show who does what.</td>
</tr>
<tr>
<td>UML</td>
<td>Originally software engineering based. It is becoming a defacto standard across industries. Uses different diagrams to represent various aspects of software. It has been modified for some business purposes.</td>
</tr>
<tr>
<td>RAD</td>
<td>Is useful for modelling people intensive, cross-departmental, task intensive processes. Its main weakness lies in its inability to show exceptions in a process. A RAD shows roles, their component activity and their interactions, together with external events.</td>
</tr>
<tr>
<td>Petri Nets</td>
<td>Both graphical and mathematical they can represent procedures, processes, machines and organisations. It uses tokens to reflect the dynamic nature of a processes, often used were parallel activities are needed.</td>
</tr>
<tr>
<td>Flowcharting</td>
<td>Allows the quick representation of the steps in process but often does not show who is carrying out the task or the information details of the task.</td>
</tr>
</tbody>
</table>

Table 5.3 Techniques and their Purpose

The reviews of process modelling techniques (Osterweil 1987; Kawalek and Kueng 1997; Giaglis 2001) and Table 5.3 reveal that there does not exist a single process
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modelling technique that covers all aspects of process modelling. Rather different models suit different purposes.

Wreden (1998), in an article published on the Planet IT website, puts forward the notion that Business Process Modelling is being used to try and deal with a number of issues in organisations, such as the implementation of ERP packages, visualizing the link of business goals with actual tasks being carried out in the frontline. Business Process Modelling is also assisting in the area of application development by helping to ensure plans meet business requirements. The growing complexity and increasingly integrated nature of business is resulting in a greater need to focus on the processes being used in an organisation.

Wreden (1998) went further to classify three categories for Business Process Modelling Tools,

- **Drawing tools** – like VISIO a drawing software package from Microsoft. It allows users to easily create diagrams. There are many diagram techniques available through this application, some of which can be used to create Business Process Models. However, because of the wide variety of tools and options available it can be daunting to an inexperienced user.

- **More technical tools** – like Casewise Systems, IDS or Proforma are specifically aimed at modelling business processes. The intended user is a Business Process Modelling expert. The diagramming technique available in these applications are often proprietary. These applications also often provide reference models for SAP R/3, Baan, PeopleSoft and other Enterprise Resource Planning (ERP) packages.

- **High end tools** – whose price can easily reach six figures, detail the work flows and other activities involved in manufacturing and other complex processes.
Wreden (1998) also highlights that a number of tools are Internet-enabled. They allow parts or the whole process to be viewed through a browser. There is also mention that models can be easily created and that “the use and benefits have spread from a small coterie of process engineers to a wider spectrum of business analysts and reengineering managers.” In this research a concept similar to this has been extended to support frontline people, who could use and contribute to the creation of a Business Process Model directly through a Web based tool.

5.4.1 Selection of a Modelling Technique

Business Process Models are best captured by consulting frontline people because they are actually carrying out the tasks in that process everyday and would be most familiar with them. These frontline people, however, do not necessarily have a background in BPM thus a key factor for any BPM technique chosen is an intuitive set of symbols. Having reviewed the available approaches, Unified Modelling Language (UML) Activity Diagram was chosen as the technique to use with the eTransformation Business Process Modelling Tool framework. UML is a modelling language that has grown from software engineering and attempts to be an all encompassing standard for modelling (Unhelkar 2001). Rather than a single modelling technique with one set of symbols and one purpose it incorporates several different techniques. Each of the techniques has its own strengths and is suited to representing certain aspects of a software application. It is also suited to other purposes. One specific part of UML is Activity Diagrams, it is made up of simple symbols similar to those of flowcharts and is well suited to the purpose of Process Improvement. Some of the key features of UML Activity Diagrams are;
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- Have intuitive symbols that are easy for all to understand
- Suits the goal of communication and Process Improvement
- UML is emerging as a world wide generic modelling standard

5.4.2 UML Activity Diagrams

UML Activity Diagrams are very similar to flowcharts. Flowcharts originally a software engineering tool have also been widely used outside that field for ad-hoc process diagrams. The symbols used are intuitive in nature, as shown in Table 5.4.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Start" /></td>
<td>Start</td>
</tr>
<tr>
<td><img src="image" alt="Action State" /></td>
<td>Action State</td>
</tr>
<tr>
<td><img src="image" alt="Connector" /></td>
<td>Connector</td>
</tr>
<tr>
<td><img src="image" alt="Decision" /></td>
<td>Decision</td>
</tr>
<tr>
<td><img src="image" alt="Swimlane" /></td>
<td>Swimlane – shows ownership/responsibility for processes</td>
</tr>
<tr>
<td><img src="image" alt="Note" /></td>
<td>Note – can be used to add information to any part of the diagram</td>
</tr>
<tr>
<td><img src="image" alt="Transition (Fork)" /></td>
<td>Transition (Fork)</td>
</tr>
<tr>
<td><img src="image" alt="Transition (Join)" /></td>
<td>Transition (Join)</td>
</tr>
<tr>
<td><img src="image" alt="End" /></td>
<td>End</td>
</tr>
</tbody>
</table>

Table 5.4 UML Activity Diagram Symbols
As an example of a Business Process Model using UML Activity Diagram is shown in Figure 5.3. This shows the process for evaluating the application form of someone applying to become a casual staff member.

Figure 5.3 Business Process Model of Casual Staff Application Process
5.5 Business Process Model Capturing Methods

This section describes Business Process Modelling capture methods. In addition to literature, information on BPM capture has been gathered through interviews with three Business Process Modelling experts. One interview was conducted individually with one of the Business Process Modelling experts, the other was conducted with two of the experts present. Another source has been the observation of Business Process Model capturing at an SME in Western Sydney.

5.5.1 Interview with Business Process Modelling Experts

The following describes the outcome of interviews with three Business Process Modelling experts. The information derived covers various aspects of Business Process Modelling. Primarily there is a detailed look at BPM capture methods, which focus on Workshop versus Interview based capture methods.

The following is a short description of the three BPM experts:

An industry consultant on BPM and author of several books on the topic

A professional who led a major BPM project in a leading Australian bank and is currently working on similar projects

1) Another consultant who conducted BPM with an SME, in a joint UWS-industry project
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The interviews were conducted with open ended questions with the intent of gathering information about BPM techniques and how BPM can be captured. The questionnaire used as a guide in the interviews is given in Appendix B.

Three techniques to capture Business Process Models were tried and the outcomes of those attempts are shown in Table 5.5. The first column shows the method that was used to capture Business Process Models. The other two columns show resultant success they had with an SME or Large Enterprise environment. Following the table is a detailed look at both workshop and interview based capture methods.

<table>
<thead>
<tr>
<th>Capture Method</th>
<th>Observation and comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Questionnaire</strong></td>
<td></td>
</tr>
<tr>
<td>A paper based questionnaire was given to key people at the SME. This did not work at all, with a 0% return of information through the questionnaire. Key reasons for it failing were the structure of questionnaire which restricted responses. It was also lengthy and time consuming to fill out.</td>
<td>Did not work with SMEs</td>
</tr>
<tr>
<td><strong>Workshop</strong></td>
<td></td>
</tr>
<tr>
<td>Worked for both SME and Large Enterprise. The SME could not do this regularly as it took a considerable amount of time from the participants’ daily duties.</td>
<td>Reasonable result with SMEs</td>
</tr>
<tr>
<td><strong>Individual Interviews</strong></td>
<td></td>
</tr>
<tr>
<td>Was used with great success with SME. Large Enterprise did some of the model capturing this way but preferred the workshops.</td>
<td>Gets best result with SMEs</td>
</tr>
</tbody>
</table>

Table 5.5 Methods for Capturing Business Process Models
Workshop
The first method that can be used to capture a Business Process Model would be to call all key stakeholders of a process to a workshop. In the workshop the modeller would explain the purpose of the modelling exercise. Through several discussion sessions a model of the business process would be created. All participants would able to see the entire BPM. This allows them to see any steps that occur before and after their part in the process, giving them a better understanding of their role in the business. The duration of the workshop would depend heavily on the complexity of the process. After the workshop there may be several follow-up interviews with individuals to confirm certain parts of the model.

Interviews
The second method that is commonly used is for the modeller to contact each of the stakeholders individually. Each stakeholder would be visited at their usual work environment where possible. A combination of observation and interviews would take place to gather information about the process. This is generally a one way flow of information, where the interviewee would not learn any information about what happens at other stages in the process. Once all the interviews are completed a model is created and in most cases the modeller will visit most stakeholders again and confirm the accuracy of the model.
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The capture methodologies above can be conducted using either a software based drawing package or paper. Both of these have potential limitations, such as:

- Difficult to access, update and distribute models.
- Potentially slow to make changes, version control problems.
- Difficult to integrate to other diagrams of the organisation or other diagrams of the same process.
- Not possible for more than one person to work on the same diagram at the same time.
- Contribution to creation of model limited to those physically present where modelling is taking place.

These limitations pose a problem mainly due to the speed and accuracy of producing Business Process Models. The rate at which a business can transform is a major factor in success or failure (Bradley and Nolan 1998) in today’s business world. Consequently the rate at which Business Process Models can be captured, redesigned and disseminated plays a significant role in the rate of transformation. Thus the modelling technique used and the method to capture those models also has to be rapid, accurate and allow easy manipulation. Current capturing techniques do not meet these criteria.

5.5.2 Observation of BPM Capture at a Sydney SME

The following outlines observations of an SME who is working with the University of Western Sydney (UWS) in a joint research effort. Some of these observations were captured during the previous action research cycle which resulted in the development of the eTransformation Methodology.
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The first example is from my own observation during the previous action research cycle which was discussed in Chapter 4. The second is derived after another researcher has created several Business Process Models for the same organisation. The key outcome from both observations is the importance of having a process owner who is an employee of the organisation driving the modelling effort.

Observation 1
Initial work with the organisation focused on customer interaction with the business. Through interviews with the Sales Manager key processes that involved customer interaction were identified and modelled. Capturing the models was slow and cumbersome, mainly because the person capturing the models knew about business process modelling but the not about the process. Similarly, the Sales Manager knew the process but not how to create business process models. The Business Process Models allowed the Sales Manager to determine goals that would best benefit the business. The goals were then used to design the company website.

Observation 2
As a result of research work conducted by another researcher in the AeIMS research group (Chandrarathne 2002), over 30 Business Process Models of the major activities in the organisation were created. These models give a reasonable degree of detail showing the workings of the business processes. The key lessons from this observation were that there is a need for a Process Owner to be in charge of determining where a problem lies in an organisation.
On the surface, there did not appear to be anything severely wrong with the operation of the organisation. Similarly, the classification of the processes as core, support or administration also did not show any immediate scope for improvement. This was from the point of view of the researchers. When the results were tabled to a select group of the company’s management they were happy with the results. They did not, however, have a specific goal as to what to do with the models now that they had them. When prompted what to do next, there did not appear a clear way forward. There were many models with much detail; simply looking at the models would not have given them a clear way to fix something. The models on their own, even though technically correct can not provide all the answers. Thus, to move forward a question was asked of the managers as to where they felt significant problems might lie. At this point several ideas became apparent. There appeared to be specific problems with inventory control and rework job management. The manager in charge who brought up the point also stated that the level of detail in the process models created would not be enough to uncover the root of the problem. This emphasises that the models can not be created for their own sake. The models need a purpose, the process owner is the one who is able to identify where a problems lies and then can bring a set of tools to deal with those problems. Again, this brings about the issue for bringing in consultants: the consultant will need to work closely with the process owner if anything is to be achieved. The importance of personal is often understated when it comes to technology and it should not be repeated with process models. People are at the core of the process modelling effort. A person who is working in a specific area of an organisation will develop intuitive knowledge as to where problem lies. It will not likely come through in reports or cursory process models. It requires someone with in-depth knowledge to focus on the
specific area where the problem lies. Thus, it should be implemented by the person who is aware and has the capacity to change the process should also be in charge of the modelling process, if not solely, then in a team to avoid spending time on areas that are not significant.

An alternative point of view is that a person intimately involved in a process will only be able to make incremental change. Someone outside the domain can make radical change. The reason someone outside the domain can make radical change is that they are not influenced by the ‘this is how we do it’ syndrome. They simply look at the input and output and try to find the fastest way to achieve this. What I would propose is that both are needed. Radical change is needed first to ensure that the optimal way has been chosen, then incremental change is needed to ensure maximum effectiveness is achieved. This will then go through another radical change when it is time. The next radical change will be triggered by a number of factors, which could include: change in business needs, change in regulations government or other, change in technology. Anyone of these could result in the potential for a radical change in the process. Regardless, at all times the Process Owner needs to be involved to control the planning of the change.

5.5.3 BPM and Hong Kong SMEs

The following are some of the key findings of a case study conducted in 2001 by the University of Hong Kong investigating BPM for SMEs in Hong Kong (Tam, Chu et al. 2001). SMEs are operating in a rapidly changing environment and are exposed to the forces of globalisation. SMEs exist with small monetary margins as opposed to
larger enterprises which operated with a much larger cash flow. The observed group mainly used Business Process Models to increase the speed at which ideas about a process could be communicated. The modelling technique used, Data Flow Analysis, proved reasonably easy for people to understand and the cost of it was low. The other advantage of the simple technique was cost.

5.5.4 Collaboratively Capturing Business Process Models

This section is specifically looking at the Collaborative aspect of Business Process Modelling and its benefits. Alexander (1998) proposes a business process modelling approach that:

- Consults frontline people
- Use Task modelling
- Modeller is needed

He suggests:

“One of the central problems in system engineering is to model business processes accurately but simply. This is necessary because both users and designers need to understand what is being communicated: users need to ‘own’ their requirements for any future system, so that they can control development, and designers naturally need to be able to interpret any system description correctly.”

(Alexander 1998)
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Alexander also points out that the way to carry out the modelling is for an initial rough model to be created. Then this can be worked on in detail by all participants. He proposes a four step approach:

1. A proposition is stated, discussed by the group, modified if need be, and agreed;
2. An action is taken to implement the proposition, and observes and records what happens;
3. The group engages with the experience, to see what happened in a new way;
4. The group reconsiders the proposition, makes sense of it, and prepares for another cycle.

The advantages of his co-operative approach are (Alexander 1998):

- more detailed modelling through greater user involvement;
- more accurate modelling through greater user openness;
- easier acceptance of change as it may be seen as coming from the group, not outside.

5.5.5 Recommendations for Successful BPM Capture

The following summarises the important characteristics that evolved from this research work which enable the effective capturing of Business Process Models:

- Use simple, intuitive modelling symbols.
- Involve frontline people and their input.
- An individual needs to manage the modelling process.
- Models need to be created and disseminated rapidly to improve overall transformation speed.
- SMEs need to use low cost techniques as they often can’t afford high cost solutions.
SMEs use BPM for small process changes and short-term gains, while large enterprises use BPM for large scale IS implementation.

5.6 Web Technologies for Collaborative Working

Collaborative Web technologies are another significant aspect to this research and proposed framework, as they can be used as mechanism to capture Business Process Models. This section reviews some existing online collaborative tools and presents the newly developed system that combines BPM with online collaboration.

The Internet provides an asynchronous, geographically independent platform for communication. Online environments such as discussion forums and FAQ pages are a recent manifestation created by the expanding use of the Web for communication and education. Many people gain and pass on information through textual forums on the Web such as discussion groups or information posts. Virtual teams are another creation brought about because of Web technology and it is changing the way people work in an organisation (Lipnack 1999). They are able to exchange ideas without geographical boundaries (Igbaria; Lipnack; Gupta, Karimi et al. 2000). People in a Virtual Team are able to work on large scale projects without ever being in the same physical location. The nature of these work environments can also be used as a basis in which collaborative process modelling could operate.

The Web has been used for collaborative work in the software industry for a number of years already (Isaacs, Morris et al. 1994; 1996; Grundy, Apperley et al. 1998). Software engineers are able to keep track of all aspects related to the development of their software through Web based collaborative applications, “integrating process
modelling and enactment tools with project management packages can give distributed project team members up-to-date information about the state of the work process as well as guidance about what to do next.” (Maurer and Kaiser 1998)

Divinti et al (1999) reported on a case study which investigated the use of mailing lists for collaborative work. A mailing list was used to distribute information to all participants in a project. The case study was designed to investigate how this could be used to support collaboration and the coordination activities within the group. People would post questions and others would answer those queries but the information was open for all to see. Though this was the main mechanism for sharing information when it came to making design decisions, requirements gathering were often conducted using traditional means of communication, such as, face-to-face or telephone conference calls.

Another finding of the study was that the people in the case study started sending personal messages to key experts rather than posting to general mailing list. This resulted in the answer to the query only being sent to the questioner rather than the group, and this created an environment where the direct personal messaging outnumbered the public listings.

5.6.1 Groupware

Groupware is a specific form of collaborative software and some of its key aspects are discussed below.
Use of a groupware system is dependent on the personalities of the group using it as opposed to a single user application, as stated by Grudin (1994). Groupware must deal with users with shifting roles, preferences and backgrounds. Prototypes and labs can not capture complex but important social, motivational, economic and political dynamics. Even when a full implementation is available, scheduling a test is a logistical challenge.

Group interaction unfolds over days and weeks not hours (Bardram 1996). Groupware evaluation is less precise. Field observations are complicated by the number of people involved over time at each site, the variability in group composition and the range of environmental factors that affect the use of the technology. A highly motivated group can make a flawed product look good. A demotivated group can make a perfect system look bad (Palen 1997). Groupware systems need to appeal to the users’ situation. For example, email is a success because, it is available to people who use computers more regularly. It does not incorporate role or process. It also avoids being overly rigid and disrupting the social processes.

For successful groupware direct benefits for all group members must be made apparent. In particular the technology must be designed for the process being used. Groupware design and evaluation is easier if relatively homogenous groups are targeted.

Ned Kock from New Zealand investigated how groupware affects business processes (Kock 1997). He found that virtually no organisations were using asynchronous...
groupware to improve business processes. This indicates one of two things: either it is a new field where there is potential for development or groupware doesn’t help much in business process improvement. His research showed that the introduction of groupware resulted in the following benefits and limitations:

Benefits

- Contribution effort increased
- Record keeping efficiency increased
- Response time decreased
- Business Process Improvement efficiency increased

Limitations

- Disrupted the normal functions of the organisation
- Required participation control
- Lack of Personal contact
- Increased cost because of Business Process Improvement groups

He concluded that asynchronous groupware was more likely to be beneficial than detrimental to Business Process Improvement (BPI) groups and suggested that organisations should try groupware.

He has also highlighted that for any re-engineering effort there should be a focus on the contribution being made by members. To ensure there is maximum participation by members, trust needs to be established between all stakeholders. A lack of trust will most likely result in poor levels of contribution and this will affect the outcome of the overall work that is being attempted by the group. One solution is to use face-to-face meetings.
Chapter 5  eTransformation Business Process Modelling Tool

The outcome from his study, which is used in this work and described later, is that the use of groupware is beneficial in Business Process Improvement projects and that the organisational culture plays a role in the successful capturing information from a group of people.

5.6.2 Discussion Groups

Threaded discussion groups are another specific form of collaborative work over the Internet. Discussion groups played an important role in the design of the eTransformation Business Process Modelling Tool created in this research work. The following brief background shows the link between threaded discussion groups and the modelling tool developed in this research work.

Threaded discussion groups have been used successfully in the teaching environment (Rosman 1999; Caswell 2001). While not all participants contributed equally to the discussion groups used in the study (Rosman 1999; Caswell 2001), improved learning resulted from the use of the asynchronous environment. Potentially, modelling could be used in a similar way. Web applications have the capacity to store and maintain process models, allowing them to become more than their paper/static file counterparts. Sheng, Stafford-Fraser et al. (2000) highlights the importance for development of more than either a digital shared whiteboard or an e-mail discussion group. The framework being proposed in this thesis is such a compromise that links the asynchronous discussion group with a digital drawing space for business process models (Kazanis and Ginige 2002).
5.6.3 Summary of Web Technologies for Collaborative Working

Successful use of collaborative tools over the Internet is highly dependant on culture and the way the tool is introduced to a group of people. The cultural aspect of using collaborative tools is beyond the scope of this research work. However, information gathered about successful collaborative environments have been applied in the development of the prototype used in this Research. The following section will described the framework for a Business Process Modelling tool that attempts to combine the research material for Business Process Modelling with Collaborative Web environments. The framework being described is specially designed to support the eTransformation methodology.
5.7 A Framework for Collaborative Process Modelling Through Web Forums

![Image of a diagram showing driving forces and characteristics for successful BPM]

The driving forces and characteristics for this new approach to Business Process Modelling are shown in Figure 5.4. Business processes are critical to an eBusiness, particularly the ability to visualise and transform those processes. A framework has been developed which incorporates the needs of the eTransformation methodology with the latest research in Business Process Modelling and collaborative environments. A prototype based on this framework has been built to demonstrate the concept of asynchronous collaborative modelling, for the purpose of process improvement. A detailed description of the architecture of the prototype is given in Chapter 6. The prototype combines Web technology, discussion forums and a
drawing tool to provide an improved way of capturing and disseminating Business Process Models.

The major research objective is to determine the usability/feasibility of asynchronous collaborative process modelling. There are, however, many other aspects to introducing this new approach not all of which are covered in this early research effort. Some factors that may inhibit the use of this system lie in both the technology and cultural areas:

- Resistance to change
- Use of system for political purposes
- Users lack technology sophistication required to use system
- Unsuitable process owners
- Failing to provide clear goal for process modelling

These other aspects may be investigated by others dependant on the results from the prototype.

The prototype developed in this research will use Web technology to provide a similar environment to a discussion group. The discussion group will operate under the control of a ‘process owner’, who will decide on a process that requires investigation for improvement. The following steps describe how the eTransformation Business Process Modeller system is intended to operate. A UML Activity Diagram is used in Figure 5.5 to give a visual representation of how the eTransformation Business Process Modeller operates.
Chapter 5 eTransformation Business Process Modelling Tool

1) The process owner will either already know, or will conduct a simple enquiry to find out, the purpose of the process and the key individuals involved in the process.

The process owner will set a goal for the process model e.g. to improve the turn around time, reduce the cost per unit or remove redundant steps in a process.

The process owner will then use the Web-based tool to create something similar to a discussion forum. However, instead of posting a question, a model will be drawn by the process owner and a dialogue provided with it. The dialogue will explain what the process owner is trying to achieve with the model he/she has drawn.

A list of people will be selected to have access to this particular model.

The modelling participants will be able to view the model and the dialogue provided. They will be given a copy of the model and would be allowed to alter, add or delete components of their copy of the model.

Modelling participants can respond to either the original or any other participants’ model. At all times, the original will appear at the head of the forum.
Version control problems are solved because of the forum style presentation of the models. The changes and comments on any process model can be tracked. In addition the system acts as a record of the history of any Business Process Model.

The process owner is responsible for facilitating the collaborative modelling process; he/she will be responsible for following up contributions and moderating discussions. The process owner will be responsible for determining when there has been enough discussion on a particular model and close the forum. They will then, analyse and
combine the various responses into a coherent model that he/she feels represents the process being modelled.

5.8 Conclusion

This chapter has outlined the Diagnosing and Action Planning stages of the third action research cycle. As described in section 5.8, business processes are a key component to a modern organisation. The literature reviewed in this section highlights that to improve an organisations’ effectiveness the organisation must understand its processes. In addition the best way to capture information about those processes is to use the people who actually carry out the process.

Modelling is a good way of visualising, redesigning and communicating information about processes. As described in section 5.4, literature and particularly the work of Giaglis (2001) have carried out extensive research on the use of Business Process Models in the business world. It has highlighted that different Business Process Modelling techniques are suited to different tasks. Specifically, UML Activity Diagrams, which have intuitive symbols, are well-suited to Business Process Redesign and were selected to be used with the Business Process Modelling Framework described in this chapter.

Further to the literature investigation conducted, interviews were carried out with 3 Business Process Modelling experts, as shown in section 5.5.1. These interviews discussed the capture of Business Process Models, whether conducted through Workshop environment or individual interviews with front line operators of
processes. This highlighted that gathering information from front-line people is crucial. In addition, section 5.5.2 discussed the outcome of some actual Business Process Modelling carried out with an SME in Sydney. These observations reinforced the literature in terms of how Business Process Models should be captured. As well, the observations highlighted the importance of a process owner. A process owner would be responsible for selecting and overseeing the transformation of a business process.

This chapter also investigated collaborative environments through literature. Further to that investigation was a literature review of how online collaborative systems can be used in the workplace.

All the background material covered in the first part of Chapter 5 led to the development of the framework discussed in section 5.7, for eTransformation Business Process Modelling. This framework proposes to capture Business Process Models from front-line people using an online discussion group forum and UML Activity Diagrams. The capture of Business Process Models directly is intended to work and support the eTransformation methodology. The following chapter describes a prototype that was constructed to demonstrate and evaluate the key features of this framework.
Chapter 6  
**eTransformation Business Process Modelling Tool in Use**

6.1 Introduction

The focus of this chapter is on the results of the use of the eTransformation methodology and eTransformation Business Process Modelling Tool. In Chapter 5 the framework of a prototype was described. The prototype was built and deployed to a sample group and they were allowed to use it for approximately four months. This Chapter focuses on interviews conducted with two key members of that sample group. They were interviewed about the prototype and eTransformation in general; the outcomes of those interviews are presented in this chapter.

6.2 Prototype Architecture

A prototype based on the framework described in chapter 5 is detailed here. It is aimed at examining if a collaborative online environment for Business Process Modelling is an effective mechanism for assisting with business process improvement. This chapter describes in detail the technical architecture of the prototype tool developed and the justification for all choices made. This is followed with details about its deployment to a test group.
6.2.1 Features of the Prototype

The prototype was built to show the main features of the eTransformation Business Process Modelling Tool. The two main aspects that were implemented were the use of UML Activity Diagram symbols and the collaborative discussion area. A prototype with these key features deployed in a real business transformation environment is a good way to determine the usefulness and feasibility of the eTransformation Business Process Modelling Tool. The detailed feedback from users will be helpful in determining how future implementation of the system should be approached. It will also identify modifications or additional features that would make a better system.

This prototype was developed after weighing many potential technology solutions and alternatives. The major choices are discussed here:

6.2.2 Option 1: Use an Existing Tool

An investigation into existing tools was conducted with several potential tools identified and described here:

Active Objects - Good tool provided proprietary business diagramming technique that was intuitive. However did not provide collaborative functionality and the cost was prohibitive for a prototype deployment.

Rational Rose - Mainly a CASE tool has a very strong selection of diagramming tools, however this would be too complex for the users and it did not have an inbuilt collaborative element. Also it did not readily integrate with a browser environment.

VISIO – a drawing package capable of many of modelling techniques including UML. Due to its many options and capabilities it may prove confusing to a novice user. As will be shown later in this chapter, if VISIO were suitably
modified to limit what a user is exposed to it would become a very useful
tool.
Simply objects – Very similar reasons to Rational Rose

6.2.3 Option 2: Develop Tool from Scratch

This was investigated by looking at Java and ActiveX development languages and
there integration with the Web. Though the development tools presented many
possibilities for creating a collaborative environment there did not appear to be any
easily accessible drawing tools available. Some drawing palettes that could be used
over the Web were investigated, but it quickly proved too difficult to track and store
information about objects drawn on the palettes.

6.2.4 Option 3: Combine Existing Tools

This was the chosen mechanism; it combined a drawing tool (VISIO) with a Web
collaboration tool (Teamservices) to create a collaborative drawing environment over
the web. Using existing tools removed development time and any needs for
maintenance. It did reduce choices in functionality, but this was deemed acceptable
for a prototype environment.

6.2.5 Solution Selected for Prototype Implementation

The solution of combining an existing drawing tool with a Web collaboration tool
did not match the functionality desired in an ideal system. Where the prototype
differed from the ideal system was mainly the linking of a discussion thread to a
specific diagram. Since the application used did not allow this functionality a compromise was reached. Instead of each diagram having a discussion forum, there is a single discussion forum for all diagrams. The discussion entries can be filtered by the diagram topic. The concept of a single discussion group was determined through consultation with one of the principle process owners who used the tool. The single discussion group was decided upon to keep all discussion entries in a controlled area. This would make it easier to identify if there were any new entries for a topic. A filter feature allows users to narrow their view to entries about a specific topic only.

The appearance and order of files on the site was decided to be shown in reverse chronological order. The authors name is visible, to ensure authenticity and authority of the diagram.

Another important aspect was visibility to the general public and access levels. Because of the sensitive nature of the content it was decided to have the site password protected with no public access allowed. It was also important that not all users had equivalent access. Thus access levels needed to be developed. Similarly, for political reasons, it was deemed that people outside the process group should not be able to see the models at all. This was done to strengthen the ownership that the group had and not to make it feel that all the work they were conducting would be scrutinised by superiors.
6.2.6 Technology Used

The two main pieces of technology used are, Microsoft Teamservices and Microsoft VISIO. These two products were chosen for their simplicity, interoperability and widespread availability.

Many factors led to this choice in technology. The people that are going to be exposed to this technology will not themselves be well-versed in process modelling, nor will they have high end technology skills. Thus, the environment needs to be familiar to the participants using the prototype. Similarly, the environment needs to be intuitive and simple to use. Other factors are cost and customisation time to create a working prototype.

Screen shots of the prototype are shown in Figure 6.1 and Figure 6.2. The discussion forum style of the files listed for a specific Business Process Model is shown in Figure 6.1. If an item from the forum style list is chosen (clicked-on), the corresponding Business Process Model will become visible as shown in Figure 6.2.
Chapter 6  eTransformation Business Process Modelling Tool in Use

Figure 6.1 Discussion forum style for Business Process Models

Figure 6.2 Typical interaction in collaborative modelling process
Microsoft Teamservices

Teamservices is a product contained within Microsoft FrontPage and provides a collaborative environment that could be customised to any purpose. It contains many features such as calendar, to do list, discussion forum, file upload area. The interface can be customised to high degree by using FrontPage and changing the layout and actual underlying code of any page in the site. Extensive administrative controls are available, allowing content and user activity to be controlled.

Thus Teamservices provided a collaborative environment that can be quickly and easily set up. The cost was minimal as it is part of a low cost software package called FrontPage 2002.

It would have been possible to create the collaborative environment from scratch using Java Applets, ASP and JavaScript technology, with all the functionality. However, this would have required extensive development time. As the Microsoft products contained most of the functionality required, it has proved prudent to use this technology.

Microsoft VISIO

This application was chosen because of its compatibility with the Windows environment; specifically its ability to work with the Internet Explorer browser. This would give a familiar look and feel for people to work from. A different application might cause disorientation of the users.
6.3 Research Method Selected to Test the Prototype

This section describes the research method chosen to test the eTransformation Business Process Modeller prototype. This is followed by the background of the test environment and then outcome of the tests.

The research method used was in-depth interviews conducted with open-ended questions. To help in the development of those questions some aspects of usability testing were incorporated.

Usability testing was considered as an option for analysing the Process Modelling Tool. Usability testing can be conducted from two points of view either for testing a product or comparing a product for commercial purposes. When doing this, performance speed, ease of use and comparison on functional execution are important (Nielsen 1993; Barnum 2002). Dumas and Redish (1993) clearly points out the differences between usability testing for a commercial product versus for research purposes. Usability testing of commercial products is aimed at identifying user interface issues that can be fixed. Usability testing of prototypes for research purposes on the other hand is more concerned with identify why users interact in certain ways. Another aspect is sample size; commercial testing can proceed with a small group compared to a sample size required for research purposes. When conducting usability testing from a research point of view, other aspects such as, how people use the system and how the use of the system impacts on their workflow are important. Thus, the usability from a research perspective has been used to develop some of the questions used in the interviews: specifically, aspects relating to how this
tool might impact on people’s daily work routine as well as the impact on a specific transformation project.

The in-depth interviews were conducted with open ended questions, this is a qualitative methodology designed to get the widest possible response. It was chosen primarily because this prototype is not something that can be directly compared to an existing product. It would be difficult to have come up with a predefined set of expectations to test against users. To attempt to do so might even affect the outcome or steer people’s responses. Open ended questions in an interview style often (Singleton and Straits 1999) provide the greatest potential response from people. This approach has benefits over paper based questionnaires because people tend to be more open in verbal communication. It also allows any potential misunderstanding to be clarified during the interview. Also, the interviewer has the ability to follow a train of thought or thread of discussion that might not have been predetermined before the interview commenced.

Singleton and Straits (Singleton and Straits 1999) sighted the following considerations that should be weighed up when deciding upon using open or closed questions:

Closed questions should be used for well understood situations. Open ended are preferable when broader information is desired.

If the respondents will be well informed about an issue then closed questions will suffice. Open ended questions are more appropriate if the respondents are not knowledgeable about a topic.

Closed questions are well suited to topics that respondents would have already given consideration. However, open questions are better if it is unlikely that the respondents would have thought about a particular subject on their own.
Open ended questions should be used if the respondents are highly motivated. Closed ended questions may have a negative effect on motivated people as they feel it constrains their self expression.

The researcher’s depth of knowledge about a topic: Without thorough knowledge of the language and vocabulary of the respondent group, open ended questions should be used. Only if the researcher has a good depth of knowledge of the expected responses should closed questions be used.

Thus open ended questions are the most suitable to the research being conducted in this work.

Once the interviews have been conducted and transcripts created, the next step was the analysis of the transcripts. Singleton and Straits (1999) note that when using open ended questions the coding of the responses is very time consuming and potentially subject to error. A strict coding technique is not going to be used rather a summarisation approach has been used. Summarisation will involve going through the transcript and identifying significant responses to the prototype, in a very similar manner to coding, however there will not be a comparison to other respondents as there are only two. Should further research be conducted the summarisation and transcript combined could then be coded and compared to future responses.

6.4 Background: eTransformation Business Process Modelling Tool in Use

An amalgamation at the University of Western Sydney in 2001, joined 3 member Universities, 6 campuses into a single University structure. This created a situation where the administrative functions of one School which was spread across four
campuses needed to be integrated and standardised. A group of administrative staff members was formed to integrate and establish common processes across the four campuses. This created an ideal opportunity to experiment with the eTransformation Business Process Modelling Tool prototype in a real life situation within the context of the eTransformation methodology.

The sample group was comprised of fifteen administrative staff, spread over four campuses. They resemble a SME organization because they are within a staff group of 100 people. Their tasks are similar to administrative duties in any organisation. In the future it would be desirable to use the prototype with different industries and sizes of organisations, to determine its effectiveness in different environments.

All administrative staff had good knowledge of office productivity software. They also had high exposure to Internet and e-mail applications. Few had exposure to Business Process Modelling or equivalent techniques. This was a close match to the profile of SMEs in Western Sydney discovered through a survey in 2000 (Ginige, Murugesan et al. 2001).

The eTransformation Business Process Modelling Tool prototype was deployed to the Administrative Staff group for a period of three months. It was used to support the eTransformation of two processes: ‘CasPay’ and ‘Human Resource’. These are described in Table 6.1 in this chapter. At the conclusion of that period, in-depth interviews with open-ended questions were carried out with two key participants in the experiment. This methodology was chosen because of the unknown outcome of
the experiment. In addition information about any unexpected use of the prototype could be captured.
Chapter 6  eTransformation Business Process Modelling Tool in Use

<table>
<thead>
<tr>
<th>Process</th>
<th>Description</th>
</tr>
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| CasPay  | The Casual Staff application process for the University of Western Sydney.  
Being implemented and tested at the time of interviews.  
Did not adhere strictly to eTransformation methodology. Time constraints meant that design and construction occurred at the same time, something that classically results in extensive rework as was the case here.  
Administrative staff was exposed to eTransformation in operation. |
| Human Resource | Processes for staff to: apply for leave, view their contract, etc.  
The system was at the design phase at the time of interviews.  
Followed the eTransformation methodology closely and is proving to be more successful than CasPay. |

Table 6.1 Two process being eTransformed at UWS

6.5 Interview after 4 months use of eTransformation Business Process Modelling Tool

An interview was conducted with two of the principle users of the eTransformation Business Process Modelling Tool prototype in December 2002. The aim of the interview was to gauge their use of the eTransformation Business Process Modelling Tool prototype, what they used, how they felt about the system, what they thought of the transformation effort, what they thought would improve the prototype in future use.
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The questionnaire used with the interview was broken down into the following sections:

What did you think of the tool
Why do you think the tool has been used so little to date by others in the group
What do you think would have enabled it to be used more by those people
UML: Activity Diagrams
What is the best way to accelerate transformation in general

Specific questions in each of these topic areas were used with the interviewees; these are shown in Appendix C. During the interview several issues outside the topics listed above came out and were explored as much as was reasonable considering the time available for the interview.

6.6 Feedback on eTransformation Methodology

Following the interviews, the transcripts of the interviews were analysed and summarised. The results shown in this section specifically relate to the eTransformation methodology. The first section discusses the actual benefits of the process that was eTransformed. Following this in more detail is the feedback on the actual execution of the eTransformation methodology.

How the process has been improved through eTransformation

The two processes eTransformed ‘CasPay’ and ‘Human Resource’ have been transformed from a paper based method to an online method using the web. It is now simpler for the administrative staff to access information in regards to new staff hires. All administrative staff now have access to the latest information about
staffing for tutorial and lab classes during the hire process at the start of each semester. Similarly staff now have the ability to apply for leave online, this has streamlined the process and reduced the time involved in administrating the process.

**Change should be carried out more regularly**

It was felt that the systems and processes currently being used at the University were too slow and bureaucratic; everything should be more streamlined, particularly in the school of computing, where they should be able to take advantage of technology.

**Inhibitors and Accelerators**

One of the main inhibitors of the eTransformation process is time. Dedicated time needs to be allocated to conducting eTransformation or momentum will be lost and the project will stagnate. Another key factor related specifically to the amalgamation at UWS was dealing with people. Each group of staff members felt that their way of doing things is best. To ensure success in eTransformation all stakeholders need to be convinced by the process owner of the benefits when the eTransformation will be complete. There is a definite need for the process owner to act as an interpreter between technical people and frontline employees. More people dedicated to development would also accelerate the eTransformation process.

**Willingness to Change**

A ‘willingness to change’ attitude from participants will only occur if a benefit can be seen. A physical meeting with all stakeholders is needed before any transformation work commences to let people know the plan and get commitment from them. An announcement made online (via a Webpage) would not have the
same authority. Also, if all the stakeholders are gathered in a room you would most likely have more of a chance of gaining their attention.

**Skills of the Process Owner**

The process owner needs to take into consideration more than just the Process Modelling effort. They need to be aware of the eTransformation methodology and ensure that the process improvement is meeting the business goals and strategy of the organisation. The Process owner needs to know current process to improve it and have Project Management skills. The Process owner should have the ability and authority to decide on process improvements. There is a need for one person (or team of two) to act as a pivot between the users and the technical experts to ensure the transformation runs smoothly.

### 6.7 Feedback on eTransformation Business Process Modelling Tool

The following are the findings derived with relation to the eTransformation Business Process Modelling Tool and its use. They have been derived from the in-depth interviews with two key participants of eTransformation Business Process Modelling Tool prototype:

**Gave Ownership of Processes to Administrative Staff**

The eTransformation Business Process Modelling Tool (prototype) helped to give ownership of the processes to the administrative staff. It enabled them to comment and contribute to the Business Process Model remotely. It also allowed for a
smoother transition to the new system that was introduced because the staff members were already familiar with the process flow.

**Central Repository**

The system was used primarily as a central repository for data and diagrams related to the eTransformation. Having a central repository reduced the administrative overhead associated with the eTransformation. The process owner was able to post changes to Business Process Models and documents and then gain feedback from the group.

**Face-to-Face Discussions Still Occurred**

The majority of the face-to-face meetings normally required to capture business process models still took place. The process owner would convert the information gathered from the face to face meeting into Activity Diagrams. The Activity Diagrams were displayed online and other participants had the opportunity to comment on them. Potentially, if the users become more familiar with the system through further use, it may replace some more of the face to face meetings. This would allow greater flexibility in the use of the eTransformation Business Process Modelling Tool.

**The Process Owner Needs to have Specific Skills and Authority**

The process owner should have the ability and authority to decide on process improvements. In addition, they should also have Project Management skills. Communication is another key factor that the process owner needs to facilitate, often translating information between users of the system and developers. The process
Chapter 6 eTransformation Business Process Modelling Tool in Use

owner needs to ensure that a BPM captured actually shows enough detail to enable the process to be improved. Often what is perceived to be a single step by a frontline person is actually a combination of many more steps. This highlights the issue that frontline people are not business process modellers and initially may not have enough skills to create an accurate BPM. They do however have the capacity to comment on existing models or collaboratively create them. It would be hoped that in future eTransformation attempts, the frontline people would have the ability to create a detailed BPM over the Web without the need for the process owner to assist them.

Need for Dedicated Time

Dedicated time for people to work on the eTransformation and Business Process Models is a key component to successful transformation. If eTransformation work is assigned to be conducted during spare time of participants it will most likely delay any implementation and as a result momentum will be lost and transformation will stagnate. The process owner needs to ensure milestones are met and the eTransformation is kept on track.

Usability of the eTransformation Business Process Modelling Tool Prototype and UML Activity Diagrams

The usability of the eTransformation Business Process Modelling Tool prototype was highlighted as one of its best features. The UML Activity Diagrams, though mainly captured through face to face discussions with the process owner, were easily understood by all the Administrative Staff.
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Need for Interface Design Diagrams

A key finding that was uncovered during the interviews was a request for Interface Diagrams to be made available, something not covered by UML at the moment. Interface Diagrams in this particular case related to the layout of text boxes, buttons and other controls on the Web pages that were being developed to automate the ‘CasPay’ process. The issue of interface diagrams arose at the implementation phase of ‘CasPay’ where there was a need for communication between the Administrative group and the technical development team. The development team needed to confirm the layout of buttons, text boxes and other controls on the Web page with the actual users of the process. It was felt that if the eTransformation Business Process Modelling Tool prototype could have fulfilled this need it would have been of great benefit to the development effort. The users would have a greater ability to contribute to the design.

The eTransformation Business Process Modelling Tool prototype has proven to be successful as a central repository and for the visualisation of Business Process Models. Existing methods of capturing Business Process Models have some limitations. The approach shown through the eTransformation Business Process Modelling Tool prototype has benefits over existing methodologies. The eTransformation Business Process Modelling Tool has flexibility through its geographic independent and asynchronous nature. In conclusion, a key benefit of the eTransformation Business Process Modelling Tool prototype has been the ability to gather information from frontline people in different geographical locations and to give them greater ownership of the redesigned processes.
6.8 Discussion of Findings

The original intent of the prototype was to determine if a collaborative online environment for Business Process Modelling is an effective mechanism for assisting with business process improvement. Before this prototype was introduced all process modelling was conducted by hand and basically kept as physical diagrams. These were mainly used by one person or a small group for use in making changes to a process.

The original intent of introducing the prototype was to have it replace the paper based and also to act as the main discussion forum during the eTransformation. This did not eventuate in this instance, rather the prototype was used primarily for support role and as a central repository for data and diagrams related to the transformation. Having a central repository reduced the administrative overhead associated with the transformation. It was possible for the process owner to post changes to BPM as well as documents and other pieces of information related to the transformation. Where this differs from an intranet or other website is that the process owner who does not posses Web design skills was able to add and remove information from a controlled intranet site. For the process owner it reduced the number of queries for documentation, it also allowed the latest information to be easily available to all participants.

There was also a demand for more diagramming techniques to be available for some of the technically minded participants in the eTransformation. These developers were not part of the original sample group, but were involved in the eTransformation work and did use the Activity Diagrams to gain an understanding of the process
being eTransformed. They requested that the other UML diagramming techniques: sequence and object diagrams to be made available. Collaborative tools for programmers and developers already exist and have already proven their use (Lonchamp 1998; Lonchamp 2000). However, those tools are not intended to be used by non-technical users. Thus, the eTransformation Business Process Modelling Tool offers the ability to hide complexity from people who do not need it, while still providing a full suite of tools for those who desired this. This can be managed via user profiles in the eTransformation Business Process Modelling Tool system. The non-technical users would only be able to view the Activity Diagrams, while programmers and developers would have access to a suite of tools. This was trialled during the prototype deployment, by creating a second eTransformation Business Process Modelling Tool site for technical users. A link was placed on each site. However, only the technical users had a password to the site created for them. This was created towards the end of the prototype testing time and little feedback has been received about its usage. However, it did in no way impact on the existing non-technical users. Having all this information, diagrams and documents for both technical and non-technical users centralised via the Web makes maintenance and administration a more streamlined process.

The ease of use of the prototype was highlighted as one of its best features, reinforcing the view that non-technical users should not be exposed to complicated technology aspects of eTransformation Business Process Modelling Tool. Similarly exposure to any diagramming technique more complicated than Activity Diagrams, should be limited unless the participants show ability in being able to use the more complex diagramming techniques.
Another request was for interface diagrams to be available, something not covered by UML at the moment. The interface diagrams were desired so that layout of Web pages could be discussed by participants. There was a need to confirm the layout of buttons, text boxes and other controls of the Web page with the actual users of the process being eTransformed. It was desired to place a mock up of the proposed layout on the website so that the process owner could gain feedback on it as well. This would benefit the process owner in gaining feedback about the layout. The users would have a greater ability to contribute to the design. In addition the developers would be able to see the information provided by the users and develop the site accordingly. This leaves less of a chance of miscommunication, because all the information is centralised.

The original intent of the system was for it to replace a large majority of the face to face meetings normally required to capture business process models. This has not been the case: most of the face to face activities normally carried out during BPM capture still took place. However, the models were able to be displayed online and other participants had the opportunity to comment on the BPMs posted. Potentially, in future uses of the system, if the users become more familiar with the system it may replace some of the face to face meetings.

A willingness to change is a key factor highlighted by the interviewees for any successful transformation. This has also been highlight by many authors about any change in a work environment (Grover 1993; Brill and Worth 1997). Successful change is only possible with the willing participation of people who carry out the
work. The interviewees felt the key importance of holding a meeting with all stakeholders ensures 100% attention of the group. It also gives authority to work being requested from the group and clearly defines the process owner as being in charge of that particular eTransformation effort. As well, all stakeholders are able to see one another and identities of stakeholders are made known to everyone involved. For this and all future eTransformation attempts, this authority and communication will be important to the overall success of the transformation.

Coinciding with authority required of the eTransformation is the importance of assigning dedicated time for people to work on it. If eTransformation work is assigned to be conducted during spare time of participants it will most likely delay any implementation and as a result momentum will most likely be lost and transformation will stagnate. The process owner plays a key role here and needs to ensure milestones are met and the transformation keeps moving.

Communication is another key factor that the project manager needs to facilitate, often translating information between users of the system and developers. The interviewees pointed out that there is often a communication problem between technical and non-technical people, which can result in frustration. Thus, there needs to be a key individual capable of ensuring that information flows correctly between the two groups. This is part of the role that the process owner must play.

The other key role of the process owner is to ensure that a BPM captured actually shows enough detail to enable the process to be improved. Often what is perceived to be a single step by a process operator is actually a combination of many more
steps. For example, when a process operator was asked how many steps were involved in a certain procedure, they responded ‘three’, upon investigation by the process owner, twenty steps were identified. This highlights the issue that process operators are not business process modellers and may not have enough skills initially to create accurate BPM. They do have the capacity to comment on existing models or collaboratively create them. However, it would take time and experience to be able to create a BPM on their own. This is something that should be remembered for any future attempt in using the eTransformation Business Process Modelling Tool. Initially, it needs to be driven by the process owner.

6.9 Conclusion

Existing methods of capturing BPM have been found to have major limitations with regard to model development time and cost. The new approach shown through the eTransformation Business Process Modelling Tool prototype which uses the Web has potentially many benefits over existing methodologies, particularly because of its geographic and asynchronous nature allowing more flexibility in gathering information from people. Being online allows models to be constantly updated and widely available instantly. The eTransformation Business Process Modelling Tool has been shown to be useful and warrant further investigation. The original intent to have the system replace face-to-face meetings did not eventuate during this study. However, this may change once users become familiar with the system and UML Activity Diagramming and also become committed to the eTransformation process. This is yet to be determined. The prototype needs to be refined in accordance with many of the findings derived from this investigation and deployed to a wider user
base to gain useful feedback that can be generalised, as well as having other researchers carry out similar investigations.

The eTransformation methodology has also been shown to be successful. Some of the key attributes that would ensure continuing success are: dedicated time allocated and the clear communication of benefits to frontline employees. Culture is another key factor that needs investigation.

The eTransformation Business Process Modelling Tool and the methodology worked well together. Further refinement will improve its effectiveness.
Chapter 7
Conclusion and Future Work

The research question which this thesis has attempted to answer is:

How can a Small to Medium size Enterprise (SME) eTransform to be competitive in a globalised, rapidly changing, digital world?

The attempt to answer this question led to a deeper understanding of what is ‘eTransformation’ in the context of becoming competitive in a globalised, rapidly changing digital world and led to the development of three key elements to support the eTransformation process. The three key elements developed during three action research cycles are:

- **The eTransformation Roadmap** – a way to determine existing IT sophistication of an organisation and provide a direction for the organisation to follow if it wishes to become an eBusiness.

- **The eTransformation methodology** – a method for an organisation to progress along the eTransformation Roadmap and continually enhance its business processes using Information Technology.

- **The eTransformation Business Process Modelling Tool** – a tool specifically designed to be used by the people within an organisation and help accelerate the eTransformation process.

The ‘specific learning’ gained in each action research cycle drove the ‘diagnosing’ stage of the next action research cycle. The diagram shown in Figure 7.1 describes the guiding research question answered in each action research cycle.
Chapter 7  Conclusion and Future Work

Figure 7.1 Question at each research stage

The remainder of this chapter is organised with a summary of the key aspects of an eBusiness. Then a discussion on each of the research elements followed by a reflection on the research work as whole. Finally some future research work is presented.

7.1 Key Aspects of an eBusiness

One of the key aspects of an eBusiness is flexibility, being able to respond to change. As identified in this research globalisation and the increased use of Information Technology has resulted in increased competition and a need for greater effectiveness of businesses. To succeed in this new environment a business needs to be able to ‘sense and respond’ to customers needs. These needs and desires are changing ever more rapidly as discussed in chapter 2. The findings in this research show that businesses need to continually evaluate themselves and ensure they are relevant in the marketplace.
During this research it was established that business processes play a central role in a business’s ability to be flexible and respond to change. A process based organisation can respond to changes more rapidly than a traditional departmental, hierarchy based organisation (Adler, Mandelbaum et al. 1996). The importance of business processes are first highlighted in chapter 1 and further investigated in chapter 5.

Similarly, an eBusiness has determined how to use digital channels both within the organisation and with external entities to gain maximum effectiveness from its people and processes. The end goal being that the business is able to determine customers’ needs almost before they do and then make modifications to the business to be able to cater to those changes.

To be able to achieve the form of a dynamic responsive organisation requires some key components. These were identified and discussed in detail in chapter 2. The key characteristics identified in this research were found by reviewing existing successful eBusiness organisations and looking for common characteristics amongst them, which are as follows:

- a focused Web interface
- an in-house IT infrastructure
- just in time (JIT) operation
- decoupled information & technology
- a digital nervous system

The successful eBusinesses that have adopted these characteristics have been able to reach levels of effectiveness that has enabled them to make a major impact on the industries they are in. These eBusinesses are a new way of running an organisation.
Chapter 7 Conclusion and Future Work

Just like any new development, there are initial problems and experimentation to determine the correct approach. However, those that have survived the experimentation stage are thriving in a new environment, an environment that traditional organisations can not directly compete against. That is why there is such a great need for traditional organisations to change and adapt to this new level of competitiveness. The key characteristics identified in this research can help the senior management of an organisation to develop a vision of the type of infrastructure and mode of operation they would need to gain the benefits of being an eBusiness. To further help SMEs and the development of a vision for their organisation the eTransformation Roadmap was developed and is discussed next.

7.2 eTransformation Roadmap

The characteristics of an eBusiness have been determined; however, this does not take into account the existing infrastructure and sophistication of an organisation. Without that information it would be difficult to choose what should be changed in an organisation. This gap is what led to an investigation of IT sophistication of an organisation. It drew heavily on existing work conducted by Nolan and his model of sophistication. However, his model was created before the Internet was a significant factor in the world of business. So his model was extended to create the eTransformation Roadmap. The eTransformation Roadmap viewed IT Sophistication from both an internal and external perspective. This mimics the traditional organisations structure; first they had developed internal IT systems to improve their organisations. Then when the Internet became an increasingly significant part of the business world they added on some form of external IT system.
for the Internet. In most cases these two systems were completely separate. What
the successful eBusinesses have shown is that there are benefits to be gained through
the convergence of these two systems. The eTransformation Roadmap (Figure 3.6,
p.70) shows the path to reaching convergence. It also acts as a measuring tool to
determine where an organisation is on that roadmap.

The eTransformation Roadmap was used with the IT Survey of Western Sydney
undertaken in 2000. The survey is currently being repeated in late 2003. The
analysis of the survey results will again use the eTransformation Roadmap, this will
allow progress made in the region to be viewed. The eTransformation Roadmap is
particularly useful in this instance because rather than showing basic figures of
growth or decline, for example the growth in the number of computers in the region,
it shows how effectively organisations combine the skills of their employees with
technology available. The eTransformation Roadmap is easy to understand and it
gives an informative view of the IT sophistication of an organisation or a region.

The eTransformation Roadmap is of direct benefit to the senior management of
Small to Medium size Enterprises because it gives them a visual representation of
their organisation. It allows them to see both their current position in terms of IT
sophistication and eBusiness and also to see the steps needed to move towards
becoming an eBusiness. This helps them in their decision making for changes that
need to be made to the processes, people and technology in their organisation. To
further enhance the ability of an SME to change, the eTransformation methodology
was developed and is discussed next.
Chapter 7  Conclusion and Future Work

7.3 eTransformation Methodology

Key characteristics of an eBusiness were established from the literature review. A roadmap to becoming an eBusiness was established in the first action research cycle. From the specific learning in that action research cycle it raised the question ‘how can an organisation transform it processes, people and technology to progress along the eTransformation Roadmap?’ this became the basis of the diagnosing stage of this action research cycle. The result from this action research cycle was the development of an eTransformation methodology (Figure 4.1, p.97), which clearly laid out the steps needed for staff of a Small to Medium size Enterprise to transform their processes.

How an organisation should change has been debated since the 1980’s, some of this debate was discussed in chapter 4. The mechanisms for change can be grouped into two main areas, radical or incremental. Arguments for radical change stipulate that only through radical change can radical improvements be made. Those that have promoted incremental change suggest that radical change is a very risky and though great gains might be made so too could great damage be caused to the organisation. Rather than try one of these approaches, it is proposed that a combination of the two be used; continuous incremental change occasionally combined with radical transformation. This would allow an organisation periods of minimal disruption where the organisation can capitalise on the changes they have made to their processes. This is more sustainable than constant radical transformation efforts which would take considerable resources and energy to undertake. The continuous improvement with incremental change would hopefully maintain a culture of positive
attitude towards change (rather than threatening) and enable the radical change effort to run more smoothly.

Both the eTransformation Roadmap and eTransformation methodology that were developed during the course of this research have proven to be areas of research that require a great deal of further investigation. Much of that investigation is now part of the Advanced Enterprise Information Management Systems (AeIMS) group at the University of Western Sydney. Within that group three postgraduate research (PhD) students are investigating specific aspects of the eTransformation Roadmap and the eTransformation methodology. The aim of the group is to become a world leader in eTransformation and to propel the local industries into the eEnabled world.

The eTransformation methodology is useful on its own. However, combined with eTransformation Roadmap it is powerful mechanism that SMEs can understand and use to benefit their organisation on a continuous basis. To further enhance the eTransformation methodology a prototype tool was developed to empower frontline people in the capturing and redesign of their business processes. This is discussed next.

7.4 eTransformation Business Process Modelling Tool

A core facet of an eEnabled business is its processes. Business processes that are designed to ensure people and technology work effectively together are crucial. As chapter 5 has shown they represent a key success factor for any enterprise in the digitally enabled world. Visualising business processes, planning improvements and
communicating the changes are central to enhancing any business. Business processes are also becoming more important because of the increasing use of Information Systems. Rather than the traditional business structure of independent departments, new Information Systems infrastructure is increasing the interdependence of these departments throughout an organisation. The result is a move away from department-based to process-based organisations. Thus any changes, problems or inconsistencies in business processes can have a more extreme effect on the organisation than was the case with traditional business.

Business Process Modelling is the main tool that allows the visualisation and planning of business processes. The research conducted and shown in Chapter 5 has identified that existing tools used for business process modelling were lacking in certain aspects, such as speed of dissemination and capacity to capture information easily from frontline people. Information Technology has been used to enhance many activities in organisations. Similarly, Business Process Modelling needs to evolve and take advantage of the capabilities made possible via Information Technology. This, combined with the increasing availability of the Web, led to the development of a framework to deal with this gap. Using the Web allows the modelling processes to be conducted in an asynchronously and geographically independent environment. The geographic independence of the Web allows input to be gathered from people who would not normally be available to contribute during Business Process Model capturing stage.

The prototype that was created and deployed to a test group, proved that collaborative Business Process Modelling can be successfully conducted over the
Chapter 7 Conclusion and Future Work

Web. It gave an insight as to how it should be used to gain the most benefit. It lays the foundation for further work to investigate how such a Web based tool can be used in a work environment.

The eTransformation Business Process Modeller on its own is a useful tool for capturing Business Process Models in an asynchronous fashion. However, its value is made more significant when used in conjunction with the eTransformation Roadmap and eTransformation methodology. It provides a tool that can easily be used by SMEs to enhance their organisation towards becoming an eBusiness. Combined, this holistic approach to eTransformation allows an organisation to transform faster than would be possible with separate existing methods. This is particularly significant in a globalised marketplace that is under constant rapid change.

7.5 Future Work

The work that has been conducted in this research project has acted as the basis for a much larger research effort being conducted by the Advanced Enterprise Information Managements Systems (AeIMS) research group. The group commenced with three principle members in 2000. In March 2003, it had grown approximately to 15 core participants and a score of affiliates. Included in the core group are several PhD students who are investigating specific aspects of the eTransformation methodology. The IT Survey used to develop the eTransformation Roadmap was repeated in Nov 2003 in the Western Sydney region, this will give insight into the progress that Western Sydney businesses have made. A great demand from business and industry
Chapter 7 Conclusion and Future Work

in Western Sydney to become a part of the AeIMS research effort has occurred; they see the research work as being beneficial to their business, helping them remain competitive. They have come to realise that globalisation and technological advances are starting to affect even small to medium size businesses and are looking to this type of research group for guidance.

The eTransformation Methodology, eTransformation Roadmap and eTransformation Business Process Modelling tool need to be observed in a broad range of work environments. This would lead to further refinements and improvements. Specific future work is outlined here:

**eTransformation Roadmap** – The eTransformation Roadmap is planned to be used in the analysis of the IT survey of Western Sydney being conducted in late 2003 and it will show the progress made from the previous survey that was held in 2000. There would also be benefit in conducting the survey and using the eTransformation Roadmap in other regions, this would allow the comparison of Western Sydney with other regions within Australia or around the world. It is also acknowledged that the survey questions will need to change as business and technology change for it to remain relevant. Similarly there will need to be changes made to the eTransformation Roadmap as changes in the marketplace and technology occur.

**eTransformation Methodology** – This methodology should be used repeatedly in a single organisation to determine if they become more adept at eTransforming their processes. Of particular interest will whether staff members become accustomed to the steps involved in the eTransformation methodology. The methodology should
Chapter 7 Conclusion and Future Work

also be used across a range of industries to determine if certain industries are able to cope with change more effectively than others. There may be a need to add to the eTransformation methodology to address specific issues for different industries. Similarly it would be useful to use the methodology with organisations that currently have varying stages of existing technology, for example to use the methodology with an organisation that has none or only ‘effective individual’ level of sophistication, than to use the methodology with an organisation that has a high level of technology sophistication. This would determine if there are any special needs at those different levels. This research has highlighted that there are key research questions to be answered from a humanities point of view. How does the culture of an organisation affect its ability to change? Some research work was conducted on this topic; however, it is an area that requires further investigation. The eTransformation methodology would benefit from the incorporation of key activities that would affect the response to a change effort. Often, if not handled appropriately people can become fearful or resentful and, either consciously or sub-consciously, work against the eTransformation effort.

**eTransformation Business Process Modelling Tool** – Would benefit from further use in a work environment. Other work that could be conducted is to take the lessons learnt from this work and develop a more robust prototype, and then deploy it to a wider audience. The research outcomes from this work could be used to develop a closed question survey and gather a broader response. Further investigation to Business Process Modelling tools could also be conducted to discover others around the world conducting similar work and identify if synergy exists. A new area that could also be investigated is linking Business Process Models with automatic
programming. Using the Business Process Models to create partial software or Web based programming code to help in the development of systems to support the business processes being modelled.

The business process modelling that an organisation uses is more than a planning tool. By having frontline people participating in the process of eTransformation they become a part of the new process. They will develop a sense of ownership and gain a clear understanding of their processes. Other tools need to be developed to give the people within the organisation a greater understanding and, where appropriate, control of the processes.

The research work conducted has benefited the Western Sydney region; it has focused the efforts of the University of Western Sydney, Local Government bodies and Western Sydney businesses to work together in enhancing the Information Technology effectiveness of the region. It has contributed by providing an understandable eTransformation Roadmap that can be used by a single business to determine how it can proceed to becoming an eBusiness. The eTransformation Roadmap has also served the Western Sydney local government bodies in providing them with information about the level of IT sophistication in the region which allows them to target any areas that need attention. Further the eTransformation methodology provides businesses with a step by step method for transforming the processes within their organisation. In addition, the skills developed in process transformation will aid in the continual improvement of their business. This will make those businesses more competitive and the region as a whole more competitive in our digital, globalised rapidly changing world. Another contribution of this
research work has been to Business Process Modelling. The prototype developed has shown a new way in which Business Process Models can be captured and disseminated. This is a very important aspect considering that today’s businesses need to become process-based rather than hierarchy-based. The eTransformation Business Process Modeller will help in that endeavour.

Overall this research has provided a holistic view as shown in Figure 7.2 (based on: Figure 3.6 p.70, Figure 4.1 p.97, Figure 5.5 p.140) of how an organisation can transform itself to compete in a rapidly changing, competitive digital world.

Figure 7.2 Holistic Toolset for eTransformation
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References


References


References


References


References


References


Appendix A

IT Survey 2000
Information Technology in Western Sydney: Survey 2000

The University of Western Sydney is conducting a study of IT in the Greater Western Sydney Region with the support of the NSW Department of Information Technology and Management, Office of Western Sydney, and the Western Sydney Economic Development Board.

This study aims to establish the current status of IT infrastructure and usage in the region and to assess IT skills requirement, the employment and growth potential, in addition to factors hindering enterprises in the effective use of IT for competitive advantage. The outcomes of the study will contribute to development of an IT strategy and policy formulation for the region.

Your contribution to this study is very valuable and will assist in developing the competitiveness of the enterprises in the region through the strategic use of IT. All the respondents of the survey will receive a complimentary copy of the Executive Summary of the findings and recommendations of the study.

Privacy and confidentiality of your response will be protected. All the responses will be aggregated, and only a summary and analysis of the responses will be published.

The Human Ethics Review Committee of the University of Western Sydney Nepean has approved the study/survey. If you have any complaints or reservations about the ethical conduct of this study, you may contact the Research Ethics Officer, Phone: (02)-4736 0169. Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

This survey may be completed by one or more persons as appropriate (Head of Organisation, Chief Executive Officer, IT Manager, Production/Business Manager or others familiar with overall IT planning and applications in the organisation).

Please contact either of the following, if you have any queries about the survey.

Ms Katie Paterson (02)-4820 3514
Ms Trish Saladine (02)-9689 9085

Please send the completed survey using the attached return envelope within two weeks of its receipt to:

Prof. Athula Gniige
Dept of Computing and Information Systems
University of Western Sydney
PO Box 555
Campbelltown NSW 2560

Glossary

EDI (Electronic Data Interchange) is the computer-to-computer exchange of business transactions using agreed-upon standards in terms of formats of documents. Examples are, purchase order, payment advice, etc.

Intranet: A network that uses the Internet platform, but is restricted to the internal use of a single organisation only.

ISDN (Integrated Services Digital Network) makes it possible to send, receive and modify information using telephone lines with speed and quality that were not previously possible.

ISP (Internet Service Provider) is a company that provides access to the Internet for a fee.

LAN (Local Area Network) links computers and workstations within a single location, such as an office or a building.

Spam: Electronic mass mail.

Website: The space on the Internet where the information of an organisation resides.
### Section A – Details of Organisation

#### A1. Name of the organisation

#### A2. Name of the head of organisation

#### A3. Job title of the head of organisation

#### A4. Mailing address

#### A5. Physical address (if different from the mailing address)

#### A6. Phone

#### A7. Fax

#### A8. Contact person for any clarifications

#### A9. Please list your key products or services.

#### A10. Which industry category most appropriately describes your organisation? (Tick only one)

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<tr>
<th>Industry Category</th>
<th>Code</th>
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</thead>
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<tr>
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<td>1</td>
</tr>
<tr>
<td>Mining</td>
<td>2</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>3</td>
</tr>
<tr>
<td>Computers, Software and IT</td>
<td>4</td>
</tr>
<tr>
<td>Telecommunication, Broadcasting and Transmitting</td>
<td>5</td>
</tr>
<tr>
<td>Equipment Manufacturing</td>
<td>6</td>
</tr>
<tr>
<td>Electricity, Gas and Water Supply</td>
<td>7</td>
</tr>
<tr>
<td>Construction</td>
<td>8</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>9</td>
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<tr>
<td>Retail Trade</td>
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<tr>
<td>Accommodation, Cafes and Restaurants</td>
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<tr>
<td>Transport and Storage</td>
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<td>Communication Services</td>
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#### A11. When was your organisation established? (Tick only one)

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</tr>
<tr>
<td>1–3 years ago</td>
<td>2</td>
</tr>
<tr>
<td>3–10 years ago</td>
<td>3</td>
</tr>
<tr>
<td>More than 10 years ago</td>
<td>4</td>
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A1. Please specify the location of your Head Office. (Tick only one)

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<thead>
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<th>Sydney (Central Sydney)</th>
<th>NSW (other Sydney or W. Sydney)</th>
<th>Interstate</th>
<th>Overseas</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ 1</td>
<td>☐ 2</td>
<td>☐ 3</td>
<td>☐ 4</td>
<td>☐ 5</td>
</tr>
</tbody>
</table>

A2. Please specify the geographical location of your clients, staff, suppliers and business partners. (Tick all that apply) For example, you have clients only in Western Sydney and interstate tick only those two boxes.

<table>
<thead>
<tr>
<th>Western Sydney</th>
<th>Sydney (Central Sydney)</th>
<th>NSW (other Sydney or W. Sydney)</th>
<th>Interstate</th>
<th>Overseas</th>
</tr>
</thead>
<tbody>
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<td>☐ 4</td>
<td>☐ 5</td>
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<td>☐ 8</td>
<td>☐ 9</td>
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</tr>
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<td>☐ 13</td>
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<td>Business Partners ☐ 16</td>
<td>☐ 17</td>
<td>☐ 18</td>
<td>☐ 19</td>
<td>☐ 20</td>
</tr>
</tbody>
</table>

A3. Give the approximate distribution of your clients.
(Column should add to 100%)

<table>
<thead>
<tr>
<th>Consumers %1</th>
<th>Business Industry %2</th>
<th>Government %3</th>
<th>Total 100%</th>
</tr>
</thead>
</table>

A4. Give the total number of personnel (including contractors) that work in your organisation in Western Sydney. (Tick only one per column)

<table>
<thead>
<tr>
<th>Full Time</th>
<th>Part Time</th>
<th>Casual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 5</td>
<td>☐ 1</td>
<td>☐ 2</td>
</tr>
<tr>
<td>5 to 9</td>
<td>☐ 3</td>
<td>☐ 4</td>
</tr>
<tr>
<td>10 to 19</td>
<td>☐ 5</td>
<td>☐ 6</td>
</tr>
<tr>
<td>20 to 49</td>
<td>☐ 7</td>
<td>☐ 8</td>
</tr>
<tr>
<td>50 to 99</td>
<td>☐ 9</td>
<td>☐ 10</td>
</tr>
<tr>
<td>More than 100 (give number)</td>
<td>☐ 11</td>
<td>☐ 12</td>
</tr>
</tbody>
</table>

A5. Specify the main means of communication (other than face to face contact) within your organisation for each category below. (Tick only one per row)

<table>
<thead>
<tr>
<th>Category</th>
<th>Paper, Phone or Fax</th>
<th>E-mail</th>
<th>Web site (Use Another/None)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newsletters</td>
<td>☐ 1</td>
<td>☐ 2</td>
<td>☐ 3</td>
</tr>
<tr>
<td>Notices</td>
<td>☐ 5</td>
<td>☐ 6</td>
<td>☐ 7</td>
</tr>
<tr>
<td>Administration e.g. sick leave, pay slips</td>
<td>☐ 9</td>
<td>☐ 10</td>
<td>☐ 11</td>
</tr>
</tbody>
</table>

A6. Specify the main means of communication (other than face to face contact) with customers, suppliers and business partners. (Tick only one per row)

<table>
<thead>
<tr>
<th>Means of communication</th>
</tr>
</thead>
</table>

Section B – IT Infrastructure

B1. Does your organisation use computers?

YES ☐ 1 NO ☐ 2 Go to Section D page 6

B2. Please list (in decreasing order of significance) the categories of major current and planned Computer IT applications in your organisation (such as E-mail, scheduling, accounting and payroll). For each please tick whether they are current or planned.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Current</th>
<th>Planned</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>☐ 1</td>
<td>☐ 2</td>
</tr>
<tr>
<td>2.</td>
<td>☐ 1</td>
<td>☐ 2</td>
</tr>
<tr>
<td>3.</td>
<td>☐ 1</td>
<td>☐ 2</td>
</tr>
<tr>
<td>4.</td>
<td>☐ 1</td>
<td>☐ 2</td>
</tr>
<tr>
<td>5.</td>
<td>☐ 1</td>
<td>☐ 2</td>
</tr>
</tbody>
</table>

B3. For each current Computer IT application listed above in B2, give the names of specific software package(s) used (examples: Word 97, Excel, Netscape, Corel Draw).

<table>
<thead>
<tr>
<th>Application</th>
<th>Name 1</th>
<th>Name 2</th>
<th>Name 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>☐ 1</td>
<td>☐ 2</td>
<td>☐ 3</td>
</tr>
<tr>
<td>2.</td>
<td>☐ 4</td>
<td>☐ 5</td>
<td>☐ 6</td>
</tr>
<tr>
<td>3.</td>
<td>☐ 7</td>
<td>☐ 8</td>
<td>☐ 9</td>
</tr>
<tr>
<td>4.</td>
<td>☐ 10</td>
<td>☐ 11</td>
<td>☐ 12</td>
</tr>
<tr>
<td>5.</td>
<td>☐ 13</td>
<td>☐ 14</td>
<td>☐ 15</td>
</tr>
</tbody>
</table>
### Information Technology in Western Sydney: Survey 2000

**B1. Approximate what percentage of your employees in Western Sydney have skills in using the following categories of generic applications:**

<table>
<thead>
<tr>
<th>Category</th>
<th>%41</th>
<th>%42</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office Productivity Packages (e.g. Word Processing, Spreadsheet, Business Presentation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Database (e.g. Access)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statistical packages (e.g. SPSS)</td>
<td>%43</td>
<td></td>
</tr>
<tr>
<td>Project Management (e.g. Scheduling, MS Project)</td>
<td>%44</td>
<td></td>
</tr>
<tr>
<td>Web/Internet browsing (e.g. Internet Explorer, Netscape)</td>
<td>%45</td>
<td></td>
</tr>
<tr>
<td>E-mail (e.g. Outlook, Eudora, Netscape)</td>
<td>%46</td>
<td></td>
</tr>
<tr>
<td>Web Design (e.g. FrontPage)</td>
<td>%47</td>
<td></td>
</tr>
<tr>
<td>Specify other major applications, if any</td>
<td>%48</td>
<td></td>
</tr>
</tbody>
</table>

**B4. Are there specific areas of IT skills shortage in your organization?**

- [ ] Yes
- [ ] No

Go to Question B12

**B7. Please list the areas of skills shortage.**

1. 
2. 
3. 
4. 

**B8. How do you plan to deal with the IT skills shortage in the next 12 months? (Tick all that apply)**

- [ ] Hire trained staff
- [ ] Train existing staff (including long term contractors)
- [ ] Hire short term contractors
- [ ] Outsource work
- [ ] Others (please specify)

**B9. Do you have a documented computer disaster recovery or business contingency plan?**

- [ ] Yes
- [ ] No

**Section C – Network Infrastructure**

**c1. Does your organisation have one or more Local Area Networks (LANs)? (See Glossary on page 2)**

- [ ] Yes
- [ ] No

Go to Section E page 8

**c2. Approximately, how many computers are connected to your LAN?**

**B3. What percentage of your Information Technology (IT) employees does your organization employ in Western Sydney?**

If an employee works in the IT area in addition to other work, include him/her under the Part Time/Casual category.

(Tick only one per column)

<table>
<thead>
<tr>
<th>Category</th>
<th>Full Time</th>
<th>Part Time</th>
<th>Casual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 to 9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 to 19</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 to 49</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 to 99</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than 100 (give number)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**B4. Do you provide, or fund, training for your employees in the area of IT?**

- [ ] Yes
- [ ] No

**B5. Specify approximately what percentage of IT employees have their highest qualifications in Information Technology from:**

<table>
<thead>
<tr>
<th>Source</th>
<th>%49</th>
<th>%50</th>
</tr>
</thead>
<tbody>
<tr>
<td>University</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TAFE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Information Technology in Western Sydney: Survey 2000

C1. Is the LAN system used for one or more of the following? (Tick all that apply)
- Sharing a printer
- Sharing and/or transferring files
- Accessing applications from server
- Individual file storage
- Concurrently working on files in shared directory
- Accessing a customer database
- Accessing inventory or stock information
- Others (please specify)

C2. Do you have an integrated information system Enterprise Resource Planning (ERP) to support your business processes?
- Yes
- No

C3. Do you have an Internet? (see Glossary on page 2)
- Yes
- No

C4. Specify the uses of your Internet. (Tick all that apply)
- Share official documents operating procedures
- Provide feedback mechanism from employees
- Support business workflow
- Others (please specify)

Section D – Internet Infrastructure

D1. Does your organisation have an Internet connection?
- Yes
- No

D2. What is the main type of Internet connection you have? (Tick only one)
- ISP (see Glossary on page 2) dial-up account
- Permanent telephone line (e.g. leased line)
- ISDN (see Glossary on page 2)
- Cable modem
- Other (please specify)

D3. Do you transport electronically with one or more of the following? This includes EDI (see Glossary on page 2), Internet and EFTPOS but excludes E-mail, phone and fax. (Tick all that apply)
- Customers
- Interstate/Overseas department
- Suppliers
- Australia Tax Office (ATO)
- Banks/financial institutions
- Other (please specify)

D4. What are the main uses of the Internet in your division/organisation in Western Sydney? (If you require more space, please attach an extra sheet.)

Section E – Web Site and Electronic Commerce Capability

E1. Does your organisation have a Web site?
- Yes
- No

E2. What is your Web address?

E3. Who is hosting your Web site? (Tick one only)
- Your organisation
- ISP or other hosting service provider

E4. How do you let your customers and other people know about your Web site? (Tick all that apply)
- Web address included on your office stationery
- Registering your Web site with search engines
- Promote your Web site through newspaper, TV or radio advertisements
- Promote your Web site through other Web sites (e.g. banner advertisements and portals)
- Spam (see Glossary on page 2) or broadcast E-mail advertising
- Other (Please Specify)
Information Technology in Western Sydney: Survey
2000

1. Is your Web site used for any of the following activities? (Tick all that apply)
   - Internet catalogue
   - Customer enquiries
   - Receiving orders
   - After sales service
   - Follow up service
   - Tracking order progress
   - Delivery of goods (IT products)
   - Other (please specify)

2. Do you use any form of EDI (see Glossary on page 2) with suppliers or customers?
   - YES
   - NO

Section F - IT & T Industries in Western Sydney

F1. Is your organisation involved in computer hardware, software, networking, telecommunications or IT business?
   - YES
   - NO

Section G - Future Plan

G1. Are there any major aspects that hinder the implementation, effective use, or expansion of IT in your organisation?
   - YES
   - NO

G2. Which factors hinder the use of IT in your organisation? (Tick all that apply)
   - Low return on IT investment
   - Not suitable to business
   - Lack of computer literacy of employees
   - Lack of employees with appropriate skill levels
   - Incompatibility with current business systems
   - Attitude of employees
   - Other (please specify)

3. Please specify your areas of business activities (Tick all that apply)
   - Software Development
   - Web site and E-commerce system development
   - Computer hardware assembly and manufacturing
   - Computer Networking
   - Computer software sales (wholesale)
   - Computer software sales (retail)
   - Internet Service Provider (ISP)
   - Telecommunication (other than ISP)
   - Computer IT Consultancy Services
   - Computer Network Service and repair
   - Other (please specify)

4. Do you outsource your software IT development?
   - YES
   - NO

5. Please specify where most of your work is outsourced? (Tick only one)
   - Western Sydney
   - Sydney
   - NSW Government
   - Other
   - Interstate
   - Overseas

6. Please estimate the demand for computer IT personnel in your organisation in the next 5 years. (Insert numbers if you know it)
Information Technology in Western Sydney: Survey
2000

G1. What are the next planned major introduction of computer IT infrastructure and applications in your organisation? (Tick all that apply)

- Computer Hardware
- Major Software package
- Electronic purchasing (e.g. EFTPOS)
- LAN Network
- Internet Connection
- E-mail
- Website
- Internet
- Internet catalogue
- Sales on Internet
- Other (please specify)

G2. Does your organisation have a plan for improving your IT infrastructure and IT usage? If yes, how many months does your plan encompass?

YES ☐ → How many months? _______ ☐ NO ☐

Section I – About the Survey

11. Did the survey get you to think about issues relating to the IT needs of your organisation?

YES ☐ ☐ NO ☐

12. How did you find the questions? (Tick only one)

- Difficult to understand ☐
- A little confusing ☐
- Straight forward ☐

13. Other comments about the survey

__________________________________________

__________________________________________

Thank You

We thank you for completing the survey and providing valuable information.

Please return the survey in the envelope provided.
Appendix B

Interview Questionnaire used with Business Process Modelling Experts
Appendix B

Questionnaire for Business Process Modelling Experts

A. Designed to capture some of the experience as they relate to the capture and use of business process modelling.

1. What type of clients have you conducted business process modelling for
   a. Small, SME or Big Business
   b. Government or commercial

B. Questions relating what process documentation exist before models are Created

2. How many of these organisations had or use existing visual business process models
   a. If so what type, IDEF, Flowchart, UML etc...

3. How do you maintain your existing procedures?
   a. Word of mouth
   b. Written
   c. Developed on your own

4. Did you bring key process stakeholders into a group meeting to model processes improvements?
   a. No – Why, people unavailable, not able to help
i. Separately with one person coming around and asking questions

b. Yes – Was this done in a conference environment with everyone present

5. Did you use visual models to describe process
   a. No
   b. Yes
      i. Were they drawn by hand
      ii. Computer
      iii. Other

6. If process improvement model were created and used, how was information about the changed process disseminated?
   a. Word of mouth
   b. Written instructions
   c. Written procedures

7. Who were the key participants in BPM?

8. Was there a specific process owner who decided which aspects to focus on, or was it your responsibility as the model expert?

9. How were the BPM stored and managed?
10. What changes would you like for BPM to happen?

C. Questions that Relate to After a Business Process Modelling has been carried out

11. What modelling technique did you use to capture the models?

12. What method was used to capture the models?
   a. ask question individually
   b. ask questions in group session
   c. extract from paperwork

13. Which one worked best? Why was this method chosen?

14. Where alternative methods used?
   a. Why did they fail?

15. How would you improve the process model capturing or the process models?

16. What where the advantages and disadvantages of using the modelling diagrams and methods of capture?

17. What was the biggest obstacle you encountered in capturing or drawing process models?
18. How would the model you created be used after they were handed over to the client?

19. Was it intuitive for the people involved to understand the models?

20. Did you find models created to be better than previous mechanism verbal or written?

21. How are your clients going to use the models?

22. Did you find they used ISO 9000 procedures for day-to-day tasks?

D. Aspects of Process Modelling

23. What method is best understood by participants? Why do you think this is?

24. What aspects of the model are most important?

25. What other aspects would be good to show on a model?
Appendix C

Interview Questionnaire used with eTransformation Business Process Modelling Tool Users
Appendix C

Questionnaire for

Users of eTransformation Business Process Modeller

Designed to capture some of the experience of users as they relate to the capture and use of the eTransformation Business Process Modeller.

Background

1. Briefly explain the transformation project you are involved in, its goals and your role
2. What are your thoughts about change (positive or negative) ?
3. What do you think of the concept of process improvement ?
4. What do you think of transformation currently being conducted ?

eTransformation Business Process Modelling Tool

5. Before starting to use eTransformation Business Process Modeller, did you think it would be useful to share models over the web
6. What did you think of the tool ?
7. What did you use it for and why ?
8. What do you think are its strengths ?
9. How do you think the tool could be improved ?
10. Any other comments or feedback on the tool ?
11. Please describe the usage of the tool within the group and factors that might influence its use, such as:
   - Peoples background
   - Politics
• Not needed, other tools available
• Took too much time

12. What do you think would have enabled it to be used more by those people

**UML: Activity Diagrams**

1. What do you think is the best way to use activity diagrams for change?
2. Do you know of other modelling methods and which ones? Do you think they might have been more suited to process improvement and why?
3. What do you think is the best way to accelerate transformation, in general?
Appendix D

Business Process Models Captured at Advance Metal Products

The following diagrams were captured in the early stages of discussions with Advance Metal Products. At that point it became clear the importance of Business Processes and the ability to visualise them. Creating Business Process Models is invaluable for use in improving a process.
(Business Domain) Sales

Recieve schematic or plan  →  Schematic or Plan  →  Generate quote  →  Quote  →  Send quote

(Customers) Customer

Submit schematic or plan  →  Schematic or Plan  →  Quote  →  Receive quote
Methodologies and Tools for eTransforming Small-to Medium-Size Enterprises

by Phillip Kazanis

A Thesis submitted for the degree of Doctor of Philosophy at the University of Western Sydney

2004

© Phillip Kazanis, 2004
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I would also like to thank my friends and family for their encouragement and helpful pushing along the way.
Statement of Authentication

The work presented in this thesis is, to the best of my knowledge and belief, original except as acknowledged in the text. I hereby declare that I have not submitted this material, either in full or in part, for a degree at this or any other institution.

..................................................
(Signature)
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Abstract

The 21st Century is an age of conducting business electronically. The benefits of dealing electronically with customers, suppliers, government and others is a fact that will continue the push towards further use of digital technology. The use of digital technology reduces or removes delays in many business transactions; from order placing to delivery, the entire process is accelerated. Similarly the flow of information between customers, manufacturers and suppliers is becoming more streamlined with the use of Websites, Intranets and Extranets. For example, using an extranet, customers can keep track of their orders, changes can be made, and delays can be predicted. This is simply the beginning as Information Technology is integrated further it will spawn more uses and ideas; new challenges and opportunities will become apparent.

This research work aims to address the following research question:

*How can a Small to Medium size Enterprise (SME) eTransform to be competitive in a globalised, rapidly changing, digital world?*

There are two components to this question; firstly the nature of competitiveness in a globalised environment and secondly, the issue of how an organisation can eTransform. The overall approach to this problem was to review the phenomenon of eBusiness from a global perspective and apply the knowledge gained to existing local businesses. This was done to capture the success and failure of global leaders and to apply the lessons learnt in a practical way to local SMEs in the Western Sydney region of Australia.

The background material investigated at the initiation of this work can be broadly categorised into two types (1) theoretical possibilities; proposing ‘potential’ uses of Internet technologies, and (2) case studies reporting on existing eBusinesses. Existing eBusinesses have proven their organisational structure and approach are effective, for example, using the Internet they have been able to grow a large customer base quickly, without the need for physical buildings like their competitors. In addition, they have been able to reduce cycle times in manufacturing and delivery
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compared to their traditional competitors. Their success is mainly due to a business model that exploits the features of Information Technology and the Internet, and they are referred to as eBusinesses.

A detailed literature review of eBusiness was conducted to discover what made these organisations different from a traditional business. The literature showed that these eBusinesses shared a common approach when it came to the use of Information Technology and its role in the organisation. Rather than a support role they used Information Technology as a core operating channel in their organisation for communication and transactions within and outside their organisation. A set of key success factors were identified, these served as guidelines for the remainder of the research work carried out.

The next phase in this research work involved development of the eTransformation Roadmap, a tool that served two purposes. Firstly, to measure the current Information Technology sophistication of a business. Secondly, to show the steps that an organisation can take to become an eBusiness. The eTransformation Roadmap was also used to analyse data collected from a survey of Western Sydney businesses. The survey gathered a wide array of information about businesses in the Western Sydney region. The region is the third largest economic region of Australia and contains 72,000 businesses (in 2000), it has a population of 1.8 million almost 10% of the entire Australian population. The eTransformation Roadmap was able to show the status and potential of the region with respect to eBusiness. The survey was sponsored by Western Sydney businesses, local government and economic groups, it provided them with a snapshot of Western Sydney and its capabilities to become and conduct eBusiness. The eTransformation Roadmap was also used with a number of Small to Medium size Enterprises in Western Sydney as part of an eTransforming Western Sydney project being conducted by the University of Western Sydney. The eTransformation Roadmap is used by project groups to identify the current situation at an organisation and then to plan a project that will advance the organisation towards becoming an eBusiness.

The next outcome from the research work was the development of the eTransformation methodology to be used in conjunction with the eTransformation
Roadmap. Once an organisation has identified its current position and wishes to advance itself towards becoming an eBusiness, the eTransformation methodology gives a step by step approach which an organisation can use to transform its process, people and technology to become an eBusiness. The methodology has taken existing approaches to organisational change and Business Process Reengineering and adapted it towards an iterative approach that can be used for radical or incremental change.

The final tool developed during this research was an eTransformation Business Process Modeller. A key component to the use of the eTransformation methodology is the visualisation and communication of Business Processes. This is ideally conducted by using an appropriate Business Process Modelling technique. In addition information about a process should be captured from frontline people who actually carry out the process being investigated. Currently the predominant mechanism used to capture Business Process Models is to hire a consultant. There are a number of limitations in this mechanism including the time needed and cost involved. Considering the effects of globalisation and the increasing rate of new technological developments, organisations need to be able to transform their processes rapidly. The solution proposed in this research work is to use an Internet discussion style environment with a simplified modelling tool to capture information about Business Process Models directly from front-line people. This has the benefit of being asynchronous in nature so as not to disrupt the day-to-day operation of an organisation. It also has the benefit of always being available to the organisation. The eTransformation Business Process Modeller was used successfully with a group of administrative staff to eTransform two of their processes.

Overall this research has provided a holistic view of how an organisation can transform itself to compete in a rapidly changing, digital world.