

**MANAGEMENT DEVELOPMENT PROGRAM
(Information Technology)**

**Integrating
Business Strategy and
Enterprise Resource Planning
Systems**

John L Niven (88374399)

M Bus (1999)

This Project has been submitted as a requirement of the
Masters of Business in Information Technology (M Bus)

Faculty of Business /
Faculty of Mathematical and Computing Sciences

CERTIFICATE

I certify that this thesis has not already been submitted for any degree and is not being submitted as part of candidature for any other degree.

I also certify that the thesis has been written by me and that any help that I have received in preparing this thesis, and all sources used, have been acknowledged in this thesis.

Signature of Candidate

.....

ACKNOWLEDGEMENTS

I wish to gratefully acknowledge the support of the following people:

- David Wilson (UTS), for his valuable feedback and advice
- Carole and Ken, for all their support and encouragement
- Simone, for the inspiration to fulfil the aspiration

ABSTRACT

“Half of all technology projects fail to meet CEO expectations”. CSC Index study (in CIO Enterprise, July 1998)

Enterprise Resource Planning (ERP) Systems promise to revolutionise the way a business operates: allowing greater flexibility, market responsiveness, customer service, management information and reduced costs.

However experiences and opinions vary dramatically as to whether ERP systems deliver on these promises. Certainly ERP systems customer demand remains strong, with major ERP systems vendors experiencing several years of double-digit growth and better, with a whole sub-industry of consultants and systems integrators growing around ERP system.

This study examines the strategic nature and implications of the ERP systems decision: in reality a multitude of decisions, which together have drastic and lasting effects on nearly all aspects of an organisation.

As with all strategic issues, there is no ‘step-by-step recipe for success’ with ERP, but rather a successful approach depends on the specific organisation and its environment. Therefore what is required is an assessment and analysis of these, the results of which are combined with established knowledge about IT systems development and implementation to determine the most suitable approach.

In this way ERP is integrated with organisational strategy and therefore can achieve maximum benefit. If ERP is not viewed and managed as a strategic project, it is likely, at best, to be a massive waste of resources and, at worst, may cripple an organisation.

TABLE OF CONTENTS

1	Introduction	1
1.1	Background and Purpose of Study	1
2	Research Framework	2
2.1	Objectives	2
2.1.1	Software Acquisition	2
2.1.2	ERP Systems	2
2.1.3	Business Strategy	2
2.1.4	Integrated Objective	2
2.1.5	Application to Otis Elevator Company	3
2.2	Scope of Study	3
2.3	Assumptions	3
2.4	Methodology	3
3	Software Systems: Buy or Build?	5
3.1	Separating Software and Hardware	5
3.2	Emergence of Software Development	5
3.3	Custom Software Development	7
3.4	Custom Development Problems	8
3.4.1	Separation of Power from Responsibility	9
3.4.2	Difficulty of Stating Requirements	9
3.4.3	Difficulty of Estimating Pioneering Work	9
3.4.4	Difficulty of Maintaining Legacy Systems	10
3.5	Software Development Skills "Shortage"	10
3.6	Rise of Software Packages	11
3.7	Trade-Offs Between Custom and Package Software	13
4	Enterprise Resource Planning Systems	15
4.1	Background and Overview	15
4.2	Drivers of ERP	16
4.2.1	Business Drivers	16
4.2.2	Technology Drivers	18
4.3	The Allure of ERP	19
4.3.1	Business Integration	20
4.3.2	Systems Development and Maintenance	21
4.3.3	Real-time Management Data	21
4.3.4	"Best-Practice" Business Processes	22
4.3.5	Global Operation	22
4.3.6	Reduce Technology Risk	23
4.4	Implementation of ERP	24
4.4.1	Fundamental Process	25

4.4.2	Choosing the Right Option.....	26
4.4.3	When there is no Right Option	27
4.4.4	Implementation Partners	29
5	Business Strategy.....	34
5.1	What Is Strategy?.....	34
5.2	Analysing Business Strategy	34
5.3	Strategic Management	35
5.4	Components of Strategy.....	37
5.4.1	Corporate Strategy	38
5.4.2	Business Unit Strategy	38
5.4.3	Functional Strategy	38
5.5	IT Strategy Alignment	39
6	Strategic Use Of ERP	42
6.1	ERP Strategic Alignment.....	42
6.2	ERP Strategic Assessment Toolkit	43
6.2.1	SWOT Analysis.....	44
6.2.2	Industry Analysis.....	46
6.2.3	Five Forces Model	48
6.2.4	Organisational Culture and Structure	51
6.2.5	Generic Business Strategy	53
6.2.6	Generic IT Strategy	54
6.2.7	Concluding ERP Strategic Fit.....	57
7	Case Study: Otis Elevator Company	59
7.1	History and Background.....	59
7.2	SWOT Analysis	60
7.2.1	Strengths	60
7.2.2	Weaknesses.....	60
7.2.3	Opportunities	60
7.2.4	Threats.....	60
7.3	Industry Analysis	61
7.4	Five Forces Analysis	63
7.4.1	Rivalry.....	63
7.4.2	New Entrants	63
7.4.3	Substitutes	63
7.4.4	Buyers	64
7.4.5	Suppliers.....	64
7.5	Organisational Structure and Culture.....	64
7.5.1	Structure and Organisation	64
7.5.2	Service.....	65
7.5.3	Sales.....	66

7.5.4	Administration and Manufacturing	66
7.5.5	Think Global... ..	67
7.5.6	... Act Local	67
7.5.7	Conclusion	68
7.6	Generic Business Strategy	68
7.7	Generic IT Strategy.....	69
7.8	Concluding ERP Strategic Fit	69
7.8.1	Administration and Manufacturing.....	70
7.8.2	Service.....	71
7.8.3	Sales.....	72
7.8.4	Summary	72
8	Conclusions and Recommendations	74
9	Bibliography	75

1 INTRODUCTION

1.1 BACKGROUND AND PURPOSE OF STUDY

The popularity of Enterprise Resource Planning (ERP) Systems has soared during the 1990s. Their ability to integrate business information and processes has led to dramatic improvements in efficiency and customer service for some organisations. However, there are also many “horror stories” in the literature about failed or costly implementations, which actually reduced business performance rather than enhancing it. Problems with ERP implementations have been attributed to many varied causes over the past few years. Consequently, solutions to these problems have been put forward only to be proven flawed by contrary case studies.

What is often under emphasised is the organisational context of each specific company. By this is meant the markets, organisation, resources, culture, skills and so on which are different for every company. These differences necessitate a different approach to IT strategy, and hence major IT decisions such as the adoption of an ERP System. Whether or not it is better to adopt a completely standard ERP System, or to modify and extend it, is an important strategic issue. It is important because of the cost, organisational disruption, and the resulting impact on market differentiation and competitive advantage. By adopting generic business processes defined in a software package, is the business actually sacrificing an important element of competitive advantage? However, modifying such complicated systems is very expensive and time consuming, with risks rising rapidly as the scope of modification increases. ERP System implementation seems more akin to software development than software installation.

2 RESEARCH FRAMEWORK

2.1 OBJECTIVES

The objective of this study is to provide a framework to determine the appropriate strategic fit of ERP into an organisation. In support of this overall goal, there are several subordinate objectives:

2.1.1 Software Acquisition

Examine the traditional approach to writing business software, the rise of package software, and the advantages and disadvantages of different approaches.

2.1.2 ERP Systems

Describe the rise of ERP systems, examine the reasons for their popularity, and discuss the varied success of implementation approaches.

2.1.3 Business Strategy

Describe the important notion of business strategy in relation to the use of Information Technology. Discuss the importance of aligning IT and business strategy to realise the full value of IT investment.

2.1.4 Integrated Objective

The overall objective is an integration of the above areas into a framework of knowledge, which can be applied to determine the appropriate place of ERP in various specific organisations. Associated with this is the assertion that there is no single, specific answer that can apply to all organisations at all times. The correct answer is *situational*: dependent on all the

circumstances prevailing at the time. This study provides a means by which to interpret these circumstances objectively.

2.1.5 Application to Otis Elevator Company

The strategic assessment framework is applied to Otis, to examine the appropriate strategic fit of ERP to this organisation, and provide a practical example of the assessment approach.

2.2 SCOPE OF STUDY

This study will examine and integrate the areas described in Section 2.1. This requires an overview of theory and practice in each of these areas, including a comprehensive literature review and analysis, which was covered in the separate Project A report.

For more in-depth coverage of each of the specific fields of Business Strategy, IT Management and ERP systems, consult the references provided in the Bibliography.

2.3 ASSUMPTIONS

This study assumes the reader has a basic understanding of organisational theory, and the Information Technology functions of business organisations. Robson (1997) is a thorough and comprehensive text in these areas.

2.4 METHODOLOGY

A literature review was undertaken to include both traditional and current thinking and activities in the fields of Business Strategy, IT Management and ERP Systems. In general, a balance between journal articles, reference

books, and news articles was intended to provide a solid theoretical foundation, while ensuring a practical and contemporary relevance.

Analysis of the literature led me to pursue the integration of these fields into a single framework. It appears as though there is an unspoken barrier between strategic management and IT management: a barrier which prevents the two being used together as a potent force for improving and realigning organisational performance. I do not contend that this barrier is deliberate or conspiratorial in nature, but rather a natural result of the different origins of both fields. However, the rise of computing in the business world, and the tremendous opportunities it brings, necessitate these fields being integrated and hybridised.

For this study, the combination of business and IT principles was tested and refined by applying it to my employer, OTIS Elevator Company, as well as examining the experiences described throughout the literature.

3 SOFTWARE SYSTEMS: BUY OR BUILD?

3.1 SEPARATING SOFTWARE AND HARDWARE

The need for software began the moment computers were invented. However, in the early days of computing, there was little understanding of the difference between hardware and software, as both were usually provided as a complete system by one large company.

The capabilities and performance of computer hardware have improved rapidly and continuously in the last 20-30 years, apparently following Moore's law which states computing performance will double every 18 months. At the same time, hardware costs have rapidly decreased, particularly in the last 10-15 years with the meteoric rise of the ubiquitous Personal Computer, and its microprocessor architecture. This pattern is set to continue whereby technology improvements, rising production volumes and competition seem sure to keep the cost of powerful computing hardware affordable.

This exponential growth in performance of computer hardware has not been matched by a similar increase in systems development productivity. Systems development has been a chief concern of IT management since computers were first introduced (Grindley, 1995). Reactions to this have been extreme at times, for example frustrated 'users' seizing control of computing by acquiring PCs and spreadsheets, only to subsequently drift back to centralised control when data and processes became disorganised, chaotic and more expensive overall.

3.2 EMERGENCE OF SOFTWARE DEVELOPMENT

The question of how to achieve successful systems development projects has been addressed in countless computing books and papers. This area has

evolved from determining a formula for success, to providing a flexible set of principles and a toolbox of techniques, which can cater for the unique aspects of each project.

As in most areas of business and computing, systems development 'fashions' come and go, each one promising to sweep away the problems of yesterday, but each one providing at best an incremental improvement, and sometimes making things worse (Grindley, 1995). Debated examples in this area are 3GLs, 4GLs, CASE, Object Oriented Programming, etc. Despite the improvement in tools, systems development projects are expensive in resources and time, and have a relatively high risk of failure or overruns. "40 per cent of large software projects fail" (Bryan, 1998).

It is clear from the literature and industry practice, however, that there is an established discipline for systems development projects, although it is still evolving. While not guaranteeing project success, ignoring these principles will almost certainly guarantee failure or unnecessary cost.

3.3 CUSTOM SOFTWARE DEVELOPMENT

The traditional software development approach follows the sequential lifecycle, or waterfall approach, illustrated in Figure 3-1.

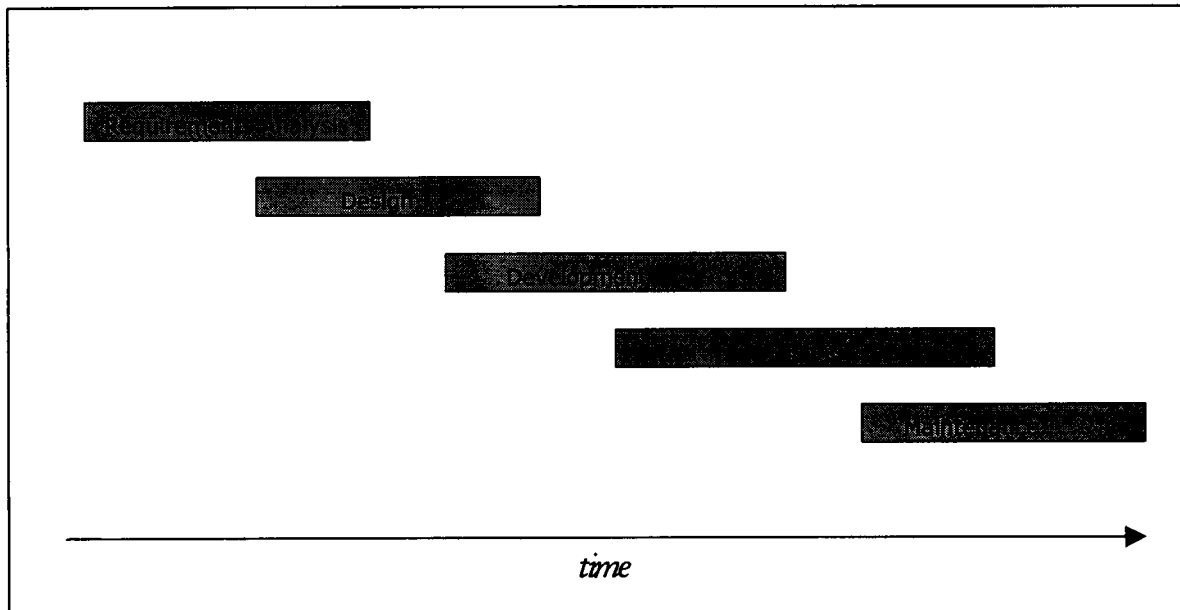


Figure 3-1 The Waterfall Approach

Using this very structured method, each step is discrete, and signed off as finished before the next is completed. Some variations allow for overlap between stages or revisiting earlier ones, but for the most part the stages are sequential.

Structured development approaches like Waterfall were intended to provide the benefit of concrete and complete information to use in the next stage. They recognised that rework of an implemented computer system is far more costly than identifying a design defect in the analysis stage before it is built. However these approaches were also very time consuming before the end-user saw any deliverables. Despite all the sign-offs and documentation, somehow the systems being built were still too often judged as “wrong”, necessitating scrapping or rework. Consequently rigid sequential approaches have declined in use in favour of more flexible methodologies tailored to

the circumstances of a specific software project (Grindley, 1995, Bennatan, 1995).

They are being replaced by iterative, or rapid revision models (Grindley, 1995). Using this approach, software is prototyped quickly for verification, and repeatedly revised until it is judged acceptable by the customer or end-user. This final iteration is then optimised for speed and reliability, becoming the end product. This approach to development is facilitated by new generations of visual design tools which reduce the amount of hand-written source code, thereby making revisions efficient in terms of time and cost.

Despite the emergence of new approaches, most organisations still experience problems with custom software development projects.

3.4 CUSTOM DEVELOPMENT PROBLEMS

The literature contains innumerable case studies about failed or over-budget software projects (both ERP and non-ERP). Any person working in IT knows of examples of vast sums of money being wasted on technology projects which are aborted, deliver significantly less than expected, or deliver at a significantly later time. It is often not publicly documented as organisations find it embarrassing and fear their reputations will be damaged.

It is only the more spectacular examples that emerge into the public spotlight, in the form of reporting of public companies, or where the business operations are so severely affected. The famous example of computerising the London Stock Exchange resulted in a US\$300 million loss. Siemens cancelled a 4 year, \$100 million HR project which did not integrate with its restructured organisation (Bryan, 1998). Thus the stakes are clearly very high.

Grindley (1995) identified the following four inherent difficulties in the development of software, which are consistent with experiences in the literature, and my experience in the field.

3.4.1 Separation of Power from Responsibility

Users demand systems without having to bear responsibility for the consequential problems of cost and complexity this may cause. This responsibility is borne by the internal software development group, who must satisfy the demands.

3.4.2 Difficulty of Stating Requirements

It is very difficult to state in complete detail what a finished software system will look like. It is frequently not known, or thinking is limited by the constraints of the current system (manual or electronic). It is inherently hard to describe and explore the possibilities of software systems unambiguously without actually building a working model or prototype of them. In the past this has been too expensive, and is still a difficult task.

3.4.3 Difficulty of Estimating Pioneering Work

Most computer systems involve a high degree of novel and foreign thinking. This may be due to new technologies, new ways of doing business or simply building trust between people who have not worked together before. Business requirements and technologies will change over the life of the project. If these are not incorporated into the final product, it may be obsolete by the time it is complete. Software development therefore becomes more of an exploratory process, often yielding unexpected discoveries along the way. Because the work cannot be completely defined, estimating its precise duration is therefore naturally difficult. It is a similar

situation to traditional product Research and Development in a rapidly changing environment.

3.4.4 Difficulty of Maintaining Legacy Systems

Because programmers each tend to solve problems differently, and tools and technologies evolve so rapidly, many companies have had a legacy of systems which cannot be economically maintained. In many cases systems have to be replaced, as the tools and knowledge to modify existing systems is no longer available.

3.5 SOFTWARE DEVELOPMENT SKILLS "SHORTAGE"

There is a popular notion that programming is inherently difficult, and therefore a shortage of suitably competent programmers will always exist. It is very difficult to train sufficient numbers of people quickly enough to keep up with rapid changes in the IT field. Skilled people are very well paid relative to the median wage, and are frequently poached from one organisation to another. Clearly good software developers are hard to find.

Grindley (1995) however asserts that the skills shortage is founded in the human aspects of organisational change. Software systems strongly influence, and in many cases determine how people's work is organised and completed. Changing software systems affects the fundamental operations of an organisation, and hence the working lives of its employees. There is simply a limit on how much planning and reorganisation that an organisation can and will submit itself to, for reasons of cost and operational disruption. Therefore, only a relatively small pool of software professionals can be supported on a permanent basis.

Perhaps surprisingly, this theme is supported in nearly all of the literature reviewed: perhaps the problem is not always the “wrong” project management technique or people, but rather the inherent limited capacity of people to conceive, explain and implement changed work patterns across a company.

In any case, organising and completing successful software implementations, be they custom-written or package, is a vital competency for organisations today.

3.6 RISE OF SOFTWARE PACKAGES

As a consequence of the risks of systems development, many companies have turned to packaged software – developed and tested already – to circumvent these problems.

Packaged or pre-written software has risen in popularity since the introduction of microcomputers around 1980. It was not possible or practical for all these new computer users to write their own software (or have it written for them), which had previously been the case when computers were almost exclusively used by large businesses and governments.

The concept of providing a standard software application, with in-built options to make it behave in different ways, caught on quickly and actually moved to the mini and mainframe computer worlds as well. By 1995, more than half of the world’s programs were purchased as packages (Grindley, 1995).

The scope of a software package may encompass only a few specialised areas (e.g. project planning, statistical analysis), or may extend very broadly to encompass an entire suite of business systems (e.g. Enterprise Resource Planning). Packages, depending on their scope, need to be integrated with

other systems, although often standard interfacing and exchange functions are provided to assist.

Robson (1997) summarised some of the benefits of packages over in-house written systems:

- Rapid availability
- Sound business procedures
- Known and verifiable quality
- Low up-front and overall costs
- Inspectable documentation
- Available maintenance
- Continual research and updates
- Varied support and training suppliers

The key appeal to purchasers is the rapid delivery time, and relatively certain cost. The need for requirements analysis is the same for all types of software, but once the requirements are finalised packages do not have to be written and tested. However, it is important not to overlook the value gained through the process of developing software. Programmer and user alike become intimately acquainted with the business process and understand it in complete detail.

Publishers of commercial software depend upon successful products to survive, therefore the quality control is often better than that of internal development teams, who may take a more craftsman-like approach to hand-building software.

Due to their wide usage the training, documentation and support for package systems is of a higher standard.

3.7 TRADE-OFFS BETWEEN CUSTOM AND PACKAGE SOFTWARE

Finally, there are huge R&D costs in the development of quality software systems. In-house developments can only apply these costs to their internal market (one, perhaps two companies), and hence often take shortcuts to reduce cost. Commercial software R&D is usually spread across a far greater number of users, and therefore tends to be of a higher quality, as a result of the larger investment made. Similarly, large companies are more likely to develop software in-house than smaller companies (McGee, 1998).

The compromise is that whereas packages are intended to satisfy the broadest possible range of needs (albeit with options for different types of users), custom developed systems are intended to solve very specific problems. Custom systems can therefore be less complex or cluttered with unnecessary functionality, and may have a performance advantage over a package. There is also the case where a business concept is so new or different that no standard package exists which provides the required functionality (McGee, 1998).

However, it is possible with many packages to modify and extend them to suit particular needs. This may be done by the vendor or by an in-house team. Although this appears to provide the best of both worlds (the pre-written functionality of the package while also satisfying special needs of the individual user), it can actually negate many of the benefits of the package approach.

Modifying package software can prevent or complicate the installation of future upgrades to the standard package produced by the vendor. It also necessitates testing of the revised software to validate its expected operation, both in the area of the modifications, and other standard parts of the system which may also be affected by the changes.

In addition to the outright cost of making the modifications, as well as the on-going cost of supporting them, it is often found that annual license fees are still due to the package vendor who retains ownership of the base system. Thus it can be a very costly approach. Despite this risk, it may still be a faster way to gain the customised functionality, rather than developing the entire system from the ground up.

Regardless of the approach taken to packages, they have become very popular, and have grown to encompass more and more functionality. In the 1990s this has culminated in a breed of super-package called Enterprise Resources Planning systems, which will be covered in greater detail in Section 4.

4 ENTERPRISE RESOURCE PLANNING SYSTEMS

4.1 BACKGROUND AND OVERVIEW

“The CIO at Autodesk [a multinational software company] is ecstatic. His investment in the software phenomenon called SAP has paid for itself twice over in the first six months in reduced inventories alone” (Batz, 1996).

ERP systems offer “the potential to integrate the complete range of an enterprise’s processes and functions in order to present a holistic view of the business operations from a single information and IT architecture” (Gable *et al.*, 1998)

The worldwide ERP market was estimated at US\$10.6 billion in 1997 (Pearson, 1998; Gartner in Macaskill, 1998), with that amount again spent on consultants assisting in implementation. SAP alone has more than 2 million users across some 19,000 sites worldwide (source: SAP). In Australia, the ERP market was estimated at A\$1 billion in 1998 (Gable *et al.*, 1998). For companies to invest this amount of money, they must anticipate enormous benefits. In addition, a study has also shown that 65% of businesses say that “an economic downturn will not effect their spending plans to implement ERP...” (CIS in March, 1998)

ERP systems generally grew from Computer Integrated Manufacturing (CIM) and Manufacturing Resources Planning (MRP) systems of the 1970s and 1980s. In the manufacturing arena, the key challenge is optimising the level of production to meet demand; knowing exactly what to produce, by exactly when, in light of changing customer requirements and priorities (Homer, 1998).

Although simple in concept, it is a very detailed and complicated process to plan all components, raw materials, employees and machine capacity across an enterprise. It requires current data to be available in support of all of these areas to construct the “master schedule”. This schedule then requires continual revision as actual work differs to plans, and customer orders are made and changed.

Success in developing systems to automate these supply processes is what produced most of the ERP vendors and systems of today. From this basis, the functionality of these core planning systems have expanded into non-manufacturing areas such as finance, services and distribution, either by internal development or by these companies acquiring others.

ERP vendors are progressively moving from back-office (production, inventory, accounting) to front-office (customer service, sales force automation) functions in a continuing move to broaden their functionality and appeal, and therefore market and revenue base. They are also starting to provide specialised “vertical market” ERP system variants, which are pre-configured to suit a specific industry, for example pharmaceuticals or travel.

4.2 DRIVERS OF ERP

Rapid change in both the business and technology arenas have combined to enable the rise of ERP systems.

4.2.1 Business Drivers

Business is conducted increasingly on a global, rather than purely local basis. This has been enabled by the increasing free-flow of resources (goods, services, funds, although not people) across national borders. In many instances, this is resulting in large-scale production activities

concentrating in the most economically favourable locations, for example manufacturing in low labour cost countries.

Customers are free to choose from suppliers on an open, global market, and therefore suppliers must all compete increasingly to retain business. This has led to continual improvements being sought in areas such as cost, service levels, or exploiting natural advantages such as availability of skills, raw materials, etc.

In the business arena, focus moved to the optimisation of entire processes, rather than optimising individual steps in isolation from each other. This followed from Michael Porter's Value Chain model (Porter, 1985), and expanded in areas such as the Quality Movement, and the Business Process Reengineering push. The commonly used term for this general concept is "supply chain".

"It's no longer good enough to plan in monthly cycles. These days, businesses must plan on a weekly or daily basis – and synchronise demand along the entire supply chain so that partners are working in tandem to optimise the entire chain, not just one part of it" – Coopers and Lybrand in Wheatley (1998).

In essence, focussing on process means looking at the chain from beginning to end, from order to delivery and payment (and beyond, integrating with suppliers and customers). It means looking from the customer's perspective: asking "what is the customer's experience?" of this service/product.

Identifying a process, and considering everything in the middle open to question, can result in tremendous creativity and improvement. Suddenly all the points of interface and hand-off between functional "specialist" departments (order entry, approval, inventory, inspection, etc) can be

reviewed and organised as individual groups delivering an entire process, rather than just a piece of it.

4.2.2 Technology Drivers

Technology has developed to enable and facilitate the adoption of ERP systems. The emergence of client/server computing in the early 1990s, allowing things such as open, standards-based networks and standard hardware platforms, has made the technical aspects of implementing enterprise computing simpler and cheaper.

In many cases new ERP systems can be accessed from PCs which are already present in organisations, looking like the office applications users already know, running on relatively inexpensive mid-range server hardware, available from a variety of vendors.

In effect technology developments put computing power once available to the largest organisations, in the hands of almost all organisations.

In many cases, it is the IT systems which inhibit or enhance the effectiveness of business processes, and their propensity to be changed. Optimum process-oriented business models are not possible for companies that have standalone, non-integrated, incompatible information systems, mirroring the organisation of the traditional functional groups. At the other extreme, companies that share a common system, with integrated real time databases, over a standard Wide Area Network, can provide real-time service and information on any aspect of a customer inquiry, and can do it largely independent of geographical and time constraints. Enterprise-wide processes require enterprise-wide software.

4.3 THE ALLURE OF ERP

“There is no return on these projects... SAP is the infrastructure. What is my return for putting electricity in this building? There is none; I just have to do it” (Donovan in Baatz, 1996a).

“Few companies buy ERP software just to save money. ‘It’s really the integration of companywide information’ that they’re typically after... ” says the CFO of Elf Autochem, “... But common sense says a single, enterprise wide computer system should be cheaper and easier to maintain than a hodgepodge of antiquated COBOL applications from a dozen different vendors” (Slater, 1998).

The following quote from an SAP R/3 brochure succinctly states the major benefits promised by vendors of ERP systems:

“R/3 overcomes the limitations of traditional hierarchical and function-oriented structures like no other software. Sales and materials planning, production planning, warehouse management, financial accounting, and human resources management are all integrated into a workflow of business events and processes across departments and functional areas. Employees receive the right information and documents at the right time at their desktops. R/3 knows no organizational or geographical boundaries. Corporate headquarters, manufacturing plants, sales offices, and subsidiaries all merge for integrated handling of business processes.”

As we can see from the above, ERP is indeed an immediately attractive proposition. And beyond the solemn promises of vendor marketing material, ERP actually can deliver many of these benefits to users, as evidenced by its enduring market popularity (March, 1998).

Sections 4.3.1 to 4.3.6 describe the areas of benefits.

4.3.1 Business Integration

Integration of process and data can be considered in both the internal and external environment.

4.3.1.1 Internal Integration

Particularly visible at top management level are the problems and costs of incompatible information systems. They are frequently frustrated in their attempts to combine and consolidate information across different parts of their organisations (Galley, 1998). In the past however, each functional area has been able to justify why they need specialised but incompatible systems. In some cases no alternative was available, but in some cases top management was simply not informed sufficiently of the alternatives.

The main attraction of ERP systems is their inherently integrated nature (Jayaraman, 1998). By having a widely available, common set of business processes, working with uniformly structured data in a shared on-line database, the promise is one of complete business integration and efficiency (Koch, 1996). This is in addition to avoiding the problems experienced with in-house development of application systems documented in Section 3, in particular the heavy on-going expenses just to run and maintain outdated in-house mainframe-based systems.

4.3.1.2 External Integration

Not limited to optimising a company's business processes, the "supply chain" concept on which ERP systems are built has been expanded to encompass suppliers and customers (Koch, 1996, Forrester, 1998).

Using standard ERP systems simplifies and streamlines the methods of linking partners' systems together seamlessly across organisational boundaries. ERP users report that up to 95% of orders arrive through Electronic Data Interchange (EDI), significantly saving time and cost in order processing (Wheatley, 1998). This is but one way, the vendors and

consultants claim, true supply chain benefits can be maximised (Forrester, 1998).

4.3.2 Systems Development and Maintenance

As packaged software, ERP systems reduce the need for highly skilled software development groups to be retained in house. As mentioned in Section 3, custom software development involves high fixed costs and complexity. For many companies, managing such groups is not within their core competencies, and has proven a significant management problem (Grindley, 1995, Infosphere, 1997).

Purchasing ERP software allows more focus to be directed at business issues, rather than on the technical issues of designing a complete system. Resources can be targeted at developing systems in more strategic areas, not addressed by the ERP system.

4.3.3 Real-time Management Data

ERP systems, providing a single integrated data repository, promise to streamline a company's information flows, and provide direct and immediate access to a vast range of real-time operational data (Jayaraman, 1998).

This is management information which the old systems could only provide once a month, or that had different numbering schemes between departments, meaning data had to be correlated manually or not at all.

Most ERP systems come with comprehensive reporting and analysis tools, providing breadth and depth of information than is possible with fragmented stand-alone business systems.

4.3.4 “Best-Practice” Business Processes

ERP systems, by their integrated nature and broad scope, literally define how business processes are performed, thereby prescribing how people are organised and perform work. One cannot work “outside of the system”.

ERP vendors invest heavily in ensuring that their products help their users work better. For example, SAP invests 16% of its gross revenues in research and development (SAP, 1998). This on-going investment, combined with the accumulated knowledge and feedback of many current users, ensures that “working to the system” can result in sound business practice, at the very least ensuring a base level of competency (Homer, 1998a).

In effect, by selecting business processes which represent best practice for an industry, it is akin to copying a competitors business model (Davenport, 1998). This can be a tremendous advantage to a new or troubled organisation.

4.3.5 Global Operation

ERP systems have been characterised by their internationalisation. They are available in all major languages, and inherently provide support for multi-currency, multi-subsidiary and distributed users (Homer, 1998a; Koch, 1996; Farley, 1997).

This allows systems to be located and managed in central locations, and yet still appear separate and tailored to local conditions (Moad, 1997). Because of the common system, consolidation and roll-up is ensured across all company divisions.

4.3.6 Reduce Technology Risk

In a similar way to their “best-practice” business processes, ERP systems generally use proven and open IT platforms.

By adopting a popular ERP system, the risks and difficulties of selecting, and implementing a comprehensive IT infrastructure are reduced dramatically. The system defines the architecture, and further work builds upon that foundation.

For example, ERP systems often come bundled with development tools (such as SAP’s ABAP/4) which provide a comprehensive development, testing and deployment environment.

Popular ERP systems are also Year 2000 and Euro compliant, meaning users do not have to accept the responsibility for dealing with these problems which have cost in-house developers great time and money (Davenport, 1998b).

Therefore users can have the justifiable expectation that ERP vendors will deal with issues and risks such as these, as part of their on-going product development efforts. And because of the large base of companies using an ERP system, it is more likely that solutions to problems with the system will be provided, due to the sheer combined economic potential of the customers.

Thus ERP systems, marketed directly to CEOs frustrated with their IT department’s apparent inertia, seem like an ideal solution. Simply pay for the software, and instantly the system provides best-practice business processes, with no hit-and-miss software development projects! “Users enter business data into the system once, and payroll, factory materials

allocation, inventory, shipping, customer service and accounts receivable all run in sync” (Baatz, 1996).

The bottom line in attractiveness of ERP systems therefore lies in the promise of increased speed, efficiency and productivity: the very issues that respond to the ever-increasing competitive issues that are putting pressure on contemporary businesses.

4.4 IMPLEMENTATION OF ERP

ERP implementation has received saturation IT media coverage in recent times.

“The decision to purchase an ERP system is easy; it’s effective implementation is difficult” (Kapp, 1997).

“Implementing ERP is for many organisations the largest project they have ever undertaken entailing the largest potential benefits and... the largest potential risks” (Gable *et al*, 1998).

Buying ERP means “buying a business model” (Computer Finance, December 1997).

In October 1998, “two years work and \$4 Million went down the drain at Macquarie university... [in Sydney] ... when it officially shelved a student information software project after it discovered customisation complications would drag implementation out past the [year] 2000 deadline.” (Bryan, MIS, November 1998)

“Trustees of bankrupt US pharmaceutical distributor Foxmeyer are suing ERP vendor SAP and its implementation partner Andersen Consulting for US\$500 Million each. They accuse SAP of ‘fraud and negligence’ and Andersen Consulting of a ‘botched implementation’”. (Bryan, MIS, November 1998).

The above examples show that rather than the hoped-for silver bullet, ERP can be a poison pill to an organisation if an inappropriate implementation approach is used.

4.4.1 Fundamental Process

ERP systems can be implemented in several different ways, which have evolved as field experience has grown. Although implementation of ERP systems appears to focus mainly on the configuration options provided by the software designers, this is a deceptively complicated process.

Before deciding which options to choose, a decision is required as to what modules will be used. This may be evident by looking at which parts of the business correspond to the package's modules, but may involve a conscious decision to only implement financials in a first phase, for example, rather than the entire enterprise. Some modules may only be appropriate for some industries (e.g. manufacturing or professional services). Selecting a smaller number of modules reduces the benefits of integration that an ERP provides, but also reduces the complexities and risks of the implementation.

Configuration options may number into the thousands (SAP has more than 8000) and impact each other in combination. The choices made can dramatically change the way a business process works in the ERP package, "but figuring out precisely how to set all the switches in the tables requires a deep understanding of the existing processes being used to operate the business" (Batz, 1996)

The plethora of options are intended to maximise the flexibility of the software. In this way, end-users can modify the operation of the software without modifying any of the underlying software code, and thereby avoid the risks and costs of custom software development, which were described in Section 3.

“Mega-packages [ERP Systems] require a higher level of organisational change than for other types of systems... firms typically need to change their business processes, organisational structure and even business strategies” (Davenport in Gable *et al*, 1998).

The decisions about how to perform a business process, how to organise people and authority in the context of the ERP system are frequently called Business Process Reengineering (BPR).

The implications of BPR can be large scale change management issues in their own right. It is this very time-consuming process of considering alternatives, testing them, reaching agreement across functional departments, implementation and training that have given ERP systems a poor image in industry circles, for being time consuming and costly.

Training and change management are cited as the two most overlooked factors for the successful release of the BPR and ERP software throughout an organisation, and can undermine success despite good strategic fit of the actual systems themselves (Baer, 1997; Slater, 1998; Bryan, 1998).

4.4.2 Choosing the Right Option

Choosing the right option is simple at the level of individual conceptual decisions, but becomes complicated as it will dictate how the business process will be performed when the system is implemented. For example, decisions need to be made regarding the organisational accounting structure, the inventory costing policy, and so on. These decisions require “that managers harmonise part numbers, for instance, so that customer service, manufacturing, accounting and finance use the same terms for the same inventory.” (Appleton, 1997). This can be difficult where managers are used to thinking only in terms of their own departments’ needs.

Understanding the subtleties of each option, and their effect in combination is a hugely complicated task. It can require intimate and detailed knowledge of how the system was written by the designers. For this reason also, consultants are often brought in to advise on these configuration options.

Selecting configuration options is where most of the ERP implementation time is spent, because it frequently requires a series of trial-and-error decisions and tests, and attempts to reach consensus by a traditionally defensive group of business function representatives.

4.4.3 When there is no Right Option

During the configuration process, situations will arise where none of the options seem to suit the requirements of the user. Despite ERP systems being the “most complex and far reaching software packages ever devised, many organisations soon find that key portions of their business simply aren’t supported fully” (Cummings, 1998).

The basic decisions available in this situation are: accept compromise in the business process, modify the software or use a specialised system.

4.4.3.1 Compromise

Compromising means accepting a less than ideal business process, to retain the simplicity of a single, vendor-supported, upgradable, unmodified ERP system.

4.4.3.2 Modify ERP System

Modifying and extending the functionality of the ERP software to suit a specific user means accepting the time, costs and risks of custom software development.

“Customisation and integration of software packages can run as high as a third of implementation costs” (Forrester in Bryan, 1998).

This is in addition to the on-going costs of re-integrating (verification, modification and testing) the changes each time a new version of the package is implemented, and also in addition to the fact that software license and maintenance charges are still due to the ERP vendor.

4.4.3.3 Use Specialised System

Using a separate, specialised system means interfacing data from the ERP system to the specialised system and back again. This adds significant cost because of the need to write interfacing software, which can cost up to \$400,000 to build (Bryan, 1998). It also dilutes the otherwise assumed seamless integration and real-time data benefits of the ERP system.

Further, it tends to reduce the accuracy of data in the long term, as referred data is not available, or out of date, at the time of input validation.

The need for specialised applications is being addressed in part by emerging middleware products called Enterprise Integration Applications (EIA) (Edwards, 1998). A number of ERP vendors are forming “partnerships” with specialist applications vendors to maximise interoperability (Rebello, 1997).

These products provide ready-to-use links between popular packages, and a generic way of programming the interfaces, which is intended to save development time and therefore cost.

However, regardless of the refinement of these EIA products, it is not possible to provide the same level of real-time integration as exists between native modules of an ERP system (Hurwitz, 1998).

None of these choices facing ERP users who find their specific requirements unmet are ideal. Trade-offs must be accepted. However, one

option is more appropriate than others in most circumstances, and must be considered from the point of view of alignment with the business strategy.

4.4.4 Implementation Partners

The ERP implementation process is complicated, therefore there are a variety of implementation partners who will provide different approaches at widely varying costs. The approaches range from fully managed, tailored implementations by consultants, to simply purchasing the generic software package “as-is”. It is important that the choice of an implementation partner and approach matches the business model and strategy of the organisation.

4.4.4.1 Consultant Implementations

The largest, and most visible ERP implementations were done for large organisations by large consulting firms such as Arthur Andersen, Deloitte, PriceWaterhouseCoopers, Ernst and Young, KPMG, etc. Project durations and costs have ranged from three months to three years, and hard data is rarely available as all parties prefer to keep it confidential. It is also difficult to compare, at a detailed level, the duration and costs between implementations, due to the inherently individualised nature of each set of circumstances. “There is no such thing as a standard cost to implement ERP” (Gartner in Slater, 1998). However, a Meta Group study found that consultant costs dwarfed the actual software costs by between 4 and 10 times (Baer, 1998).

It was these large time and materials charged, consultant-led ERP implementations that gave ERP the reputation of being expensive and time-consuming to implement. The main reason for this was that Business Process Reengineering (BPR) was the fundamental driver of the process. In fact, for a typical (consultant-led) ERP implementation project, 50 per cent of the total cost is spent on BPR (Forrester in Bryan, 1998).

The reasoning (or, as some have expressed the view, marketing) underlying the BPR-focussed approach was an extension of the promise of ERP to allow new ways of doing business, and unprecedented integration.

These new opportunities simply “demanded” that a complete reconsideration be given to the way companies ran their business processes.

BPR involves a great deal of discussion and agreement. Because of its implications for organisational change, it is often resisted at each step by those with vested interests in the status quo, and influenced by hidden agendas and fears of people affected.

The more ambitious the scope of these business changes, the more surprises there seemed to be. For example, to support a radically redesigned business process, additional functionality must be developed in the system; internal politics need to be dealt with; there may be inadequate data in the legacy system to support the new process properly, and so on.

Add to this the problem of how to judge when the BPR is truly complete: is this process perfect, or just acceptable? Hence it is easy to see why an environment may develop which is conducive to “analysis paralysis”.

Consultants frequently provide all the project management, consulting, programming and implementation resources required. Companies therefore under emphasised the importance of skills transfer to their own staff, and found themselves dependent on expensive consultants much longer than originally planned (Davenport, 1998b).

Successful implementations using this BPR-based approach are possible, but require a focussed, dedicated, talented and fearless leadership group who are able to communicate and propagate organisational change.

Most organisations do not have this environment, and therefore the process outcome falls somewhere short of expectations.

4.4.4.2 Plain Vanilla

At the other extreme, due to the lengthy and costly initial large-scale BPR-based ERP implementations, a “no-modification” approach referred to as “plain vanilla” has emerged. This involves accepting the generic business processes available in packages, often pre-configured by the authors to suit a specific industry or business type.

These implementations allow for some configuration options, but not code modification or extensions. The generally accepted definition of “no modifications” is any option or configuration that is not supported by the vendor (Baer, 1998). Any options or modifications not supported by the software vendor require specialist integration and testing to ensure compatibility with each new version of the software released by the vendor, thereby imposing significant on-going costs upon the user. “Plain Vanilla” is intended to avoid the costs and risks of maintaining such customisation.

The results of an extensive study (Baer, 1997), show that there are almost no ERP implementations which do not involve even a minor degree of unsupported modifications. From this we can conclude that although businesses share many or most things in common, there are specific requirements which will always be different.

For this reason, the plain vanilla approach is more a state of mind than a reality, and has fallen in popularity, since it emerged as a knee-jerk reaction to the expensive and lacklustre implementations that received prominent coverage in the early days of ERP.

4.4.4.3 Systems Integrators

A solution which has grown in popularity is to engage small “systems integrators” to provide a complete hardware and software ERP solution. These companies are trained in how to configure the packages, but do not

have the consulting, project leadership and software development resources of the big consulting firms.

Hence, their scope is more limited, but so are their costs. A benchmark ratio of 3:1 is indicative of the services costs to software costs (Baer, 1998). Fixed Price contracts have also grown in availability in this market. Customers are primarily medium-sized enterprises (\$50 – 500M), rather than the multi-billion dollar multinationals who still prefer the consultant-based approaches (Baer, 1998).

The approach is more based on the technical aspects of the hardware and software, with the project management, organisational change, communication and training functions left primarily to the user organisation.

Hence these costs may not show up as part of the project, or the activities may be underdone. Regardless, many organisations find they are able to obtain many of the benefits of ERP at a much reduced cost.

These companies will still perform small modifications to tailor it to a specific business, but by skill and support necessity, these are kept minor, unless the customer is willing to support the cost of an in-house or outsourced software maintenance capability.

It appears the systems integrator model has achieved a workable compromise between ‘consultant’ and ‘plain vanilla’ approaches, and will become the preferred model for medium-sized businesses adopting ERP. However, under this model it is even more important that a company integrate the ERP system with business strategy, because there are no business-oriented consultants on the project who can advise and assist with such decisions.

In summary, the question in ERP implementation is therefore not whether to allow modifications at all, but how to keep them to an “essential”

minimum. Pearson (1998) found that keeping custom code below 10% is a common target, to contain maintenance expenses.

Regardless of the approach used, ERP implementation and operation requires a conscious decision to incur the costs (make an investment) in return for market differentiation or operational performance, rather than to maintain the status quo.

The difficulties and issues faced in ERP implementations are the same as for other software projects: the difference is the scale. But ERP will affect every part of an organisation, as a result of its inherently integrated nature. “Mistakes that ripple through comparatively smaller software projects assume tsunami-scale proportions during an ERP implementation.” (Bryan, 1998).

However, an approach which works well in one instance does not guarantee success in another. The problem is therefore how to determine which approaches are more likely to succeed in a particular set of circumstances. This process of strategic assessment and decision making is discussed in Sections 5 and 6.

5 BUSINESS STRATEGY

5.1 WHAT IS STRATEGY?

There are many different definitions of the term 'strategy'. Robson (1997, pp4-5) provides 10 different definitions, including one of her own which is:

“Strategy is the pattern of resource allocation decisions made throughout an organisation. They encapsulate both desired goals and beliefs about what are acceptable and, most critically, unacceptable means for achieving them.”

This rather dry definition, encapsulates the essence of other definitions offered in the literature. The different definitions are discussing the same concept, but are assuming and promoting a particular method for deriving the strategy, which is why they are worded differently.

In simplistic terms “strategy” simply means how an organisation responds to its environment: its capabilities, its decisions to take action, and its evolution and growth over time. A company’s choices in these areas determines how it performs in its market today, and most importantly, how it will perform in the future.

5.2 ANALYSING BUSINESS STRATEGY

Strategy may therefore be deduced from patterns of organisational behaviour, rather than directly and clearly stated. It can be articulated or unarticulated. Where it is clearly articulated in its own right, strategy provides a yardstick and framework against which to measure organisational decisions and actions.

Articulated strategy can be directed with much greater effect than unarticulated strategy. Unarticulated strategy is naturally somewhat ambiguous and subjective. It can be directed only at each individual

decision point, and cannot be used to guide and influence the pattern of all actions of an organisation, as is the case with a clear articulated strategy. Unarticulated strategy is also often called emergent strategy: it is not something planned and architected, but rather emerges over time simply from an observed pattern of actual organisational behaviour.

5.3 STRATEGIC MANAGEMENT

Strategic decisions are not so much related to the immediate financial implications (although often they are), but rather their influence to change or constrain organisational behaviour. Therefore a decision to focus business on electronic sales channels may be far more strategic than achieving this year's profit result through cost cutting. However this is not necessarily the case, it depends entirely on the environment at that point in time, the organisation's present abilities, and so on. The point is that because strategy involves an element of predicting the future, it is not an exact science.

This is complicated further because strategy can no longer assume stability over the long term. The pace of change in world economies and technology requires constant change to remain competitive. Yesterday's success is becoming tomorrow's failure, because the environment changes rapidly.

Nonetheless, organisations who have a clearly articulated vision, objectives, plans for achieving them, and who apply their resources in a consistent manner to these things tend to consistently outperform over the long term those organisations which do not. The exceptions are of course, where the strategy planned so carefully, is inappropriate to the environment.

Getting the strategy "wrong" is the risk all organisations face in conducting strategic planning. To minimise this risk, in the past, companies have taken considerable time to consider and refine strategy, and implement it over the long term. However, in the modern business world, this time is a luxury

that almost ensures the environment will have changed before the strategy can be implemented. Therefore it is revised, but in this extra time, the environment has changed again. This frustrating situation has been termed “analysis paralysis”. In response to this, strategy today places greater influence on building and maintaining flexibility and agility. Change and unexpected developments must be accepted as a simple reality, and therefore the most useful competencies are the rapid appropriate responses to these things: being able to identify opportunities, apply resources and capitalise on them before more sluggish competitors even see the opportunity. Increasingly the first dominant player in a new market segment comes to define that segment, and either grows strongly in its own right, or is acquired by another company at a premium price. Both of these outcomes are appealing to shareholders who provide the company’s equity.

5.4 COMPONENTS OF STRATEGY

Strategy operates at different (vertical) levels and in different (horizontal) areas throughout the organisation, with these strategies being interdependent across an organisation. Figure 5-1 shows the related elements of strategic management.

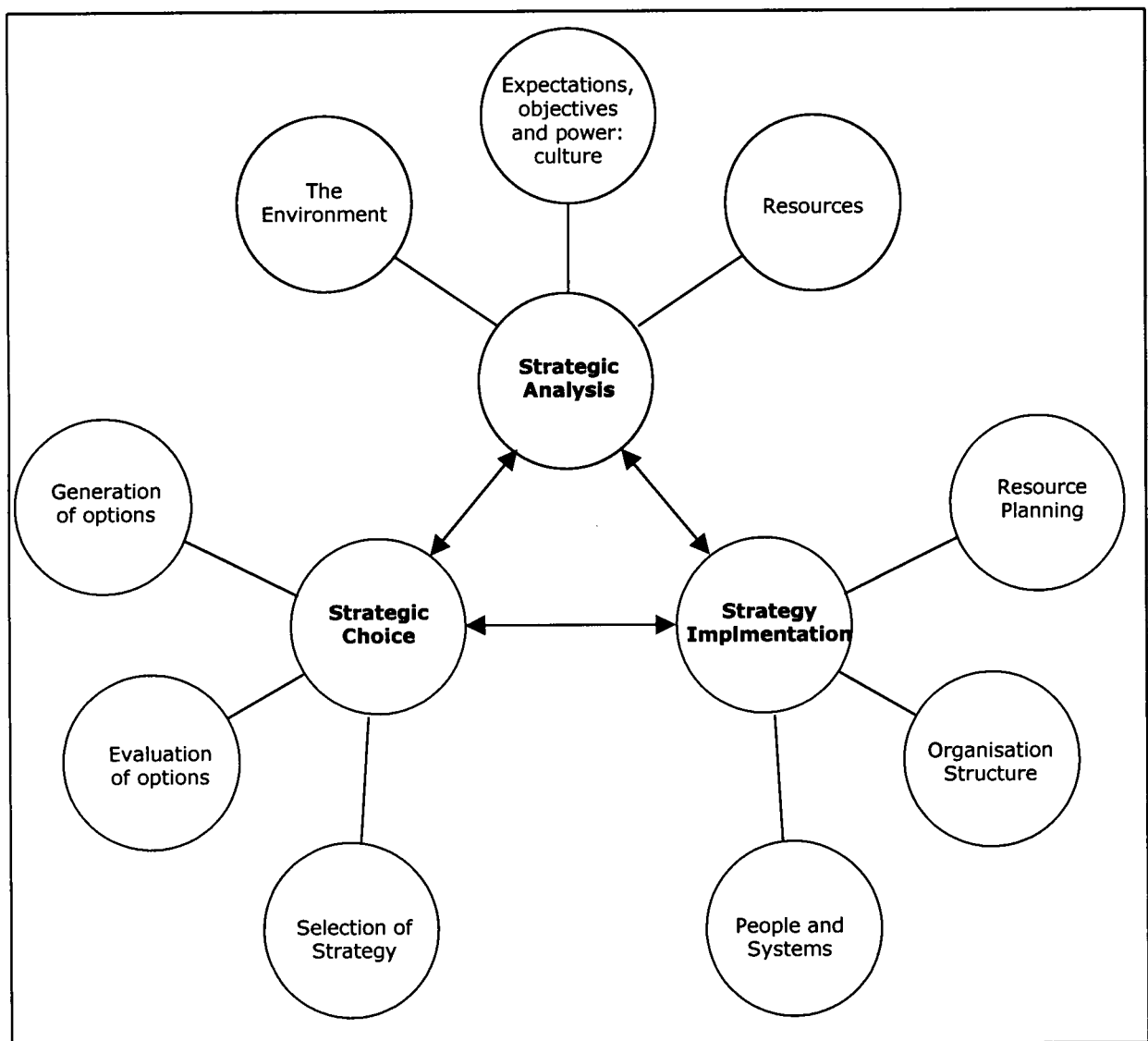


Figure 5-1 Elements of Strategic Management (Robson, 1997)

A popular analogy is to liken a corporation to a human body: each organ has a specific, but different purpose and objective. Some have immediate

effects (e.g. cardiovascular system), others have more subtle or long term effects (e.g. endocrine system). However the interaction and performance of each part determines to a great extent the health of the whole person. It is important that the performance of every part in an organisation be consistent with the overall strategy.

For example, the IT strategy can strongly influence the possibilities and achievements of the corporate strategy. It can derail the corporate strategy if it is not in alignment.

5.4.1 Corporate Strategy

At the top level is the corporate strategy. Robson (1997) defines this as “the sense of direction for the *entire* organisational group, and so it identifies those businesses that the organisation will engage in. At this level, only the global objectives, and the general orientation in order to achieve them, are defined.” The corporate strategy sets the tone and manner for the business style which operating business units will conduct.

5.4.2 Business Unit Strategy

Each business unit has a strategy or “intent” linked to the corporate strategy. Rather than the prescriptive step-by-step action-focused “strategies” of the past, this should provide the broad directions of what the organisation wants to be, and broad directions of how to get there.

The result should be a reference point for individual functional areas to use in their decision making and operations.

5.4.3 Functional Strategy

A business will have a number of functional strategies which apply available resources in the best way to contribute to the overall business strategy. IT is one of these functional strategies, marketing would be another.

These segregations are intended to be “logical” not physical: each will influence and depend on another, and must be in harmony overall and not optimise one function to the detriment of another, which would be self-defeating or wasteful of overall resources.

Therefore each level and element of strategy affects one another, across layers and functions. Hence strategy needs to be reviewed, revised and refined to ensure consistency, alignment and accuracy.

Not a top-down or bottom-up approach, but a combination of the two, the development of strategy is an investment that can bring great rewards in business performance and is essential for long term survival.

These rewards stem as much from the outcome of the strategy development, as from participation in the process of developing it, which can have significant political, psychological and team-building effects.

5.5 IT STRATEGY ALIGNMENT

The importance of IT and business strategy alignment has been selected by top management of corporations as the most important issue facing IT directors for the last 4 years in a row (CSC, 1998).

IT has the ability to greatly affect business performance.

In 1997, CSR Australia reported an abnormal operating loss of \$38 million, attributed to problems resulting from its \$70 million SAP R/3 implementation. George Weston suspended an ERP implementation mid-rollout to meet global standards on a different product (Bryan, 1998).

Due to a poorly implemented billing system, US-based Oxford Health Plan lost US\$300 million and two thirds of its stock price within a year

(Bresnahan, 1998). The problems were traced back to poor linkage between the IT and business goals for the project.

Most IT strategic alignment problems are not this spectacular, but “poorly envisioned and executed IT investments become slow leaks that can burden a company while remaining almost unnoticed – until it is too late” (Bresnahan, 1998).

Figure 5-2 illustrates the integration of IT and Business strategy.

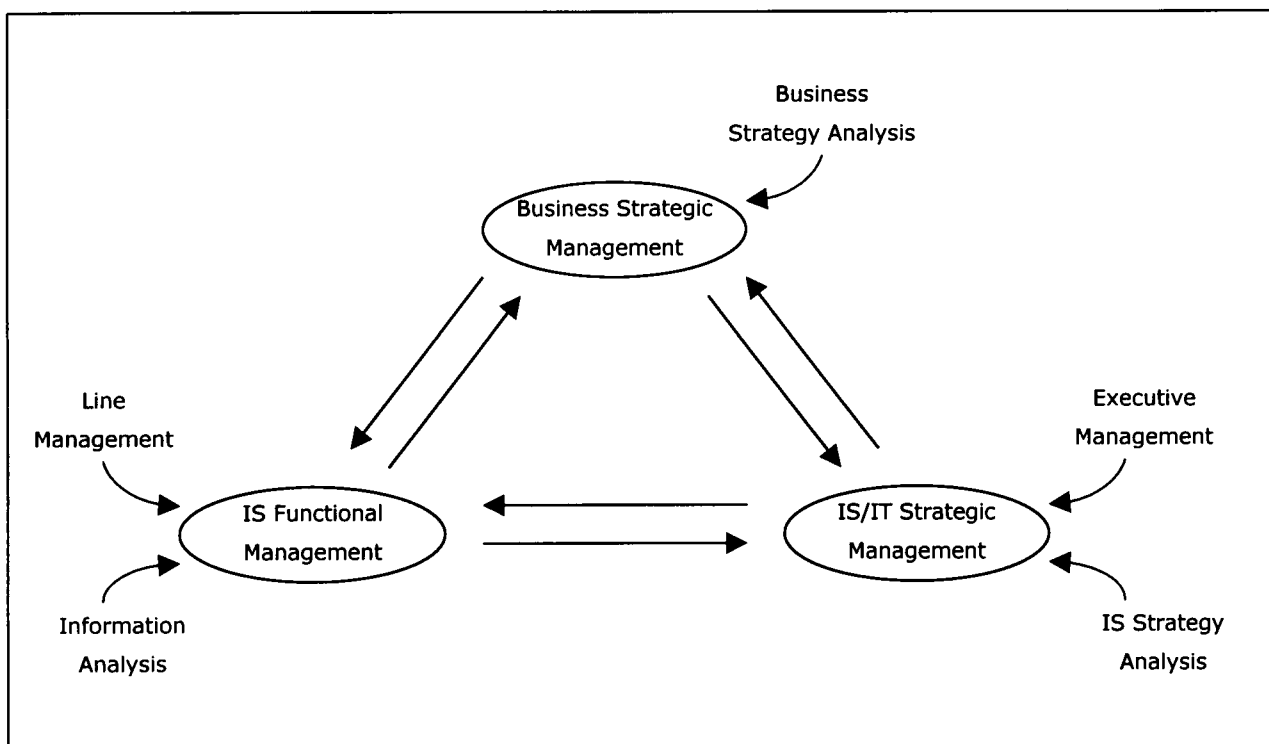


Figure 5-2 Integrated IS Strategic Management (Robson, 1997)

IT strategy, like all aspects of business strategy, must be connected, and consistent. Robson (1997) identifies three ways in which IT strategy relates to business strategy:

5.5.1.1 Alignment:

The translation of business goals into a set of consistent IT goals.

5.5.1.2 Impact

Enhancing or deteriorating the performance of business goals, for example a system which speeds up or slows down a business process.

5.5.1.3 Redesign

Allowing business processes to be performed in ways not possible without IT.

There is therefore often a close, reciprocal relationship between the IT strategy and the overall business strategy. ERP systems can affect strategy in any or all three ways, depending on the nature of the business and its environment.

6 STRATEGIC USE OF ERP

6.1 ERP STRATEGIC ALIGNMENT

Section 4.4 examined the different features and possibilities of ERP systems implementation approaches. In some cases ERP seems to bring all the promised benefits, in others it seems an unmitigated disaster, even when using a similar implementation approach! In some cases users found that the “expense of the customisation outweighed any benefits derived from the additional functionality. Others found the opposite to be true.” (Cummings, 1998)

The central thesis of this study is that the reasons for the mixed experiences are not faults or limitations in ERP systems, or any particular implementation or customisation approach *per se*. Rather, it is contended that the strategic implications of the ERP implementations were not integrated with other elements of business strategy.

For example, the inherent integration, tight control and centralisation which ERP brings can directly contradict an organisation’s current strategy (successful or otherwise). The contradictory signals this sends will naturally lead to problems in the form of resistance, conflict, confusion and delays.

As mentioned in Section 5.5, it is vitally important that the elements of strategy be consistent and aligned to avoid these sorts of problems. It is also clear that ERP implementation is much more than an IT project or strategy: it is an overall business unit, or more appropriately, a corporate strategy.

Implementing ERP touches almost every employee and process in the company. It must therefore be driven from the top, as a significant organisational change initiative, planned and resourced accordingly. Only from the top levels of management is there sufficient authority and

perspective to settle all the questions and difficulties across the various functional areas.

The first step in assessing the adoption of ERP systems necessitates a strategic assessment of the organisation. The results of this review will identify the opportunities and risks of ERP, as well as identify an appropriate implementation approach.

Although this study strongly contends that business strategy should drive the approach to ERP implementation, it is also true that ERP implementation will affect strategy. This reciprocal relationship works in the same way that any consistent patterns of organisational behaviour, over time, come to define strategy (see section 5.2).

Therefore, in assessing the best way to implement ERP in an organisation, we must not only determine fit with current business strategy, but look at ways in which ERP systems can influence and promote alternative strategies, by defining and supporting changed patterns of organisational behaviour.

In essence, strategy determines behaviour which determines strategy.

Any successful strategy however, must still be appropriate for the industry, market and economy in which a business exists, regardless of whether it is supported by ERP or any other form of IT.

6.2 ERP STRATEGIC ASSESSMENT TOOLKIT

The purpose of this section is to provide a framework or toolkit to conduct this strategic assessment, which can be used to guide the ERP decisions to a success both in the short and long term, because they will be consistent with the desired strategy and culture of the organisation.

In this section we shall utilise some traditional strategic management tools, applying them to the particular characteristics of ERP systems.

6.2.1 SWOT Analysis

The SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis is a generic and ubiquitous technique widely used in strategic planning. It is a useful technique to use at the earliest stages of strategic assessment as a brainstorming and checklist tool with which to scope and identify the main issues.

It has the advantage that most people are familiar with it, it can be taught easily, and is a very quick way to generate and organise ideas, which can be subsequently rationalised and refined.

6.2.1.1 Strengths and Weaknesses

Strengths and weaknesses, one the negative of the other, provide an audit of the organisations capabilities: what it has the ability (skills, resources, knowledge) to do well, and what it does not have the ability to do well.

In relation to ERP, factors which are important are:

- IT Maturity
- Standard IT Infrastructure
- Project Management Skills
- Past Success with Organisational Change
- Strong Leadership

6.2.1.2 Opportunities and Threats

Opportunities and Threats provide an assessment of the organisation's environment: what things the firm should be doing to attack or defend in the market place.

In relation to ERP, examples of important factors are:

- Competitors' Adoption of ERP
- Relative Time to Deliver Customer Orders
- Degree of Centralisation or Decentralisation Appropriate to Market/Industry
- Integration of Supply Chain to Suppliers/Customers
- Rate of Market/Industry Change

These two continuums (SW and OT) can be correlated to determine important areas of strategic focus. For example, if a firm identifies an opportunity requiring skills or technology it is weak in, it will either need to build capability or look for other opportunities in areas it has strength, which would have a lower risk.

6.2.1.3 Application

Figure 6-1 assists in assessing risks with SWOT.

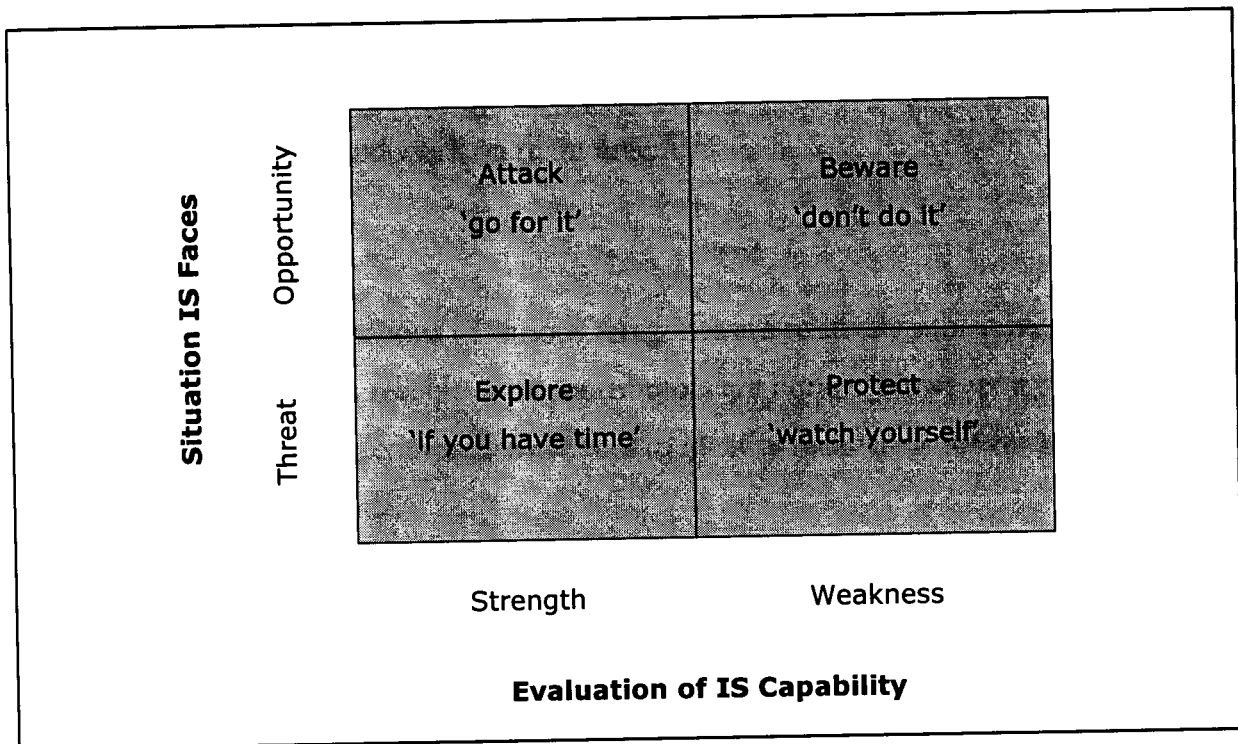


Figure 6-1 (Robson, 1997)

The first step is to link the external factors (Opportunities and Threats) to their related internal factors (Strengths and Weaknesses). Then these items can be positioned in one of the four quadrants on the diagram.

The “attack” quadrant will contain opportunities in areas which the company is strong: these should be the main priority, providing the most return for the least risk. The “explore” quadrant contains threats in areas which the company is strong: it has the ability to respond to these threats, and should do so where resources are available. This is because the company is relatively strong in these areas, and can defend itself ably.

However where the company faces threats in areas which it is weak, it should “protect” itself from attacks in these areas by competitors: these are exposed vulnerabilities. Lastly, where there are areas of opportunity, but the company is weak internally, it should “beware” of pursuing them as it is more risky and time-consuming to change weaknesses into strengths.

However, all of this assumes there are some strengths in the first place! Where a company finds mainly weaknesses and threats it must of course prioritise these and work on them urgently.

Because the allocations to various categories are relatively subjective, SWOT is only as reliable as its contributors are honest. However it provides a convenient and comprehensive tool to identify main areas for further analysis or set aside.

6.2.2 Industry Analysis

This technique provides a method to assess the possibilities and constraints that IT can have given the nature of a particular industry. This is a more detailed and focussed assessment of the external environment than in

SWOT, and looks at sources of competitive advantage in the following areas (Parsons, 1983 in Robson, 1997):

- **Products and Services:**

Their nature, production life cycle and speed of distribution

- **Markets:**

Their overall demand, degree of segmentation, and geographic distribution possibilities

- **Economies of production:**

The relevant range of economies of scale, the necessary flexibility versus standardisation trade-offs and the value adding stream.

ERP's effect on the above areas needs to be considered carefully. It may be things that competitors are already doing, or it may be something completely new.

For example, would a faster delivery time using an ERP system improve the company's competitive position?

Would giving customers the opportunity of being able to place direct orders into your ERP system improve sales?

Would being able to consolidate business units onto a single central system reduce overheads and improve profitability overall?

6.2.3 Five Forces Model

Porter's five forces model, shown in Figure 6-2, aids the identification of the competitive environment in which the organisation exists, and can be used to look at current and future situations.

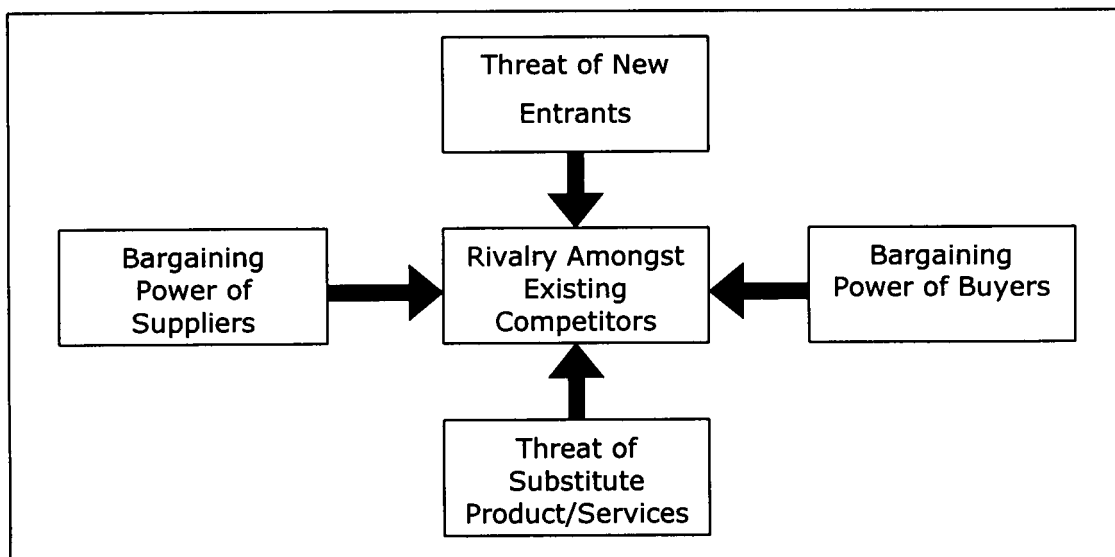


Figure 6-2 Porter's Five Competitive Forces (Porter, 1980)

Porter (1980) found that all competitive forces could be placed in one of five groups. Although the number of possible competitive forces is huge, only a limited number are relevant to an organisation at a particular point in time. The result of the analysis will stem primarily from whether the company is currently in a strong or weak competitive position (Threats and Opportunities).

6.2.3.1 Rivalry Between Competitors

The level of rivalry in an industry strongly determines its overall profitability. When rivalry is high, profits will tend to be low. Rivalry, or active competition, is driven by a number of factors, and the other four competitive forces.

For example, in mature industries, growth tends to be lower, and therefore increasing sales significantly will be at the expense of a competitor, rather than as a “natural” absorption of overall market growth. Rivalry is therefore higher in mature, low growth industries.

An emerging, but increasing example of reducing rivalry in an industry is “co-opetition”, whereby companies compete in the market, but may share common logistics and delivery infrastructure, for example trucks and warehouses (Wheatley, 1998).

ERP systems can assist by integrating and linking the ordering systems of the competing companies in such a way as to provide the efficiency of in-house operations of larger scale. Rivalry then becomes more focused on marketing and product development.

6.2.3.2 Threat of New Entrants

If it is easy (inexpensive) for new competitors to enter a market, there will tend to be more competitors, and more risk taking, therefore competition will be greater, and profits lower overall.

Barriers to market entry can take many forms from government regulation, natural cost advantages, high capital requirements, economies of scale, and so on.

Simply though, these barriers are in effect large up-front investments that a company must risk to enter a market. The greater the risk of shareholder funds, the less likely a company is to enter unknown territory.

If a market expectations necessitate a sophisticated IT (ERP) component (e.g. finance, booking services, logistics and distribution), the cost and complexity of setting this up can act as a barrier to entry.

6.2.3.3 Threat of Substitutes

Substitutes are products perceived as equivalent by a customer. If products are readily substitutable, and the switching costs are low, profits will tend to be lower. This is because, in the absence or disregard of apparent differentiation or disincentive, customers will purchase cheaper substitutes.

Companies should work on ways to differentiate their products in the minds of their customers, and provide incentives for loyalty.

IT can be a point of differentiation. For example, in the PC market, Dell provides a web site service which, given the serial number of your machine, provides specific support information relevant to exactly that model and configuration of equipment, thus simplifying what would otherwise be a complex undertaking for most customers.

Other PC manufacturers who do not provide this service, all things being equal, are providing a less convenient product. This service is integrated with Dell's order processing system, which is part of their ERP system.

6.2.3.4 The Power of Buyers

The power of buyers depends on how sensitive they are to price, and how much bargaining leverage they can exercise. This force is related to the threat of substitutes, but emphasises the buyer rather than the product.

Not all buyers are price sensitive. Price sensitivity is affected by things such as brand loyalty, product quality, buyers own profitability, and so on. Similarly if buyers purchase a large volume of goods they have strong bargaining power over competing suppliers.

Again, this force is reduced by differentiating product in the minds of buyers, and building loyalty based on things other than price.

ERP can reduce the power of buyers by providing improved analysis and intelligence about their buying and negotiation patterns, improving the prediction of their future behaviour.

By linking buyers into the company's ERP system, the convenience and internal cost savings can justify a higher purchase price as well as reduce their power to buy elsewhere.

6.2.3.5 The Power of Suppliers

The power of suppliers is high where a highly differentiated or rare input is required to produce a product, or where very high switching costs would be incurred (e.g. electricity to gas).

The power of suppliers is reduced by such things as having to maintain a high sales volume to cover fixed costs, or where there are many equivalent suppliers to buy from.

ERP can affect the power of suppliers, the most simple example being by internal automation reducing the need for labour.

Another example is where ERP can integrate the suppliers with the company, by placing direct electronic orders, or automatically forecasting and placing long-term orders with the supplier, thereby reducing purchase price.

6.2.4 Organisational Culture and Structure

If two organisations are presented with the same problem and are in the same circumstances, culture is the thing which will cause them to behave differently (Robson, 1997).

Culture is the set of norms, expectations, habits which influence our actions. It is not a hard, measurable thing, although a great deal of research has gone into assessing it.

Culture is important because people, and organisations, will have difficulty acting in strong contrast to their cultural tendencies and structural constraints. Organisational culture can be changed, but it is a long-term exercise, and a major strategic initiative in its own right.

The structure of an organisation often defines, and conserves it's current culture. While structure can be changed seemingly quickly (by management decision), it takes time for the dust to settle, and for behaviour and communication patterns to emerge which are consistent with the new structure.

A simple way to assess organisational culture quickly is to plot the organisation's position on the following continuums (adapted from Robson, 1997):



This simple exercise gives a good feel for the type of culture, and may be refined by the Delphi technique to sample a range of expert views.

6.2.5 Generic Business Strategy

Based on his Five Forces model, Porter (1980) identified three generic business strategies.

6.2.5.1 Product Differentiation

This strategy is to make your products 'better' than competitors' in the eyes of customers. It requires innovation and product development to stay different, and justify a price premium.

ERP can play a part in this strategy by providing better customer service (for example providing a single point of contact and access to a central database about customers), or by linking customers into the company's computer systems directly.

6.2.5.2 Low Cost

This strategy is to make your products cost less than your competitors, at a level of quality that is acceptable to customers. This requires an unrelenting focus on minimising costs to stay ahead of the competition. Success in this strategy requires you to have the *lowest* cost.

ERP may be suitable where it is used to lower costs directly in business processes (through higher degrees of automation), or by rationalising the duplicated operations of multiple business units. However this cost reduction objective needs careful consideration against the large investments required to establish and operate ERP systems.

6.2.5.3 Focus/Niche

Rather than addressing the broader market, this strategy addresses the needs of a smaller defined set of customers sharing common needs. However, competition *within* each niche itself will take place on the basis of product differentiation or low cost.

By definition the focus/niche strategy orients the business to smaller portions of the market than the other two generic strategies. Hence the economies of scale which help justify ERP may not apply equally as well. However, within each niche, the same possibilities for ERP could apply.

Further, in some cases ERP systems can actually help define the niche being targeted. For example some large organisations have policies which require all suppliers to use ERP systems which are compatible with theirs to allow Electronic Data Interchange ordering and invoicing to occur (and hence reduce their purchasing overheads). These companies are willing to pay a slight premium on purchase price as they are saving the overheads of employing more buyers and accounts staff. A supplier may specifically operate to satisfy this niche. One example of such a company is the small (\$22 million in revenue) Accugraph company (Koch, 1996).

6.2.6 Generic IT Strategy

Parsons (1983) suggests that IT strategies fit into one of six general categories. These categories are useful to make judgements and extrapolations about a current set of observed behaviours and facts, or to consciously choose a future strategy. It is important to know in terms of ERP, what the current strategy is, and what may need to be done to align it with the ERP initiative and business strategy.

6.2.6.1 Centrally Planned

Centrally planned IT strategy means that there is a coherent, coordinated IT strategy which is integrated and aligned with the business strategy. Centrally planned does not necessarily mean centrally controlled, this would more likely be a monopoly strategy.

What it does mean is that a company takes the overall view that its IT architecture is an integral part of its business strategy. This strategy is

highly compatible with ERP, as it aligns with the strong integration of process and data that ERP brings.

6.2.6.2 Leading Edge

This strategy is adopted where an organisation believes that taking advantage of technology developments as quickly as possible provides competitive advantage. Adopting this strategy means accepting the risks of some failed initiatives for the pay-offs of successful ones, and requires a highly innovative and strong IT function and IT skills throughout the organisation.

This strategy is likely to be found in organisations where central control and direction is perceived as stifling creativity, or insufficiently flexible. The philosophy behind ERP may be in conflict with such an organisation, because ERP places high priority on standardisation, consistent processes and tight controls.

This strategy might also emerge as a result of under-managed technocrats, rather than for legitimate business development reasons.

6.2.6.3 Free Market

This strategy is based on the philosophy of placing authority with responsibility. Because individual users are responsible for business results, they should have authority to select the IT which best suits their needs.

This strategy requires sufficiently skilled users, and almost ensures that integration of information between user/functional domains will not be practically possible.

Although highly successful in the short term, this strategy can lead to excessive overall costs due to duplication of skills, and under-utilisation of IT infrastructure.

This strategy contradicts the integrating philosophy of ERP, and hence will cause conflict if not changed before ERP arrives.

6.2.6.4 Monopoly

This is the opposite of free market, and defines a single source of authority and responsibility for IT provision. The centralised policies require auditing and compliance measures to be in place which creates overhead.

However it does achieve consistency and leaves the way open to integrate information and processes via a single IT architecture.

For this reason, if this strategy is well regarded by the business, it is conducive to successful ERP implementations, as many of the perceived increases in control and authority do not apply because they are already in place.

6.2.6.5 Scarce Resource and Necessary Evil

This strategy is one where IT resources are considered very scarce, and always to be managed at minimum cost. Therefore it is associated with an environment of very tight budgetary and project control, often suited to difficult economic times.

However this strategy means that companies will often miss opportunities to improve the business in favour of concrete, incremental improvements on the status quo.

There may be very little innovation with IT, or projects are very well justified in terms of cost/benefit. Usually however, it means not realising the full potential benefits of IT, and accepting the compromises inherent in this.

Implicit is a self-fulfilling belief that IT cannot make significant competitive advantage for the business.

Clearly evidence in the IT industry has shown that this is not true for all firms, and should only be concluded after careful consideration.

It is not likely that an organisation considering an ERP implementation would have this IT strategy.

6.2.7 Concluding ERP Strategic Fit

During and after conducting an assessment of current and desired strategy a pattern will emerge. The different tools and techniques for assessing strategy overlap in coverage, but emphasise different issues, and approach the problem from different perspectives.

The intention behind this is to find a pattern of consistent answers emerging from the different models, similar to the way navigators may use triangulation to accurately determine their position by a process of taking consistent approximations.

Out of this pattern will be a clear picture of the current strategy and issues that integrating ERP will raise.

Where the strategic picture is not clear, it may be highlighting some existing strategic conflicts which need to be addressed, or it may be an error in the assessment. Either way, these require further investigation to determine their nature.

Once strategic contradictions are highlighted, actions can be planned to address them, which may include using ERP as a tool to achieve the desired strategic adjustments.

From there an appropriate implementation process can be followed, one which is guided by and consistent with the business strategy.

The best way to illustrate this assessment process is to examine the case study of Otis Elevator and its parent company United Technologies Corporation, and the conclusions reached.

7 CASE STUDY: OTIS ELEVATOR COMPANY

7.1 HISTORY AND BACKGROUND

Otis is a subsidiary of a global US-based company, the founder of which invented the forerunner of the modern elevator in the mid-19th century. Otis Australia was founded in 1883, and currently has revenues in excess of \$250 million and employs 1800 people. Presently market share is between 50-60% of new elevator installations, and similar for servicing of elevator equipment. Otis has local operating companies in almost every country throughout the world.

The market for elevators and escalators is very mature and well-defined. However, what appears to be a simple and mundane product contains extensive electronic, mechanical and human technology to ensure its performance, reliability and safety. Development and maintenance of these essential products is therefore a very specialised field. Otis is completely vertically integrated; engineering and designing products, manufacturing, installing and servicing them for the life of the building.

Otis requires a high degree of broad technical expertise, and an extensive local service force. Only incremental advances in absolute product performance are possible, for example passengers do not want faster accelerations for comfort and safety reasons.

As a mature market leader, Otis has had a conservative and 'engineering excellence' culture, which is being shaken up by the growing strength in the performance of more flexible competitors.

Recently a new worldwide CEO and CIO have been appointed. Their objectives are to improve the profitability of the company through short

and long term initiatives. Their brief is very wide, and the direction is one of global behaviour and operation, which is in contrast to a more decentralised organisation of fairly autonomous domestic operating companies.

7.2 SWOT ANALYSIS

The following are the SWOT analysis results for Otis Elevator Co.

7.2.1 Strengths

- Current Profitability
- Market Position
- Stable Labour Force
- Proprietary Technology
- Field Infrastructure
- High Quality Product
- Technical Expertise

7.2.2 Weaknesses

- Inflexibility
- Complacency
- Product / Service Innovation
- Weak IT Project Management Skills in Local Companies
- Duplicated IT Functions in Each Local Company

7.2.3 Opportunities

- Global Rationalisation / Economies of Scale
- Remote (Automated) Equipment Fault Resolution

7.2.4 Threats

- Competitors Ahead in Elevator Technology
- Competitors Ahead in Service Technology

7.3 INDUSTRY ANALYSIS

The elevator industry is a hybrid of the industrial engineering and construction industries. Elevator companies are judged by the cost and reliability of their products. There are a wide range of customers from architects, to commercial property managers, to home unit collectives to individual residents.

Frequently the people who design and construct the building, and also make the selection of elevator equipment, are not the ones who are responsible for the cost of maintaining and servicing the elevator after the building is complete.

The core of the elevator business is the servicing of installed equipment. The installation of new elevator equipment is not done to return a significant profit at the outset, but rather to secure longer term service revenues.

The elevator and escalator markets are very mature in terms of basic service and operation, similar for example to motor vehicles. The basic performance parameters are limited by the ability of people to tolerate rapid acceleration and changes in altitude.

However technological developments which improve product cost and service reliability are where the engineers focus their efforts. For example one of Otis' competitors recently introduced a patented elevator design which no longer required construction of a motor room at the top of the building, meaning an additional (rent-producing) floor can be added within the same building height restrictions.

In 1995 Otis acquired its then next largest competitor, almost doubling its market share and sales volume.

There are now three large elevator companies in the Australasian market: Otis, Schindler and Kone. There are also a range of smaller service companies who have eroded the market share and profitability of these companies by selectively targeting service contracts.

Customers in recent years have become far more sensitive to price, and have found the lower prices offered by small companies hard to reject, particularly where, for example, government business is concerned. Over time the larger companies have reduced prices to gain jobs, and erode Otis' post-acquisition market share.

Although the large manufacturers have ranges of proprietary equipment linked to custom diagnostic and management tools, the majority of the installed base of elevator equipment can be serviced almost as effectively by any elevator company, as by the manufacturer, at least in the short term.

A common development is that a customer will accept a low service contract price for a term of several years, during which time the equipment condition and performance gradually deteriorates due to inadequate maintenance being performed.

At the end of the contracted period, the competitor does not bid aggressively to keep the job, and one of the large service companies picks up the cost of restoring the equipment condition, as well as a lower contract price. As a result, gradually prices in the market fall overall, putting great pressure on cost reduction.

Increasingly, what is important to customers are "softer" benefits like account management, getting problems personally responded to quickly, and automatic provision of things like comprehensive management and fault summary reporting (thereby reducing the customer's administrative overheads). These things are becoming more important than the actual

physical attributes and performance of the elevator, which for the most part is assumed to be the same.

7.4 FIVE FORCES ANALYSIS

7.4.1 Rivalry

Competitive rivalry has grown in recent years as Otis' major competitors vie for market share, and the smaller competitors with lower cost structures undercut price. The traditional big players in the industry do not wish to concede ground, and customers do not perceive strong differentiation in the short term between the different companies' maintenance services.

7.4.2 New Entrants

The absence in the Australasian market of Japanese companies who are competitors with Otis globally is notable. They have not entered the market due to the costs of establishing the human and technical infrastructure in a mature, relatively static market, but this could change depending on relative conditions in overseas markets.

On a smaller scale, the barriers to entry for a small company are very low, as they do not have to build a large human and technical infrastructure to overcome Australia's natural geographic barriers and low population density. Small companies also do not need to maintain the sales volumes to cover the level of fixed costs and overheads of the larger companies.

7.4.3 Substitutes

In the short term, there is little perceived differentiation between products. As long as the equipment functions fairly reliably, the customer is happy. However over the longer term, the equipment breaks down far more often and expensive repairs are required. Hence, in the short term, the threat of

substitutes is high. Over the longer term, the value of the manufacturer's maintenance is appreciated, but not actively marketed by the company.

7.4.4 Buyers

This power has grown significantly in recent years. Previously, the cost was simply budgeted and paid by customers. Now, buyers decide increasingly on price, and are in some instances consolidating their elevator portfolios to consultants who then have large bargaining leverage to obtain lower prices. Aggressive renegotiation of contracts was almost unheard of a decade ago, and has now become the generally accepted practice.

7.4.5 Suppliers

The power of suppliers is not high, due to the fact that many parts are sourced internally, and raw materials are available from a wide range of suppliers. Taking advantages of consolidated purchasing volume is presenting a problem due to the difficulty of consolidating global purchasing data.

7.5 ORGANISATIONAL STRUCTURE AND CULTURE

7.5.1 Structure and Organisation

Otis employs 67,000 people, 59,000 outside of the USA. Revenues in 1997 were US\$ 5.5 billion, with 83% generated outside of the USA. Products are offered in 222 countries.

Otis worldwide is organised into domestic operating companies who are accountable for their business results, and relatively autonomous in their operations. These national companies are grouped into regions such as Asia/Pacific, North America, Europe and so on. Each region reports to Worldwide headquarters in Farmington, Connecticut, USA.

The business performance of Otis companies is judged primarily on 'hard' financial performance (EBIT and Cashflow), and the associated impact on the stock price. The company's financial accounting and reporting is very standardised throughout the world.

Although they are given a fairly high degree of operational autonomy, the local operating companies must adhere to uniform, comprehensive and stringent financial policy and controls, which are regularly audited.

This serves to ensure mostly common processes in the back-office administrative and accounting functions. There is a very high degree of consistency in these processes worldwide.

The commonality of processes in "back-office" functions is balanced however by the unique requirements that different markets, cultures and remaining regulatory environments continue to have around the world.

Otis operates in nearly all countries, and this includes a great variation in such things as labour cost, technology, infrastructure, customer sophistication and so on. Each market has needed to be addressed by the local Otis company based on these characteristics.

Sections 7.5.2, 7.5.3 and 7.5.4 consider the Otis business divided into three general categories.

7.5.2 Service

The service business has traditionally been an area of competitive advantage for Otis, but it is now falling behind. Service procedures are well documented and managed within each country, and these reflect local market requirements and characteristics of the service portfolio (for example high-tech/low-tech, high-rise/low-rise, etc).

The service staff average 15-20 years of experience, and form a very stable and highly skilled workforce. The main problem is that total costs are too high for the emerging market price level, but service standards must not (appear to) be reduced from the customers' perspective.

Otis has a service span of control of 1 supervisor to 10 mechanics, the cross-industry benchmark is 1 to 20. The business is very labour intensive, requiring mechanics to physically attend the site to rectify any operational problems.

All job dispatch and progress reporting is done via pad and paper, and by voice over mobile phone or trunk radio. Product technical information is either held in the mechanics head, or detailed in manuals located at the branch office. Information is not accessible remotely.

7.5.3 Sales

Sales is a labour intensive manual process, with most work being done by hand, and using word processors and spreadsheets. There is no standard sales force automation system, although attempts have been made, different markets have different operational and tracking requirements.

7.5.4 Administration and Manufacturing

This is a major area of consistent process, not only across Otis but its parent company. There is significant duplication across each operational company. Consolidation and rationalisation in this area could save significant overhead costs through economies of scale alone.

7.5.5 Think Global...

The traditional national organisation is being changed by the new CEO to a more global operation and organisation, with increasingly common process and policy standards across these regions. A “shared services” (Field, 1997) initiative put forward by Otis’ parent company seeks to eliminate duplication of back-office functions, such as Finance, HR and IT, by consolidating them across the group and providing services via in-sourcing.

A single IT infrastructure and application set would assist greatly in achieving commonality of process, integration of data and economies of scale across these support functions.

The new globalisation initiatives are partly in response to the need for lower costs to reflect the reality of lower prices in most markets, and increase the speed at which the company’s processes can be changed. The initiatives are also enabled by the rapid reduction in local country-specific elevator regulations, which enables worldwide standard product development: products no longer need to be specifically engineered for different markets, which is a very expensive process.

7.5.6 ... Act Local

In the past the justification to scuttle common systems projects has been that local market differences were irreconcilable, and therefore each company needed its own complete set of tailored systems. The fact that other elevator companies have successfully used ERP in the back-office has proven that assumption wrong, and the IT infrastructure is already in place at Otis to support the systems.

Although this conceptual consistency has been recognised by Otis in the past, many common systems and processes have failed to remain uniform, because each operating company and region implemented them locally with variations to suit perceived local “needs”. These implementation variations

made the systems and processes sufficiently different to prevent things like automated data consolidation.

In addition, the processes and infrastructure were managed by teams accountable primarily to local company management, giving incentive towards satisfying local needs as a high priority, then looking toward the “lofty” goal of common processes as a secondary consideration.

In short, the goals were correct, the problem was in the organisation (appropriate allocation of authority and responsibility) of the implementation.

7.5.7 Conclusion

Otis has a conservative, risk averse culture, reflecting its many years in an industry it strongly defined, and its traditional market leadership position. It has therefore taken a long time for it to truly appreciate the fundamental ways its markets and competition are changing. Although no longer complacent, it needs leadership and direction to find new strength and identity.

7.6 GENERIC BUSINESS STRATEGY

Otis has always pursued differentiation as a high quality service provider, able to meet any need in the market. In effect its name became synonymous with elevators. It strongly resists the temptation to reduce its quality of service to lower apparent prices.

The importance of long-term quality to customers has reduced, replaced by increasing price sensitivity. Otis’ diminishing technology leadership, and under-emphasis on marketing and customer relationships (now expected by customers in the changing market place), makes the traditional past strategy less and less effective.

Otis cannot simply emulate its smaller competitors. Over the long term, it is relied upon for innovation and setting the standard for service, as competitors come and go. What is required is a reduction in cost, leveraging its unique global nature. This naturally ties in to things such as shared services and globalisation.

7.7 GENERIC IT STRATEGY

As discussed previously, the different local country operating companies have had quite autonomous control over their IT organisation and function. In Australia the model is a combination of Centrally Planned and Monopoly. IT is generally seen as a cost to be contained, and the emphasis of technological development is seen in terms of in-product technology, rather than IT used to deliver customer service processes.

The majority of IT budgets are non-discretionary (up to 90%) which limits the ability to pursue any new initiatives, so the emphasis is on running existing systems with greater efficiency.

To tackle ERP successfully, greater emphasis needs to be placed on IT spending, and it needs to be viewed as an investment and not just a cost.

7.8 CONCLUDING ERP STRATEGIC FIT

Otis has many common areas in administrative, back-office and support functions. However there are also a number of local requirements in sales and service delivery due to the naturally diverse nature of the global markets and economies in which Otis operates.

It is also a company with a long tradition of “engineering excellence”, conservative development and reluctant change.

Therefore, a full scale “big-bang” ERP implementation would be risky and difficult if not impossible. This is due to the complexity and degree of cultural change required, at the same time as there being no package available that meets all the requirements of local companies. Therefore a compromise and phased approach is more appropriate. This approach should allow many benefits to be attained while reducing the risks of a failed ERP implementation.

7.8.1 Administration and Manufacturing

It would make sense to achieve the cost savings and economies of scale by adopting ERP across the traditional back-office functions of finance, HR and manufacturing, as these are quite common across all operating countries, and are configurable and tailorable for a wide range of foreign requirements. This is also in the core competency of the ERP packages and hence presents a lower risk.

The cost of adopting ERP for this would likely be justified due to the global nature of the rollout and the total savings to be achieved through elimination of duplicate IT and administrative infrastructures and staff that could be realised. There is no competitive need to be differentiated in these back-office processes. The sound business practice models embodied in the ERP systems, and their configuration options would be quite sufficient, and would allow the company to focus its resources and attention in its core competencies: the design and service of elevator and escalator equipment. Leveraging the cost of product innovation across a truly global market is a formidable competitive tactic.

This scope of ERP implementation would also improve dramatically the quality and speed of availability of a wide range of operational data with which better decisions could be made, and further cost reductions such as in purchasing by pursuing global agreements. Most of the benefits of ERP would be realised by targeting just the back-office functions initially.

7.8.2 Service

The main strategic issue facing Otis is about working smarter to reduce its labour costs, which are a major portion of its service cost, which in turn is the main revenue earner for the business. It cannot afford to erode the value of its service base long-term, nor to deskill its workforce (to reduce labour cost) as they are key to maintaining the brand image and reliable operational performance which are its prime intangible assets.

Because the service business is Otis' core competency, and it has specialised requirements it is a suitable candidate for ERP customisation or development/integration, after the initial implementation in the back-office and shared service insourcing initiative.

The service systems can be developed to provide a flexible, yet proprietary package for use by all Otis companies. It could be a source of strong competitive advantage and market differentiation as it will embody the "Otis way" of servicing.

It should be implemented and integrated with the standard back-office ERP systems, and the development cost could be spread much more widely than in the past where each company developed its own service management systems which were often stand-alone.

The alternative of implementing only standard ERP service management applications, and not tailoring them, would require many compromises and changes to the specialised way Otis works, and contradict its differentiated fundamental service strategy.

It would result in generic processes, which are not appreciably different to competitors, and actually devalue the knowledge and skills gained from large-scale elevator maintenance over many years.

7.8.3 Sales

This same philosophy would apply to the sales force area, the customisation of an appropriate sales force automation module, but as a lesser priority. An interim generic sales automation system could be considered to obtain basic benefits over current manual methods, and the full custom system tackled after service management.

7.8.4 Summary

It is clear given the environment (internal and external) of the company, the main objective in the short term should be to adopt common ERP-based administration and manufacturing systems. This change is big enough in terms of management and benefits alone, other areas should be deferred for now, but ultimately build upon this solid foundation.

This project should be staffed by primarily internal resources, but organised on a strictly global basis, an approach which has been successful for global rollouts of other multinational companies.

This will retain skills and proprietary knowledge in-house, as well as result in a highly optimised implementation process gained through experience.

In closing, it is worth noting, that if this strategic assessment had been conducted on one of Otis' small local competitors a very different answer would have been generated, most probably not to adopt ERP, but rather to concentrate on being the lowest cost provider and personalised service.

The strategic opportunities and threats facing such an organisation are quite different to those facing Otis, even though they may operate in the same industry.

Strategic questions must be answered from within the organisational context of each specific company.

8 CONCLUSIONS AND RECOMMENDATIONS

Companies face a daunting decision when considering whether to adopt an ERP system. The choice and its implications will be felt for many years after being made, and can potentially bankrupt the company if handled poorly. In contrast, it can also enable a company to streamline and integrate its business processes quickly and reliably, and further allow it to focus its resources on areas of competitive advantage.

However, the correct approach varies for each company, and in some cases ERP should not be adopted at all. Determining the correct approach should be handled like any other strategic issue: with comprehensive assessment, and consistent decision making in line with articulated strategy. It is when actions contradict strategy that problems arise, direction founders and the business performance is reduced.

Therefore it is strongly recommended that ERP, like all significant strategic issues IT or otherwise, must be led by the CEO, and fully supported by top management. Because IT and ERP cut across all business functions to affect nearly every staff member in an organisation, only the CEO and their team has the perspective and authority to manage and overcome the reactions to change.

Certainly if ERP is considered simply another IT project or a cost saving initiative, it will most likely fail to deliver the anticipated benefits. Indeed, a poorly integrated ERP strategy, because of its sheer scope and scale, may actually cripple the business rather than liberate it as expected.

9 BIBLIOGRAPHY

1. Abramson (1998); "Breakfast, Lunch & Winner"; Abramson, Gary; CIO Enterprise Magazine; CIO Communications; Jul-98
2. Appleton (1997); "How to Survive ERP"; Appleton, Elaine L; Datamation; Datamation, Inc.; Mar-97
3. Baatz (1996a); "Marketing Genius"; Baatz, E. B.; CIO Magazine; CIO Communications; Jun-96
4. Baatz (1996b); "The Toll of the New Machine: Ready or Not"; Baatz, E. B.; CIO Magazine; CIO Communications; Jun-96
5. Baer (1997); "Can ERP Project Costs Be Contained?"; Baer, Tony (*ed.*); Computer Finance; ComputerWire Plc; Dec-97
6. Baer (1998); "ERP: Want it Quick & Cheap?"; Baer, Tony (*ed.*); Computer Finance; ComputerWire Plc; Mar-98
7. Bancroft *et al* (1998); "Implementing SAP R/3, 2nd Edition"; Bancroft, N.H.; Seip, H.; Sprengel, A.; Manning Publications; 1998
8. Bennatan (1995); "Software Project Management"; Bennatan, E. M.; McGraw-Hill; 1995
9. Bresnahan (1998); "What is Good Technology?"; Bresnahan, Jennifer; CIO Enterprise Magazine; CIO Communications; Jul-98
10. Caldwell and Stein (1998); "Beyond ERP - New IT Agenda - Second Wave of ERP"; Caldwell, B.; Stein, T.; InformationWeek; CMP Media; Nov-98
11. CSC (1998); "Companies Struggle to Align Business Strategies, I/T Priorities"; Plowman, Bruce (*ed.*); (Published Paper); Computer Sciences Corporation; 1998
12. Cummings (1998); "How to customise and revamp SAP R/3 across an enterprise"; Cummings, Joanne (*ed.*); I/S Analyzer; United Communications Group; Apr-98
13. D'Amico (1998); "Mixing it Up with SAP R/3"; D'Amico, Mary Lisbeth; Computerworld Global Innovations; IDG Communications; Sep-98
14. Davenport (1998a); "Putting the Enterprise into the Enterprise System"; Davenport, Thomas H.; Harvard Business Review; Harvard University; Jul - Aug 1998
15. Davenport (1998b); "Living With ERP"; Davenport, Tom; CIO Magazine; CIO Communications; Dec-98
16. Deloitte (1998); "Second Wave, New Beginning"; (Anonymous); (Published Paper); Deloitte & Touche Consulting; 1998
17. Edwards (1998); "Expanding the Boundaries of ERP"; Edwards, John; CIO Magazine; CIO Communications; Jul-98
18. Farley (1997); "Defining Enterprise Resource Planning"; Farley, Gregory A; APICS Magazine; APICS; Mar-97
19. Field (1997); "Share & Share Alike"; Field, Tom; CIO Magazine; CIO Communications; May-97
20. Forrester (1998); "Supply Chains Beyond ERP"; Forrester; (Published Paper); Forrester Research; Feb-98
21. Gable *et al* (1998); "Cooperative ERP Life-cycle Knowledge Management"; Gable, Guy G; Scott, Judy E; Davenport, Tom D; ACIS Conference Proceedings; ACIS; 1998
22. Galley (1998); "ERP Integration: The Galley Perspective"; Galley, Connie; www.messageq.com; TSI Software; 1998
23. Goodwin and Seegert (1996); "Implementing ERP in a Big Way"; Goodwin, Bill; Seegert, Margie; APICS Magazine; APICS; Jun-96
24. Grindley (1995); "Managing IT at Board Level, 2nd Edition"; Grindley, Kit; Pitman; 1995
25. Hecht (1997); "Choose the Right ERP Software"; Hecht, Bradley; Datamation; Datamation, Inc.; Mar-97
26. Hollands (1998); "New SAP software lifts R/3"; Hollands, Mark; The Australian; News Ltd; Nov-98
27. Homer (1998a); "Who's Where in ERP software - Australian Top 10"; Homer, Glyn; ComputerWorld; IDG Communications; Oct-98
28. Homer (1998b); "ERP: What's New, What's Not"; Homer, Glyn; Enterprise Resource Management; APICS; Dec-98
29. Hurwitz (1998a); "Integrating Packaged Apps: It's Seldom Quick & Easy"; (Anonymous); (Published Paper); Hurwitz Group; Sep-98
30. Hurwitz (1998b); "Midmarket Companies: Choosing an ERP Solution"; (Anonymous); (Published Paper); Hurwitz Group; Oct-98
31. InfoServer (1998); "The Coming Wave: ERP Meets Business Process Outsourcing"; (Anonymous); InfoServer; InfoServer LLC; Oct-98

32. Infosphere (1997); "Software: Build or Buy?"; (Anonymous); Infosphere Newsletter; Infosphere Sydney; Apr-97
33. Inglesby (1997); "Putting on My Horned Hat"; Inglesby, Tom; APICS Magazine; APICS; Nov-97
34. Jayaraman (1998); "Global Challenges, Real World Solutions"; Jayaraman, Sundaresan; (Published Paper); APICS; 1998
35. Kapp (1997); "The USA Principle: The key to ERP Implementation Success"; Kapp, Karl M; APICS Magazine; APICS; Jun-97
36. Keller and Teufel (1998); "SAP R/3 Process Oriented Implementation"; Keller, G; Teufel, T; Addison-Wesley; 1998
37. Koch (1996); "Flipping The Switch on SAP"; Koch, Christopher; CIO Magazine; CIO Communications; Jun-96
38. Macaskill (1998); "A lot of business brouhaha"; Macaskill, Angus; MIS Magazine; IDG Communications; May-98
39. March (1998); "ERP: A Bulletproof Market"; March, Richard; Computer Reseller News; CMP Media; Nov-98
40. McGee (1998); "Strategic Applications -- Companies are Forging a Unique Blend of Custom & Commercial Software to gain a competitive Advantage"; McGee, Marianne Kolbasuk; InformationWeek; CMP Media; Nov-98
41. Moad (1997); "Hanging on For Dear Life"; Moad, Jeff; PC Week; Ziff-Davis; Nov-97
42. Pearson (1998); "Complex Compromises"; Pearson, David; CIO Magazine; CIO Communications; Jun-98
43. Porter (1980); "Competitive Strategy: Techniques for Analysing Industries and Competitors"; Porter, M. E.; Free Press; 1980
44. Porter (1985); "Competitive Advantage: Creating Sustaining Superior Performance"; Porter, M. E.; Free Press; 1985
45. Rebello (1997); "Interoperability: The Proper Pairing of Automated Solutions"; Rebello, Ray; APICS Magazine; APICS; Oct-97
46. Robson (1997); "Strategic Management & Information Systems"; Robson, Wendy; Pitman; 1997
47. SAP (1998); "R/3 System Overview"; (Anonymous); (Brochure); SAP AG; 1998
48. Scott (1998); "ERP Platforms: As The Pendulum Swings"; Scott, K; AuthorITies; CMP Media; Dec-98
49. Slater (1998); "The Hidden Costs of Enterprise Software"; Slater, Derek; CIO Magazine; CIO Communications; Jan-98
50. Wheatley (1998); "Lighten Up"; Wheatley, Malcolm; CIO Enterprise Magazine; CIO Communications; Feb-98