Modelling and Measuring Relationships
between IT-Business Strategic Alignment
and Performance Outcomes

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ABSTRACT

This is a study on the relationships between information technology (IT) as an enabler of corporate strategy implementation and the impact of IT on competitive advantages on companies in Australia. The main purpose of this study was to increase our knowledge of the influences of IT and business strategy alignment (in short, IT-business strategic alignment) upon the competitive performance of Australian companies.

The core objective of this research was to develop an IT-business strategic alignment measurement model (termed CSA model) and its associated measurement methodology that is practical and easy to use by the business for better decision making in the realm of IT-business strategic alignment.

The second objective of the research was to test the CSA model. To achieve this, data from 37 Australian manufacturing companies were studied. Variables developed in the CSA model were analysed using descriptive and inferential statistical methods commonly used by business. The outcomes of the data analysis related to

- the strength of IT-business strategic alignment at corporate strategy, business processes and business operations planning levels within Australian manufacturing companies;
- the contribution of IT-business strategic alignment or organisational performance;
• whether there were positive relationships between IT-business strategic alignment and business performance outcomes.

Among the steps involved in building the CSA model and subsequently testing it were
• conducting a detailed study of and reporting on concurrent IT-business strategic alignment practices and literature;
• defining and developing measures for the IT-business strategic alignment construct;
• defining and developing measures for the impact of T-business strategic alignment on organisational performance;
• assessing the relationships between the degree of IT-business strategic alignment and its contribution to organisational performance; and
• testing the hypotheses that there are associations between IT-business alignment and the business performance outcomes.

The results of the analysis showed that IT-business strategic alignment at corporate strategy planning stage is somewhat incoherent but is adequate at business process/operations planning level. This study also showed that contrary to popular belief, even though IT-business strategic alignment has direct impact on five out of ten key competitive advantages commonly cited, namely ‘customer service’, ‘product quality’, ‘product/service leadership’, ‘revenue gain’ and ‘cost saving’, a high degree of IT-business strategic alignment has no positive relationship with these competitive advantages with the exception of ‘customer service’ and ‘product quality’.

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ACKNOWLEDGEMENTS

The motivation to conduct this research arose from my personal experience as management consultant in IT and business processes improvement areas where I have to grapple with IT projects that are misaligned with corporate strategic objectives. The most important deficiency I found is the lack of knowledge and simple practical measurement tools in the practice of alignment between business and IT strategy. I have derived immense professional satisfaction in conducting this research and hope to utilise the knowledge gained in the research in my future endeavours.

As with any PhD study, this thesis would not have been completed without the assistance and encouragement, either directly or indirectly, from many people. The greatest contribution undoubtedly comes from my supervisor Dr Harchand Singh Thandi. He has been the main source of guidance and support during my entire PhD program.

I would also like to thank Dr Sheik Rahman, the research coordinator of this doctoral program, for his advice and feedback on numerous administrative and academic matters.

Also thanks are extended to Mr John Taffe, lecturer at Swinburne mathematics school who helped me chose the most appropriate statistical methods for this research.
I am grateful to the organisations that participated in the survey and interviews. This research would not be possible without the cooperation extended to me by the senior managers of these organisations who have spared valuable time in participating in the survey and subsequent follow-up activities.

I am also grateful to Australian Graduate School of Entrepreneurship and Swinburne University of Technology for the financial support and the facilities provided for this research without which I would not have been able to complete this study.

At a personal level, my wife Ming-li and kids Wayne and Jeffrey have sacrificed a lot in sparing me from the household responsibilities and encouraging me to carry on despite several odds.

The ultimate test of this study lies in its practicality to not only Australian manufacturing industry, but also for any company that wishes to plan and implement IT systems. I am happy that I could come up a simple practical IT-business strategic alignment model, empirically validate it and in the process identify some key relationships of successful IT-business strategic alignment practices.
DECLARATION

This thesis contains no material which has been accepted for the award of any other degree or diploma at any University and, to the best of my knowledge and belief, contains no material previously published or written by another person or persons except where due reference is made.

Edward CT Ho
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Part I. Introduction
Chapter 1

INTRODUCTION

1.1 Background to the research

An enduring problem for strategy management is the sustainability of competitive advantage (Porter 1980, Porter 1985, Barney 1991). Most studies that explore the link or alignment between information technology and competitive advantage argue that innovative information systems of an industry leader are quickly followed and widely adopted by its competitors. Because of this, information technology (IT) is often considered as an enabler to strategy execution and not a means to ensure competitive advantage in the longer term (Banker & Kauffman 1988).

On the other hand, while most IT-business strategic alignment researchers and practitioners accept that IT played an important role in the contribution to company's performance outcomes, some researchers argue that implementation of information technology could produce unintended or unexpected outcomes (Ciborra 1991). These researchers argue that structured studies of relationships between information technology implementation and business strategy are useless because they could not produce predictable outcomes.
Adding to these arguments, some literature shows that certain corporate variables such as intra-firm structural differences, one of the sources of unexpected outcomes, can be combined with information technology as complementary assets to give a potential source of sustainable competitive advantage (Clemons & Row 1995, Feeny & Ives 1990, Heatley, Agarwal & Tanniru 1995).

These studies are gaining wider acceptance in the business and academic arena especially with the advancement of Internet technology and the eventual collapse of the Internet bubble.

The fact of the matter is, with the increasing need for companies to compete globally, information technology is fast becoming a compulsory strategic consideration in most corporate planning exercises.

Although there are contradicting voices and confusion on the contribution of information technology to business performance, most management and IT researchers and practitioners (such as Clemons & Row 1995, Feeny & Ives 1990, Heatley, Agarwal & Tanniru 1995) agree that the survival or competitiveness of a company is becoming more and more reliant on leveraging innovative information technology solutions in almost every facets of a company's business processes and operations.

It thus appears that the understanding of the alignment between information technology, corporate strategy planning and business processes and operations has gained much more urgency for better management of a company and for a
company to compete globally, especially with the backdrop of growing competition internationally.

It is based on this background that this research has been conducted. Further, a picture seems to emerge that the IT-business strategic alignment research arena at international level is full of conflicting and complex philosophies. At the same time, there is not much research done from an Asia Pacific, in particular Australian, perspective.

The present research aims to reorganise the literature on corporate strategy and IT-business strategic alignment into a linear context and to explore a simpler and more practical approach into measuring the impact of IT-business strategic alignment on a company’s performance outcomes. Based on a simplified IT-business strategic alignment construct, the relationships between the use of information technology, corporate strategic planning, business processes and operations and their impact on Australian companies competitive advantages are analysed.

1.2 Research problems and hypothesis

In early 1990s, many researchers (McGee & Prusak 1993, Broadbent & Weill 1993) commented that while it is widely accepted that information technology is an indispensable tool in improving productivity and competitiveness, many companies still do not consider information technology during strategy planning process because of lack of management leadership or adequate funding. Most
still consider information technology as a sort of second-class resource or 'luxury' that is relevant only in the execution of strategies.

In today's business world, whether these claims are still valid amidst the age of IT proliferation, remains to be proved. The view that information technology is a 'luxury' and a dispensable tool in strategy execution no longer holds true. This is partly due to ever-reducing IT hardware costs but, more importantly, also due to the advancement of IT applications in assisting almost all facets of business functions. The corporate world today widely acknowledges that it is a mandatory exercise to incorporate IT early in the strategy planning process.

However, while the business world understands the importance of IT on their business performance, it is not clear what the extent is of IT-business alignment in contributing to the sustainable competitive advantage of the company because of the lack of empirical studies in this area. This is especially so in the Australian and Asia Pacific contexts (The Conference Board & PricewaterhouseCoopers 1999). There is a serious lack of studies that investigate the direct IT contributions to various competitive advantages such as customer satisfaction services, or product leadership gained by companies by instituting sound information technology solutions that were planned and closely aligned to corporate strategic objectives during corporate strategy planning process.

The investigation of the variables contributing to the achievements of competitive advantages requires an examination of (a) information technology
usage and strategy planning process, (b) the combination of these, plus (c) the companies' intended competencies that lead to inimitable superior business performance (Barney 1991). In other words, in order to understand how IT-business strategy alignment is related to business performance, one needs to study the alignment of IT at various business planning levels.

Business planning may happen at various levels depending on the need of a company and, normally, the levels are unique to each organisation. Larger organisations tend to plan their business activities starting at corporate strategy formulation; followed by business unit strategic planning, then business processes design and finally operations planning and execution. However, most companies tend to lump corporate and business unit strategic planning into one planning cycle or planning level. Accordingly, for the present research, information technology is seen to be planned and aligned into the three business planning levels – corporate strategy planning level incorporating business unit strategic planning; and business processes and operations planning and execution as shown in figure 1-1.

The first objective of the research was to develop an IT-business strategic alignment measurement model (termed CSA model, refer to figure 5-1 for detail explanation) based on these business-planning levels. Throughout the model design, the principles of keeping the CSA model simple and practical for businesses were used, whilst ensuring that model design includes the essence of the major research works as well as IT-business strategic alignment theories and models available today.
The second objective was to measure the contribution of IT-business strategic alignment to business performance. Based on the CSA model, a measurement methodology was created with the aims of obtaining explanations to following contexts:

Firstly, to find out whether there were any direct impacts from the IT-business strategic alignments at corporate strategy planning level to commonly cited company's competitive advantages.
Secondly, to establish whether there are any direct impacts from the IT-business strategic alignments at company's business process/operations planning level to company's competitive advantages;

Thirdly, to find out exactly what competitive advantages and benefits could be obtained by having a strong IT-business strategic alignment at both corporate strategy planning and at business process/operations planning stages. This is because IT-business strategic alignment could potentially bring unexpected outcomes (Ciborra 1991) and it is necessary to weed out unwanted business performance outcomes. If IT-business strategic alignment has an impact on organisational performance, we need to find out what are the competitive advantages affected and whether the competitive advantages achieved at each level are inimitable or sustainable.

Finally, if there were relationships between IT-business strategic alignment to business performances, to confirm whether a higher degree of IT-business strategic alignment in the corporate strategy planning level and business process/operations planning level would contribute to a higher degree of business performance outcomes.

As mentioned earlier, most management and IT researchers (McGee & Prusak 1993, Broadbent & Weill 1993, Chan et al 1997) readily accept that IT does provide a positive contribution to a company's performance. However, to prove that these claims are true, based on the last research intent posed above, the following two research hypotheses were constructed and tested:
Hypothesis 1 (H1): The stronger the link or alignment between corporate strategy and information strategy planning, the more the competitive advantages and benefits that could be obtained. This would be a test to find out if there was a direct positive relationship between IT-business strategic alignment at corporate strategy planning level and business performance.

Hypothesis 2 (H2): The stronger the link or alignment between business process/operations and IT processes/operations planning, the more competitive advantages and benefits that could be obtained. This would be a test to find out if there was a direct positive relationship between IT-business strategic alignment at business processes/operations planning level and business performance.

The first objective (model development) and the second objective (answering the research questions and testing hypotheses above by testing the model) formed the key purpose of this study.

1.3 Justification for the research and its contributions

There are various reasons for the initiation of this research. Firstly, there is a lot of literature (McGee & Prusak 1993; Chan et al. 1997; Tallon, Kraemer & Gurbaxani 1998) about IT-business strategic alignment available in the developed countries especially about North American and Western European companies, but when it comes to Asia Pacific region – including Australia, the
number of researches conducted on IT-business strategic alignment from an Australian perspective are very few, with the exception of the works done by some researchers such as Broadbent and Weill (Broadbent & Weill 1993, Broadbent et al. 1996).

Secondly, most empirical studies, such as by Tallon et al. (1997) examining IT-business strategic alignment effectiveness have focused on the impact on financial performance alone. There are doubts voiced by various researchers (Bakos & Kemerer 1992, Tallon et al. 1997) concerning the usefulness of focusing on econometrics dimensions alone, and solid multi-dimensional empirically based conclusions concerning the usefulness of information technology alignment to corporate strategic planning have not yet emerged.

Thirdly, it has been accepted by some researchers (Itami & Numagami 1992, Ciborra 1997, Maes et al 2000) that most of the IT-business strategic alignment involved complex and rigid relationships models that are normally difficult to use, if at all being meaningful in any practical sense.

Based on the shortcomings of these studies, this research took an alternative perspective. It steered away from the conventional studies that used mainly financial performance indicators as a measure of outcomes or success of strategic planning and biased towards gathering direct views of senior managers involved in information technology and corporate planning. It examines the impact of information technology strategic alignment on various non-financial dimensions of company performances as well as other criteria.
such as customer satisfaction and employee loyalty which are in certain sense contribute more to a company's sustainable competitive advantages than the financial indicators. Also, to reduce rigidity and complexity of previous IT-business strategic alignment models, the study consolidated key elements of these models and proposed a simple and practical IT-business strategic alignment model. Coupling with a well-defined methodology, this study provides a practical approach to measuring the relationships between IT-business alignments on business performance.

The research results should contribute to filling the gap in the IT-business strategic alignment literature by examining the proposition that the higher degree of IT aligning at corporate planning and at business processes design level, the greater the benefits and competitive advantages the company obtained.

It is also envisaged that this research will add to the understanding of IT interaction with strategy planning within the Australian context.

1.4 Conceptual framework of the study

The conceptual framework of the study was broadly classified into areas as shown in figure 1-2.
The conceptual framework encapsulated the key elements and guidelines of the present study. In essence, the ‘prerequisites’ column entails the body of knowledge that needs to be mastered. This knowledge facilitates the understanding of the existing ‘IT-business constructs’ before embarking on building a new IT-business strategic alignment model. In the present study, a conceptual research model, termed CSA model was conceived. A detailed study on elements contained in the ‘relationship measures’ and ‘outcomes’ area was required in deriving the variables used in the CSA model.

The research was phased as follows:
First phase of the research involved reviewing the literature that touched on the general principles and practices of corporate strategy management, business processes/operations design and strategic information system planning.

Second phase of the research explored various IT-business strategic alignment models available and examined their usefulness among IT and management practitioners.

In the third phase, based on the findings from the literature review, a rough conceptual research model or a preliminary IT-business strategic alignment model (refer figure 1-3) was built. This model formed the basis in building a new IT-business strategic alignment conceptual research model. The new model was built based on the premise that it consolidated the most important principles of the IT-business strategic alignment literature, and most importantly, that it makes practical sense and is easy to use by IT and management practitioners. The new IT-business strategic alignment conceptual research model developed (refer to figure 5-1 in chapter five) was termed the consolidated strategic alignment model (CSA model). The model was developed based on the conceptual framework shown in figure 1-2 and by incorporating key variables into model shown in figure 1-3.

And, finally, in the last phase, based on this preliminary conceptual framework, research areas are further refined to the study of key variables and relationships as defined in the preliminary conceptual framework. The unit of analysis were
at the level of corporate strategy, business processes and business operations where hypothesis H1 and H2 are tested.

1.5 Research scope

As indicated earlier, the first objective of the study was to develop a practical IT-business strategic alignment model. The scope of study in developing the model was confined in the conceptual framework (refer figure 1-2).

The second objective of the study was to measure the relationship between IT and businesses. The scope of the study was limited to major manufacturing companies in Australia. The measurement variables were restricted to the measures of the relationships between IT-business strategic alignment and competitive advantages/benefits as shown in figure 1-3.

Figure 1-3: Preliminary IT-business strategic alignment model

Source: Author
1.6 Methodology

This first research aim was to develop an IT-business strategic alignment model that measured the relationships between information technology, strategy planning, business processes design and operations planning. The model was then subjected to test. Analytical survey method combined with interviews was adopted. Survey questions were developed pertaining to the variables as defined in the newly developed IT-business strategic alignment model (termed consolidated strategic alignment model or CSA model as shown in figure 5-1). The questionnaires were directed at senior information technology managers, holding positions such as chief information officer or IT director, to provide an organisational context and an understanding of the aims and critical success factors and their relationships to information technology strategy. Doubtful questionnaire returns, for example those that were partially completed or containing confusing remarks, were followed up with email, telephone, or face-to-face interviews to gather more information.

Within the questionnaires, questions measured the variables in the CSA model on a 6-point Likert scale. The questions were grouped as follows:

- Category 1 - Organisational arrangements: to grasp an understanding of the organisation's structure, policies, procedures, systems, and general corporate strategies.
- Category 2 - Linkage between information technology and corporate strategy: to understand the strategic intent, the type of systems used, the
degree of alignment and its associated benefits and competitive advantages obtained, if any, at this level.

- Category 3 - Linkage between information technology and business processes/operations: to understand the strategic intent, the type of systems used, the degree of alignment and its associated benefits and competitive advantages obtained, if any, at this process/operations level.

Figure 1-4 depicts the various steps that comprised the research framework.

Source: Author
- Step 1: Research problems were proposed and revised after extensive literature reviews.

- Step 2: Literature review was conducted with the aim of structuring the study context and laying down the groundwork for the formulation of research framework, and development of IT-business strategic alignment model, research questions and hypotheses.

- Step 3: IT-business strategic alignment model (CSA model) and its associated variables were developed after literature review. As a precursor to testing the model, boundaries of research area were delimited to only manufacturing companies in Australia and to variables contained in the CSA model.

- Step 4: Design of survey questionnaires - for this study, data were directly collected from senior information technology managers through a questionnaire survey rather than relying solely on secondary financial data, as is common in most empirical studies. Besides the multi-dimensional rationales as discussed in the previous section, managerial opinion and perceptions were deemed to provide information that secondary data were too general to reveal. To create the survey instrument, relevant literature was reviewed to generate a pool of items and variables describing information technology-enabled strategic advantages. In addition to literature review, expert industry advice was sought to assess the validity of
the measures, and of the conceptual and functional equivalence of the constructs. The items or variables generated from the measurement development processes above were grouped theoretically into various categories. The independent variables (refer table 1-1) were grouped into two categories – IT-business strategic alignment at corporate strategy planning level and IT-business strategic alignment at business processes/operations level.

Table 1-1: IT-business alignment at two business planning levels

<table>
<thead>
<tr>
<th>Business Planning Level</th>
<th>Scale (from chaotic to perfect alignment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategic Alignment at Corporate Strategy Level</td>
<td>1  2  3  4  5  6</td>
</tr>
<tr>
<td>Strategic Alignment at Business Process/Operations Level</td>
<td>1  2  3  4  5  6</td>
</tr>
</tbody>
</table>

Source: Author

As shown in table 1-2, ten dependent variables were identified and a Likert scale of 6 points was used against each variable to measure the extent to which IT-business strategic alignment has an impact on a company’s business performance.
Table 1-2: Common performance measures cited

<table>
<thead>
<tr>
<th>Business Performance Criteria</th>
<th>Scale (from insignificant to very significant)</th>
</tr>
</thead>
<tbody>
<tr>
<td>K1 - Customer Services</td>
<td>1 2 3 4 5 6</td>
</tr>
<tr>
<td>K2 - Employee Loyalty</td>
<td>1 2 3 4 5 6</td>
</tr>
<tr>
<td>K3 - Time to Market</td>
<td>1 2 3 4 5 6</td>
</tr>
<tr>
<td>K4 - Product Quality</td>
<td>1 2 3 4 5 6</td>
</tr>
<tr>
<td>K5 - Prod/Service Leadership</td>
<td>1 2 3 4 5 6</td>
</tr>
<tr>
<td>K6 - Brand Loyalty</td>
<td>1 2 3 4 5 6</td>
</tr>
<tr>
<td>K7 - Revenue Gain</td>
<td>1 2 3 4 5 6</td>
</tr>
<tr>
<td>K8 - Cost Saving</td>
<td>1 2 3 4 5 6</td>
</tr>
<tr>
<td>K9 - Market Share</td>
<td>1 2 3 4 5 6</td>
</tr>
<tr>
<td>K10 - Sustainability</td>
<td>1 2 3 4 5 6</td>
</tr>
</tbody>
</table>

Source: Author

- Step 5: Data collection and fieldwork - the sample of companies that participated in the study included only manufacturing companies located in Australia. Also, solely manufacturing companies were included in the study to ensure some degree of homogeneity among the study objects. The following criteria were employed to determine the specific population from which the sample was to be drawn: (1) to ensure a minimal degree of homogeneity among the respondents, the companies included in the sample were restricted to manufacturing companies and (2) to reduce the confounding effects of diversification, the companies in the sample were limited to those that generated most of their sales from a single industry (Rumelt 1974). The corporate data were collected from two sources - the public records from ASX and demography data from ABI. The survey
collected data for all measures such as strategic intents, competitive advantages obtained and degree of alignment directly from senior IT managers. Besides the mail questionnaire survey, actual fieldwork investigations were conducted for certain companies though personal interviews with senior IT managers and management consultants to (a) validate the information from the fully completed questionnaire returns, and (b) to generate more value from the partially completed or questionable returns.

- Step 6: Data analysis and interpretation - descriptive statistics were initially used to describe the sample mean and distribution, as well as provide some general profiling such as years in office of the respondents. This was followed by inferential multivariate correlation analysis to detect underlying dimensions that could explain relations between multiple variables. The method used was the one-tailed correlation test examining the means of individual scale items. This test was mainly used to test the two hypotheses (H1 & H2). Other statistical analyses were conducted to examine whether the dependent variable was significant if the mean score is significantly greater than zero at the set significance level. Hypotheses were considered as supported if the mean scores were significantly different, in the hypothesized direction, at the 5 per cent significance level.

Final step: Writing up thesis - thesis was prepared according to 2002 Swinburne University Higher Degree Committee guidelines and following
the Australian Graduate School of Entrepreneurship style manual's writing convention.

### 1.7 Outline of the thesis

This thesis classified the research discussion into six parts and ten chapters, as shown in figure 1-5.

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<th>Part IV. Research design</th>
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Source: Author
1.8 Limitations and key assumptions

Basically, this research has some limitations and assumptions were made to overcome these limitations. Some of the major limitations are as follows:

1) Statistical analysis limitation: this study received only 37 fully completed questionnaires out of 200 survey questionnaires mailed out. An additional 18 partially completed questionnaires were received. A small sample size and large number of variables could, in general, lead to two statistical analysis problems throughout the study. Firstly, the use of simple descriptive and inferential statistical significance test was seem to be more appropriate than the use of more powerful statistical analysis methods associated with large samples. Secondly, it was difficult to use advanced multivariate statistical methods to identify patterns in the entire set of measurements. Ideally, a larger number of questionnaires, at least 200, should have been collected for any meaningful statistical analysis. Nonetheless, to overcome small sample weaknesses, the survey responses were checked individually and followed up with individual interviews (either by phone, email or face-to-face, with the respondents and external consultants who had worked in the companies) to correct any confusion to ensure that each sample was free of error and to add value to the incomplete questionnaire.

Many basic assumptions of the use of correlations, such as linearity and normality assumptions, were also applied in this study.
2) Sample selection and representativeness: since this study only dealt with manufacturing companies listed in IBIS (2001) database, the study outcomes might not be relevant to smaller manufacturing companies not included in the IBIS (2001) database. The study outcome would not be meaningful to other industries such as banking industry. Although there are similarities in business processes and performance criteria, such as customer value retention, companies in different industries tend to have their own industry-specific business strategies which, in turn, have an impact on IT-business strategic alignment.

Also, as the companies in the survey are all Australia-based, the study outcomes might not apply to other companies outside Australia.

3) Data collection process: this research relies on data from a single respondent in the participating company. Ideally, a broader range of interviewees would have been preferred. A single respondent survey might cause the following effects: inaccurate perception of situation; biased opinion or vested interest. Nonetheless, the single respondent mode was adopted on the assumption that enticing involvement from too many parties would cause dilution of opinion on IT-business strategic alignment issues. The main aim of the research was to capture perceptions of senior IT managers on IT-business strategic alignment issues and it was assumed that the top IT person within an organisation had an absolute influence on IT-business strategic alignment direction. This could be an imperfect method but ways to minimize the bias (Collins & Porras 1996) have been introduced in the present study. Among
them were vigorous data validation processes such as employing individual interviews for dubious questionnaire returns and enticing current or ex-company consultants’ verification on data collected.

This study assumed information provided by the respondents was consistent across all companies but, sometimes, uneven information was unavoidable because of participants’ personal views of the issues (Collins & Porras 1996).

4) Assumption of correlations versus causes: this study assumed that if there was correlation between variables stated in the CSA model, there was also an association causal link between these variables. Collins and Porras (1996) claimed that establishing association between variables does not necessary indicate there is causal links between variables. In view of this, further investigation is required to verify the appeared linkage.

5) Uniqueness of each organisation: IT-business strategic alignment was normally developed through an ongoing interaction among various parties, including business managers and IT managers. Because of this, the study outcomes’ answers will be different for organisations of different sizes and at different growth stages.

6) Adequacy of variables: variables developed for the CSA model were deemed to have covered the key business performances criteria for a company. Although the research participants were asked to record any variables not covered in the questionnaires, this approach still had the risk of ignoring some
other key variables that are important to IT-business strategic alignment research.

There were also instances where some companies under research were in troubled times, for example, subjected to strike by workers. These companies could have contributed to certain bias in the research outcomes (Collins & Porras 1996).

To overcome the above research limitations, several avenues for further research should be followed up. The CSA model (figure 5-1) and the methodology provided by this research should be used to replicate, extend and refine this research. For example, further research should be done by identifying important variables for IT-business strategic alignment in other industries or group of companies, in addition to existing variables in the conceptual model. This includes replication to other industries such as banking and finance, as well as comparison in international settings. Also, as this research has concentrated on the public listed manufacturing companies, further research should examine to what extent the findings applied to smaller (small-medium size) companies.

Looking internally within a company, further research could be extended to collect data from a number of different functions and hierarchical levels within the companies as to assure the representativeness of the data.
Further research also needs to confirm the impact of other strategic variables not covered in the study such as environmental conditions and regulatory structures. Besides strategic variables, there is also a need to explore different variables to test the IT-business strategic alignment paradox that negate many popular beliefs that IT-business strategic alignment is related to performance outcomes.

Finally, to ensure that correlation does equate to causal links among the variables, there is a need for studies that investigate in more detail the underlying reasons that cause companies to adopt certain strategic alignment portfolio and IT infrastructure.

1.9 Conclusion

Based on the CSA model, survey questionnaires were developed for the variables defined in the CSA model and were sent to participants asking them to complete scores for the variables.

The following summarised some findings from the analysis of the survey questionnaires responses, in which respondents were asked how they perceived the strength of IT-business strategic alignment currently at their organisation and the relationships between the strength of IT-business strategic alignment in relation to business performance.
The first and second research question dealt with the overall strength of IT-business strategic alignment at corporate strategy planning and business process/operations planning level in Australian manufacturing industry. It was found that IT-business strategic alignment at corporate strategy planning level was perceived to be incoherent, whilst the IT-business strategic alignment at business process/operations planning level was regarded as adequate.

The third research question dealt with finding out the contributions of IT-business strategic alignment to business performances. The responses showed that the following key performance indicators were positively influenced by IT-business strategic alignment:

- **K1** - Customer services
- **K4** - Product quality
- **K5** - Prod/service leadership
- **K7** - Revenue gain
- **K8** - Cost saving

One of the research objectives was to check whether there was a direct positive association between the degree of IT-business strategic alignment and business performances. This research objective was posed as two hypotheses H1 and H2.
To test these hypotheses, correlation analyses between A and K variables were conducted and the variables supportive to the hypothesis are summarised in table 1-3.

<table>
<thead>
<tr>
<th></th>
<th>Hypothesis H1</th>
<th>Hypothesis H2</th>
</tr>
</thead>
<tbody>
<tr>
<td>K1 - Customer Services</td>
<td>Supported</td>
<td></td>
</tr>
<tr>
<td>K4 - Product Quality</td>
<td></td>
<td>Supported</td>
</tr>
<tr>
<td>K10 - Sustainability</td>
<td></td>
<td>Supported</td>
</tr>
</tbody>
</table>

Table 1-3: Results of hypothesis test

Source: Data analysis

The hypotheses testing result simply disproved the notion that if IT-business strategic alignment has a positive influence for certain sets of business performance outcomes, exerting tighter integration between IT and business would certainly bring about higher business performances for the same sets of business performance outcomes.

Based on these findings, it could be concluded that:

- At corporate strategy planning level, even though most respondents thought that IT could improve on customer service (K1), product quality (K4), product/service leadership (K5), revenue gain (K7) and cost saving (K8), the correlation analysis postulated that, with the exception of customer service (K1), there was no evidence to suggest that tighter integration of strategy and IT planning would yield higher performance outcomes for product
quality (K4), product/service leadership (K5), revenue gain (K7) and cost saving (K8).

- Similarly, at business processes/operations level, with the exception of product quality (K4), there is no proof to suggest that higher degree of IT-business strategic alignment or tighter integration between IT and business processes/operations would bring higher business performance outcomes for customer service (K1), product/service leadership (K5), revenue gain (K7) and cost saving (K8) even though most respondent felt that IT-business strategic alignment contributes to better K1, K5, K7 and K8 performance outcomes.

Although management practitioners and researchers have frequently argued that IT-business strategic alignment enables an organisation to realise greater performance outcomes, the results of this analysis confirm that not all the performance outcomes cited in the popular press are related to IT-business strategic alignment. From this, we could conclude that organisations that use IT to provide greater support for the business strategy will not always realise all the performance outcomes as desired.

This research raised some interesting questions about the relationships between IT-business strategic alignment and business performance. For example, why is it that tighter integration between IT and business does not guarantee similar amount of improvement for certain business performance criteria while it has positive correlation with on other performance criteria?
Could it be that there is a point of reflection where the costs of IT investment outweigh the performance improvement it obtains and causing a negative relationship between IT-business strategic alignment and business performance? What are the factors that negate the positive relationship with IT-business strategic alignment on one set of business performance criteria and not on the other sets of performance criteria?

Various reasons may be contributing to the disparities between popular belief and this research on IT-business strategic alignment impact on business performance. Obviously, these questions need to be investigated in future researches. This research rendered its usefulness in providing a conceptual model and a methodology for a company to capture and measure key IT-business strategic alignment variables that are important to a company's competitive advantages.
Part II. Literature review
Chapter 2

BUSINESS PLANNING

2.1 Introduction

This research is about the relationships between IT-business strategic alignment and company's competitive advantages or business performance. To help one understand each individual component of the relationships, this literature review surveys the major researches and practices in the field of strategic management, business process design, operations management, strategic information system planning and IT-business strategic alignment. The literature review was conducted with the ultimate aim of deriving a conceptual research framework or IT-business strategic alignment model. The conceptual research model derived should consolidate the key principles of the IT-business strategic alignment literature. At the same time, it is important to keep the model simple and relevant so that it is of practical use to management and IT practitioners.

This chapter details the literature that starts with the top level of the three-level business planning level structure (refer to figure 1-1) to the bottom. The literature review then branches into IT strategy planning, again starting with the top level of business planning structure and proceeding to the bottom of the structure. Finally, the IT-business strategic alignment models were discussed.
Section 2.2 of this chapter looks into the basic corporate strategy planning concepts, commonly used tools and models in strategic planning process. This section also serves as a precursor for IT related strategic alignment modelling discussion in chapter 4.

Section 2.3 of this chapter provides general concepts of business processes design and operations management.

2.2 Business strategy management

The term ‘strategic management’ or ‘strategic planning’ is not new and has been in literature since the 1970’s. Over the years, various versions of definitions have been given by different renowned academics such as Ansoff (1988) and Porter (1980). There is no right or wrong definition. This research adopted the arguments by David (2001) that viewed ‘strategic management’ as the art and science of formulating, implementing, and evaluating cross-functional decisions that enable an organisation to achieve its objectives.

David pointed out that strategic management focuses on integrating management, marketing, finance/accounting, production/operations, research and development, and computer information systems to achieve organisational success. Sometimes, ‘strategic management’ is often used synonymously with the term ‘strategic planning’. In fact, the latter term, strategic planning, is more often used in the business world, whereas the former is often used in academia.
Since the outcomes of this research are both valid in academia and business world so the term 'strategic management' and 'strategic planning' are used inter-changeably herein.

2.2.1 Basic concepts

Almost all literature describes strategic management in terms of stages or processes. Although there are variations among the stages as postulated by different authors (Ansoff 1988, Porter 1980, David 2001), the strategic management process could basically be classified into three stages, namely strategy formulation, strategy implementation, and strategy evaluation.

Strategy formulation includes developing a vision and mission, identifying an organisation's external opportunities, and threats as well as internal strengths and weaknesses (or SWOT analysis), establishing long-term objectives, generating alternative strategies, and deciding on particular strategies to pursue. Issues in strategy formulation include determining what new businesses to enter or old businesses to abandon, how to allocate resources, whether to expand operations, enter new markets or to form a joint venture.

At the strategy implementation stage, it requires a company to establish long term business objectives, develop business policies, motivate employees, and allocate resources so that formulated strategies can be executed. Strategy implementation also includes activities such as developing a strategy-supportive culture by creating an effective organisational structure, redirecting marketing
efforts, preparing budgets and linking employee compensation to organisational performance. Strategy implementation often is called the action stage of strategic management and normally involves employees and managers to put formulated strategies into action.

Strategy evaluation (or strategy feedback and control) is the final stage in strategic management. At this stage, the main activities are reviewing whether there are any changes in external and internal factors that formed the bases for current strategies, measuring performance against set goals, and taking corrective actions if necessary.

2.2.2 Strategic planning tools and models

The strategy management process could be initiated at anytime but, normally, it starts whenever there is a need to institute strategic change within a company. For example, the strategy change could be a routine exercise to draw up a three-year plan or be part of a systematic planning exercise. The strategic change could be triggered by a new market entry initiative, new product development, or by some kind of events that can be structured and modelled. The strategy planning process could be short or lengthy, simple or complex but the sequence or processes of the exercise remains largely the same as discussed earlier in section 2.2.1.

Over the years many tools and models have been developed to provide a structure to the strategic management process. Table 2-1 shows some key
management tools and models conceived over the years at various stages of competitive environments.

Table 2-1: Evolution of management models

<table>
<thead>
<tr>
<th>Period of Stable Growth</th>
<th>Period of Competition</th>
<th>Period of Hypercompetition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period</td>
<td>1945 – mid 70s</td>
<td>Mid 70s – mid 90s</td>
</tr>
<tr>
<td>Characteristics of competitive environment</td>
<td>Growth &amp; chances</td>
<td>Competition &amp; cyclical growth</td>
</tr>
<tr>
<td>Corporate objectives</td>
<td>Revenue growth &amp; spread of risks</td>
<td>Survival &amp; profitability</td>
</tr>
<tr>
<td>Corporate strategies</td>
<td>Expansion</td>
<td>Re-focussing to core businesses, restructuring, niche marketing, mergers &amp; acquisitions</td>
</tr>
<tr>
<td>Management tools and models</td>
<td>Ansoff’s matrix, product lifecycle model &amp; Boston square</td>
<td>Porters generic strategies, core competencies &amp; business process reengineering</td>
</tr>
</tbody>
</table>


Most of the tools and models were developed to identify and analyse the interaction between external competitive environments and internal organisational, future visions, and functional and process capabilities. Some of the models emphasised the importance of functional and organisation integration whilst others are process-orientated. Among them are IT and business strategy alignment models which are the subject of discussion in chapter 4.
There are many management tools and models available today. However among the most frequently cited and used in academia and management world, four tools/techniques standout and worth mentioning. The four tools/techniques are SWOT (Strengths, Weaknesses, Opportunities and Threat) analysis model, Ansoff's Matrix (1965), Porter's (1985) five forces model, Porter's (1985) value chain analysis and the Boston Square. Some of the common characteristics of these tools/models are flexibility and adaptability. These models can be used in a variety of ways using approaches specific to a company's unique environment.

**SWOT Analysis:** SWOT is an acronym representing 'S' for strengths, 'W' for weaknesses, and 'O' for opportunities and 'T' for threats. SWOT analysis model dominated strategic planning of the 1950s. Its main objective is to facilitate structuring of information to ensure the best alignment between the external environment and internal situation (Mintzberg 1994). Sometimes, SWOT is also used as a simple way of communicating ideas, policies, and concerns to managers, employees and other stakeholders. The SWOT analysis model is normally represented as shown in figure 2-1.
An organisation proceeds with analysis that looks at future possibilities for the company through a systematic approach of introspection into both positive and negative concerns. Normally, a brainstorming exercise is conducted to identify the key factors that may affect desired future outcomes such as the organisation's internal strengths, weaknesses, and external threats and opportunities leading to determining the company's unique competencies and key success factors. These key factors identified are then debated and recorded in the SWOT model. Along with considerations of society and company values, strategy are then developed or selected.
Ansoff's matrix: Igor Ansoff (1965) argued that strategy is designed to transform the company from present position to a new position as described by the business objectives taking in view of the constraints of the capabilities and the potential of the organisation. Ansoff’s matrix (figure 2-2) is used as a tool to achieve the goal of position transformation.

According to Ansoff, there are four major categories for selection that encapsulate the future vision of the company:

- *Market Penetration* – increasing market share of existing products in existing markets at the expense of the competition;
- *Market Development* - new potential customers or users are identified for existing products;
- *Product Development* - new product possibilities are identified for existing customers or users; and
- *Diversification* - there is better opportunities exist outside the scope of the current business.

The Ansoff Matrix allowed mapping of each segment opportunity against status of both product and market. The resulting pattern provides a basis for assessing whether growth or other strategic choice for the company is required. A measure of risk is also implied by the Ansoff Matrix, as strategies geared around penetration are inherently less risky than those geared around new business development or expansion. Highest risk of all is those strategies based upon diversification where the company is committing both to new product and new markets with unknown pitfalls.
Figure 2-2: Ansoff's matrix

<table>
<thead>
<tr>
<th>Product</th>
<th>Present</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>Market Penetration</td>
<td>Product Development</td>
</tr>
<tr>
<td>New</td>
<td>Market Development</td>
<td>Diversification</td>
</tr>
</tbody>
</table>


**Porter's Five Forces Model:** Porter's five forces model (1980) as shown in figure 2-3 outlines what to look for in the analysis of a company's environment and the attractiveness of the industry. The five forces include the risk of new competitors entering the industry, threat of potential substitutes, the bargaining power of buyers, the bargaining power of suppliers and the degree of rivalry between the existing competitors. External environmental scanning includes identifying external opportunities and threats, evaluating industry's overall attractiveness, and identifying factors contributing to, or taking away from, the industry attractiveness. Through its choice of strategy, the company can alter the impact of these forces to its advantage.
Figure 2-3: Porter's five forces model

Source: Porter, ME 1985, Competitive Advantage - Creating and Sustaining

The value of Porter's model is that it enables managers to think about the current situation of their industry in a structured way and as a starting point for further analysis. It has some limitations as pointed out by Recklies (2001), who argued that Porter's model assumes a classic perfect market. The problem is the more an industry is regulated, the less meaningful insights the model can deliver. Another shortcoming of the model is that it assumed static market structure. This is hardly the case in today's dynamic markets and this makes comprehensive description and analysis of all five forces very difficult in
complex industries with multiple inter-relations, product groups, by-products and market segments.

**Value chain analysis:** Value chain analysis is a tool developed by Michael Porter (1985) to examine organisational production and support processes for their contribution to competitive advantage. Porter (1985) argued that competitive advantage could not be understood by looking at a firm as a whole. Competitive advantage stems from the many discreet activities a company performs in designing, producing, marketing, delivering and supporting its product.

Figure 2-4 depicts how the various functions could be linked together.

**Figure 2-4: Porter's value chain**

According to Porter (1985), the primary activities in the value chain are comprised of these elements:

- *Inbound logistics* - involve relationships with suppliers and include all the activities required to receive, store, and disseminate inputs;
- *Operations* – include all the activities required to transform inputs into outputs such as products and services;
- *Outbound logistics* - include all the activities required to collect, store, and distribute the output;
- *Marketing and sales* – activities that inform buyers about products and services, induce buyers to purchase them, and facilitate their purchase; and
- *Services* - includes all the activities required to keep the product or service working effectively for the buyer after it is sold and delivered.

Secondary activities that support the primary activities are:

- *Procurement* – include the acquisition of resources for the firm;
- *Human resource management* - consists of all activities involved in recruiting, hiring, training, developing, compensating and dismissing personnel;
- *Technological development* - pertains to the equipment, hardware, software, procedures and technical knowledge brought to bear in the firm's transformation of inputs into outputs; and
- *Infrastructure* - serves the company's needs and ties its various parts together. It consists of functional departments such as accounting, legal,
finance, planning, public affairs, government relations, quality assurance and general management.

This model is designed mainly to assist with analysis at the functional level. It provides a framework for evaluating the contribution made by internal processes to overall customer value. Porter (1985) proposes that business should be analysed in terms of its primary activities such as inbound logistics, operations, outbound logistics, service, marketing and sales and its support activities such as firm infrastructure and human resources. The analysis can proceed on a number of ways, for example:

- Identifying the actual activities performed by the organisation in each of the generic categories nominated in the value chain analysis model;
- Analysing the value added by each of these activities in terms of overall business strategy such as cost leadership, differentiation and timeliness;
- Examining how linkages and flows build value as business processes flow across tasks;
- Examining how process flows beyond the organisation i.e. process flow into and out of the company and whether changes to internal processes can improve the interface with suppliers or customers at various stages in the value adding process;
- Identifying those activities which are key to success of business strategy;
- Examining the resource allocations with a view to allocating resources in accordance with the contribution of the activities to strategic direction.
The value chain analysis is aimed to strengthen those activities which contribute most to overall corporate strategy while constraining allocation of resources for less critical activities.

The drawback of the value chain analysis model is that it does not consider issues in the external environment except where these have an influence on internal process design or implementation. Similarly, some aspects of the internal environment such as information technology infrastructure are not addressed through the application of this model (Mintzberg 1994). Nonetheless, this model can provide a useful overall assessment of organisational strengths and weaknesses by providing a framework for a structured and systematic analysis of specific operations within the organisation.

**Boston Square:** The Boston Square, sometimes also called Boston Matrix or Product Portfolio Matrix (figure 2-5) has profound implications for a business and has gained wide acceptance as a strategic tool (Thompson & Strickland 1998).
This technique, developed by the Boston Consulting Group in the 1970s, has a two dimensional matrix in which the vertical axis is defined as 'market growth rate' and the horizontal axis is defined as 'relative market share'. Market growth rate is a synonym for consumer cash consumption. Relative market share is an indicator of the strength of the company in the segment, relative to its key competitors.

This matrix has two controlling aspects, namely market share and market growth. Product range for a company is specified and placed onto the matrix. One can then plot the products as a ‘bubble’ in the matrix that gives relative market share. The diameter of each ‘bubble’ in the matrix is directly proportional to the volume or revenue accruing to the products under consideration. The products could fall into one of four segments as follows:
- *Dog* - products with a low share of a low growth market that do not generate cash for the company but tend to consume financial resources from the company;

- *Cash cow* - products with a high share of a slow growth market. Cash cows generate more financial returns than is invested in them;

- *Problem child* - products with a low share of a high growth market. These products consume resources and generate little in return and absorb most financial resources as a company attempts to increase market share; and

- *Star* - products that are in high growth markets with a relatively high share of that market. Star tends to generate high amounts of income.

The theory underlying the Boston Matrix is the product life cycle concept. This concept states that products are cash poor at the beginning of their lives and require significant investment until they achieve widespread market acceptance. At the peak, mature products generate a surplus of cash. When more competitors joined the market, the products become commoditised and start to lose revenue generation advantage.

The model is useful in its simplicity of use but the main problem is that it oversimplifies a complex set of decisions and it is a planning tool that relies on senior managers’ gut feelings.
2.2.3 Summary for section 2.2

This section explored the role of strategy planning models in capturing business values in the strategy management process. It identified and discussed major business models conceived since 1940s. The 1960s brought qualitative and quantitative models of strategy, the time when Ansoff's model was developed. The 1970s marked the rise of the Boston Consulting Group’s product life cycle model. During early 1980s, the Porter models became widely accepted.

The 1990s was dictated by strategic intent and core competencies, and market-focused organisations. These newer thinking of strategic planning were focused on adaptability to change, flexibility, and importance of strategic thinking, organisational learning and 'strategic agility' (Gouillart 1995).

Most of the strategic planning models discussed so far come predominantly from the general management literature. They seldom indicate the implications of the models on information systems design, or recognise that changes in the capacity for handling information using technology are changing the roles of business. This is understandable since computer usage in the business world before 1980s was not prevalent due to lower level of technology commercialisation and the related cost impediment.

Since 1980s, a series of tools, methods and models which came out of the tradition of designing information systems, taking the perspective that a good strategy plan has to take into consideration of information system strategic
planning practices, sprang into the mainstream general management literature. Some important IT-business strategic planning literatures are discussed in later sections 2.4 and 2.5. The next section discussed the second and third level of business planning – business process design and operations management, as well as their relationships with information technology planning.

2.3 Business process and operations

2.3.1 Business process design and IT

What is business process? Davenport and Short (1990) defined business process as 'a set of logically related tasks performed to achieve a defined business outcome'. In their view, business processes have two important characteristics. They have internal and external customers, and they cut across functional departments or organisational boundaries. For example, an orders-fulfilment process traverse across customer services, sales, inventory management, manufacturing and purchasing departments.

Business process design or more popularly termed business process reengineering (BPR) was explained by Teng, Grover and Fiedler (1994) as the critical analysis and radical redesign of existing business processes to achieve breakthrough improvements in performance measures.
The concept of BPR has been with us since early 1990s. BPR is generally viewed as a strategic initiation to improve business process. Cross-functional business manangers normally form the BPR project team with a non-IT project leader and a non-IT business sponsor who have better control over the processes leading the team. The team leadership reflects the needs for business process focus rather than IT-focused. However, this does not mean that IT is secondary in BPR. In fact, it is quite the contrary.

Hammer (1990) reckons BPR requires ‘radical change’ in the company’s way of doing business and IT is considered as the key enabler of the change. He described the use of IT to challenge the assumptions inherent in the work processes that have existed since long before the advent of modern computer and communications technology. He argued that, at the heart of BPR, is the notion of ‘discontinuous thinking, or recognising and breaking away from the outdated rules and fundamental assumptions underlying operations. These rules of work design are based on assumptions about technology, people, and organisational goals that no longer hold.’

Hammer suggested the following ‘principles of reengineering’:

- Organise around outcomes, not tasks;
- Have the persons who own the output of the process to perform the process;
- Subsume information processing work into the real work that produces the information;
• Treat geographically dispersed resources as though they were centralised;
• Link parallel activities instead of integrating their results;
• Put the decision point where the work is performed and build control into the process; and
• Capture information once at the source.

Davenport and Short (1990) argued that BPR requires taking a broader view of both IT and business activity, and of the relationships between them. They argue that IT should be viewed as more than an automating force and that IT should be used to fundamentally reshape the way business is done.

In process view, to maximise task effectiveness, business activities should be viewed as more than a collection of individual or even functional tasks. This means that IT and BPR have a recursive relationship. IT capabilities should support business processes, and business processes should be designed in terms of the capabilities IT can provide. Davenport and Short (1990) referred to this broadened, recursive view of IT and BPR as the new industrial engineering. Davenport and Short (1990) outlined the capabilities such as transactional, geographical, automation, analytical, informational, sequential, knowledge management, tracking, and disintermediation that reflect the roles that IT can play in BPR.

Teng, Grover and Fiedler (1994) argued that functional coupling of a process could be differentiated along two dimensions - degree of mediation and degree of collaboration. They defined the 'degree of mediation' of the process as the
extent of sequential flow of input and output among participating functions. Their definition of the ‘degree of collaboration’ of the process is the extent of information exchange and mutual adjustment among functions when participating in the same process. In their framework, information technology is instrumental in reducing the degree of mediation and enhancing the degree of collaboration. Also, innovative uses of information technology would inevitably lead many companies to develop new, coordination-intensive structures, enabling them to coordinate their activities. Such coordination-intensive structures may raise the organisation’s capabilities and responsiveness, leading to potential strategic advantages.

All the literature discussed in this section has pointed to the importance of the roles of information technology in bringing about successful business process design and, ultimately, organisation strategic advantages. Following section 2.3.2 explores what is operations management and how IT plays an equally important role in the operations management practice.

2.3.2 Operations management and IT

The field of operations management is vast and overlaps with many business practices such as business process design and strategy management. It is a professional field, which covers a wide variety of topics dealing with activities
necessary from designing the production and services process for creating an
organisation's output, to coordinating the resources required for the output
creation, and to control resources utilised in output creation such that the
product and service are satisfactory to customers' requirements.

Among the topics covered in the operations management field include:
• Process design, service/product design and development;
• Productivity;
• Management of technology;
• Resource management;
• Facility location and facility layout;
• Work systems design;
• Materials requirements planning, capacity planning, production and
  operations planning;
• Production scheduling;
• Purchasing, materials management and inventory management;
• Maintenance;
• Quality assurance;
• Statistical process control;
• Just-in-time management;
• Total quality management;
• Manufacturing strategy, and
• Continuous process improvement.
The field of operations management also covers popular and much researched operations areas such as supply chain management, enterprise resource planning system (ERP), mass customisation techniques and so on.

Pannirselvam et al. (1999) examined the state of operations management research in the 1990s from the standpoint of topics and methodologies to look for trends, and to determine implications for future research. They surveyed pipeline research in the operations management area by analysing the topics discussed in international and national conferences attended by operations management academicians and researchers. Their findings show some significant changes in the kind of research being performed in the 1980s against that in the 1990s. Since early 1990s and up to 1999, there are more literature on strategy management, quality management and supply chain management showing greater research interests in these areas. The operations management researches in the late 1990s are also more integrative in nature. For example, in supply chain management area, interaction between various functional areas such as customer services, purchasing, finance and production are widely researched.

In the area of strategy management – an area closely related to this research, it is widely accepted among researchers that a sound operations strategy is the one which is clearly outlined, widely understood and allows flexibility to adapt to changes in the environment (Boyer & McDermott 1999). Like corporate strategy, operations strategy could then be translated to an operations plan that defines how a business will operate and management decisions made into
policies and procedures. Organisational structure is then built or redesigned at the same time, defining the relationship between different business operations, the way information flows, and showing the chain of command.

In general, the theme of operations management researches emphasised two important aspects – integration to other business activities and sharing of information between business activities. These researches highlighted the importance of information technology in operations management, whereas as discussed in the section above, information technology plays a pivotal role in integrating business activities across departments and facilitating information flows between functions.

It is well worth noting that, in practice, operations planning are never done in isolation. It is normally conducted either at strategic planning or business process design level. It is because of this reason that this research merges the business process design and operations management as one business planning level when it comes to IT-business strategic alignment conceptual research modelling.

2.4 Conclusion

Strategic management, business process design and operations management as first level, second level and third levels in a three-level business planning pyramid (refer figure 1-1) respectively play an important role in the strategy
management process. To achieve business goals, these three levels of business planning could be conducted in concert in one planning cycle or separately in different time fence. No matter which approaches a company uses, information technology is always an inseparable component in the planning process. It is, therefore, a prerequisite to include all three planning levels in the study of IT-business strategic alignment.
Chapter 3

INFORMATION TECHNOLOGY STRATEGY

3.1 Introduction

This chapter looks into various approaches of strategic information systems planning and IT-enabled business process/operations design and planning.

It starts with explaining the importance of IT in strategic planning, then looks into IT strategy planning concept, the IT business applications available today, and the techniques and tools used in IT strategy planning.

3.2 The importance of IT strategy

In 1999, a study was conducted on global e-business outlook by The Conference Board's Information Management Centre and management consulting firm PricewaterhouseCooper (1999). The study interviewed eighty-three business and IT professionals from seventy-six multinational companies representing virtually every industry sector. Following are some of the highlights of the findings.
• Over two-thirds of senior executives identified their top challenges as meeting customer demands and managing technology – in particular technology change and integration.

• Senior executives have staked out three different stances toward e-business. About one-third are e-business leaders or innovators, another one-third have decided to enter the field but are not sure when, and yet another third are undecided. These differing attitudes have led to differing IT strategy-planning approaches. Over one-third of respondents have dedicated team planning and implementing IT initiatives, or they have senior managers’ involvement, which could be taken as a serious commitment. Others take lower profile approaches, including part-time task forces and ad hoc IT project teams.

• Most executives are measuring IT success through not only improved quality of information but also other performance measurement criteria, including increased loyalty of customers. More than seven out of ten executives cited both of these as key performance metrics.

Similarly, a summer 1999 survey (World Economic Forum 1999) of about 334 global chief executive officers leading companies with headquarters in eleven countries, including Australia also reviewed that Asia Pacific-based companies share the same emphasis on the importance of IT to a company’s competitive advantages. Among the highlights of the survey are:
• In 1999, while much of Asia was addressing the challenge of economic recovery, the IT applications on business were accelerating at an astonishing pace in the USA and certain parts of Europe. Its status in Asia was still embryonic – although, in some places, it appeared that a sense of urgency among government and corporate leaders would rush it through a rapid gestation.

• The chief executive officers agreed that IT applications in business will have a significant impact upon competition in their industries, with bankers most concerned that new competitors will use the internet to enter their markets and approach their customers.

• When discussing IT applications on business or e-business, it is possible that Asian corporate leaders are still thinking in terms of e-commerce – the sale of products and services over the net – rather than broader applications that ultimately transform a firm’s value proposition.

• As they assess the impact IT on business, the chief executive officers are less certain than might be expected of its potential in such areas as cost reduction and employee recruitment.

• The Internet has not added much to the earning of Asian corporations in the previous years; hopes for robust future growth are strongest in — although not completely confined to Australia.
Although the above studies were conducted in 1999 during a period where the hype of Internet revolution was driving up technology investment bubbles, they still ring true today. The studies show there are some challenges facing many established companies in Asia Pacific region in understanding and realising the value of information technology adoption.

Many companies (Duffy 2001) acknowledged that with the advance of the new technology such as client relationships and supply chain management software, the companies could leverage these technologies to the companies’ advantages. These technologies could offer the company an opportunity to develop IT-enabled business strategies that ranges from building interactive relationships with its customers and suppliers, improve operating efficiency to extending its reach to the market.

It is based on these backdrops that information technology strategy is increasingly being viewed as a mandatory component in achieving optimum competitive strategies. When it comes to IT strategy planning, there are dissimilarities between IT strategy and IT planning. In practice, however these two components always go hand-in-hand.

3.2.1 IT strategy and IT planning

In general, an IT strategy expresses the firm’s basic beliefs about its use of IT. Most IT strategy would be translated to IT plans or operations, but IT strategy
by itself is not an action plan or a set of decisions, but rather a collection of fundamental principles that guide future decision making (Davis & Olson 1985). For example, for some organisations, an IT strategy might include such principles as ‘all external customer related activities will explicitly consider ways to embed IT capabilities into customer services and product/service delivery process’. Some other companies might adopt principles such as:

• ‘Because internet technology is so pervasive in the market today, that they will invest in leading edge systems and aggressively pursue new and experimental applications, without requiring formal cost benefit justification’; or,

• ‘All product divisions will have responsibility for application development and acquisition, but all decisions about technology platforms and infrastructure will be made by corporate IT department’.

Distinction has to be made between IT strategy and IT planning as this research focuses on IT strategy and not IT planning. An IT strategy helps managers to define the decision-making boundaries for future action, but does not determine the actions themselves, as this is the realm of IT planning (Ward & Griffiths 1997). Therefore, IT strategy is used to set the priorities that govern decision-making by the users and IT professionals.

It appears that the main difference between IT strategy and IT planning is that IT strategy forms the policy framework for the company’s use of IT, and describes how the company’s senior managers will relate to the IT
infrastructure, whereas IT planning, on the other hand, focuses on the execution of the IT.

Difference between IT strategy and IT planning could also be distinguished by 'timing'. Generally, business and IT strategies have time horizons that look into many years into the future – typically between three and five years. IT planning sometimes termed strategic IT plans, on the other hand, typically focuses on the next one to three years. In practice, however, like corporate strategies, IT strategies could be changed within a short period of time due to unforeseen circumstances. For example, an overnight change in IT strategy sometimes happens with an acquisition or change in senior management. Ironically, the execution of these IT strategies through detailed IT plans, however, could take years to take effect.

IT strategy, like operations management strategy, could not be developed in a vacuum without regards to corporate strategy. There are many approaches to aligning IT strategy to business strategy or, in short, IT-business strategic alignment. These approaches were discussed in details in section 2.5.

Among the approached which is a core concept adopted by the present study was that suggested by Henderson and Venkatraman (1993). Henderson and Venkatraman thought that the IT-business strategic alignment design should be based on the common sense premise that the effective use of IT requires consistency between competitive strategy and IT strategy. In other words, they felt that a set of IT principles should be established. These IT principles should
take into consideration the opportunities and limitations of the IT applications available in the market with the company's competitive positions so that the company's business strategy was facilitated. IT and business strategies are then translated into their own sets of plans, policies, processes and organisation structures that must be consistent with the underlying business strategies and with each other.

Since the availability of business IT applications dictates the formulation of IT strategies, the following section discussed the major categories of technologies available in the marketplace.

3.2.2 Business IT applications

Like many terms in everyday use, 'information technology' can mean different things to different people. Therefore, before presenting business IT applications available in the marketplace and their uses in the business, it may be helpful to define the technologies included in this study. For the benefit of some researchers, especially IT research specialists, IT strategy needs to be considered in the broadest possible sense. The definition of business IT applications could therefore include the following:

- Transaction processing applications,
- Information processing and reporting applications,
- Decision support systems,
• Executive support systems,
• Professional productivity and groupware tools,
• Knowledge-based systems and artificial intelligence,
• Process automation and robotics,
• Voice and data communications,
• Design and manufacturing automation, and
• Embedded computer technology such as smart cards or ATMs.

This definition comprises not only software and hardware technologies that supported the corporate strategy and business processes planning, but also a range of lower level business operation technologies such as factory robotics. These definitions of business IT applications are somewhat broader than the scope of IT applications in this research.

The focus in this study is on IT applications or software that supported core business functions at corporate strategy and business processes design level. Therefore, in this study, we adopted a more business-focus higher-level technologies definition espoused by the AMR E-Business Model (AMR 2001) as shown in figure 3-1.

The AMR Research E-Business Model is a framework for describing and constructing information strategies and selecting the applications and technology that best support them. The model spans across all functional departments within a company as well as external entities such as vendor, distributors and customer – termed 'extended enterprise' (AMR 2001). The
AMR E-Business Model shows how various applications and technologies support business strategies and processes within and beyond an enterprise.


The AMR E-Business Model classified the business processes and technologies into three major application areas:
• Supply chain management – the technologies supported business functions such as product demand planning, order fulfilment, logistics, warehousing and distribution planning. Most of the major software providers in this field come from enterprise resources planning (ERP) software vendor background although there are many players that provide specialist applications such as advanced planning optimising system (APS) or warehouse management systems. Among the key software vendors are SAP, Oracle, JDEdwards, Baan, Peoplesoft, Manugistics and i2.

• Customer management - these are mainly customer-facing IT applications supported functions such as call centre management and data mining of personalised customer data. The main thrusts of these IT applications are to enable supreme customer relationship building through a computerised personalised customer services processes. The main players in this marketplace are the ERP vendors such as SAP, Oracle and Peoplesoft as well as specialist client relationship management (CRM) software vendors such as Siebel.

• Enterprise management – these are mainly the IT applications that support the supply chain and customer management functions such as finance, human resources management and procurement as well as knowledge management and intelligence gathering system that supports corporate strategy management processes. Again, the main players in the market are ERP vendors as well as many other smaller specialists’ software vendors.
The IT applications in the AMR E-Business Model shared common characteristics that allowed IT being increasingly used as a strategy-enabler for companies. Among the common characteristics are:

- Richer functionalities - the functionalities offered by the software are getting richer and higher productivity could now be achieved.

- Speed of processing - the processing speed is getting faster while at the same time the hardware costs are getting cheaper.

- Development of Internet – Internet development created new IT applications such as CRM and business-to-business (B2B) procurement previously not possible or too expensive to implement (e.g. EDI) pre-internet era. Internet also encourages globalisation and as the growth of service industry is getting more important, knowledge management is getting critical.

The availabilities of technology and the breaking down of cost barriers are driving the use of IT in business. This is one of the key reasons that IT strategies are becoming an indispensable component in corporate strategy planning exercises.

Following sections discussed some of the most commonly used IT strategy-planning tools and techniques.
3.2.3 IT strategy planning tools and techniques

There are many published papers on tools and techniques for identifying opportunities to support management processes with information technology (Banker & Kauffman 1988, Heatley, Agarwal & Tanniru 1995). These tools and techniques differ in focus, emphasis, and applicability to particular areas of concern. Some of the older but well-known pre-1993 IT strategy planning methods (before the birth of IT-business strategic alignment modelling practice) was briefly discussed below.

**IBM Business Systems Planning (BSP)**

IBM BSP (1984) is one of the representative models and methodology of traditional IT strategic management approaches. BSP is used to identify areas for the application of information technology and it is focused on capabilities to improve specific functional areas of the firm. BSP is the first generation of methodology that utilised strictly on operational view of the firm, with an objective to improve the efficiency of particular business processes. This model represents ways of formally modelling the operations of the enterprise so that potential improvements in efficiency and effectiveness can be analysed. The BSP process is generally classified into four main stages: requirements gathering, technology acquisition, stewardship and retirements. The main drawback of this model, as of many other IT strategy planning models, is that it cannot be easily applied to poorly structured functions.
Strategic Information Value Analysis

In 1980s, management consulting firm, Arthur D Little developed an information system planning and analysis tool termed strategic information value analysis or SIVA (Curtice 1985). The planning approach is top-down, driven by overall business objectives and future information needs, and aims to produce a set of four interlocking information architectures: information supply, data, technology and organisation. This tool recognises the importance of IT in corporate strategy planning and the necessity of a task force of highly experienced and valuable staff in the planning process. However, besides suggesting incorporating IT in the strategy planning process using top-down approach, and listing what the task force should be doing, this tool provides no indication of how IT could be aligned to business strategies.

Natural Language Information Analysis (NIAM)

NIAM (Verheijen & Van Bekkum 1982) is sometimes called object-role modelling (ORM). It is a method for modelling and querying an information system at the conceptual level. It uses complex mathematical notation and symbol to mimic business problems. NIAM was first developed in 1970s and many researchers have contributed to the NIAM methods over the years. The drawback of this method is that it focuses on mathematical rigour and it is
mainly the domain of technical personnel, removing information systems from the social.

Some of the common characteristics of all three methods discussed above attempt to make a process or operation systemic which evidence suggests is faulty philosophy, because in most cases, the role of the unsystematic human factors comes out of each of them when the issue of evaluation is raised (Ciborra 1997).

Another common characteristic of these methods is that the IT strategy planning exercise is conducted from top down. It starts from the presumption that there is an organisation, that it has a level of coherence, hierarchy, structure and purpose. In practice, these assumptions seldom hold true (Ciborra 1997). These methods are normally non-evolutionary. In other words, once the IT strategy is set, it is difficult to fine-tune to suit dynamic change of competitive environment. This concept does not reflect the ever-evolving business environment encountered by most firms today. Globalisation, emerging of new competitors and other game-changing trends necessitate more dynamic IT strategy settings.

Also, if the objective of IT strategy planning is to incorporate IT into every aspect of the firm's business, then the traditional approach IT strategy planning is lacking in aligning IT into corporate strategy. Most the tools or techniques fail to recognised the rapidly evolving and changing IT applications. Thus the changing IT environment is not explicitly considered as a lever to change either
in the competitive strategy or in the underlying business processes and operations. IT considerations are usually introduced only after the general themes have been developed.

To be fair, the information technology pre-1993 was not business-friendly. As such, business competitive environment and corporate strategy were not defined in terms that are helpful for identifying opportunities to use IT strategically. Some companies may come up with a short list of critical success factors that help to focus attention on important areas but little effort is made to describe how the firm would position itself in the competitive environment, and how it would relate to its customers, suppliers and competitors as information technology was not really considered in this strategic context.

Because the relationship between the firm’s competitive strategy and its use of IT was developed through several layers of planning – corporate strategy, business processes and operations, the chances that IT would, in fact, have any strategic impact is small if the traditional IT strategy planning methods are used. In other words, there was no alignment between the firm’s use of IT and its competitive strategy.

In an ideal world, IT should be integrated in corporate strategy planning exercise and all competitive strategies should include IT in the same way they include marketing, production and finance. For most companies, however, this is not yet the case (Duffy 2001). IT-business strategic alignment processes are a very useful exercise prior to undertaking lower planning activities such as
business processes design and operations planning, system architecture
development and other necessary tasks.

All these reasons point to the conclusion that these methods are not suitable for modern IT-business strategic alignment practices. And due to the shortcomings of these methods, there were later researches into more pro 'corporate strategies' IT-business strategic alignment models. These models are the subjects of discussion in chapter four.

3.3 Conclusion

According to Applegate, McFarlane and McKenney (1996), the effective use of IT requires that attention should be paid to organisational arrangements and work practices as well as to the technology. A good information system normally consists of a blend of all three - IT, organisational arrangements and work practices. The successful use of IT requires that these three aspects of a system are in harmony. Hence, the realisation of benefits from the implementation of a new information system requires changed organisational arrangements and work practices. Applegate, McFarlane and McKenney (1996) commented that continuing to merely react to new technology and the notional change it triggers could throw a business into a tailspin.

It is vital that IT is treated as a compulsory factor in corporate strategy planning and not just as a technology to be used to assist with the implementation of
strategy. This chapter touched on the various work practices in IT strategy planning and the technologies available in the marketplace today.

Chapter four discusses some of the post-1992 IT-business strategic alignment models that overcome some of the shortcomings of traditional IT strategy-planning methods.
Chapter 4
THEORIES AND RESEARCHES ON IT-BUSINESS STRATEGIC ALIGNMENT MODELS

4.1 Introduction

The fundamental difference between IT-business strategic alignment models and traditional strategic IT planning methods is the elevation of IT as part of a company's strategy, rather than just a response to it (Henderson & Venkatraman 1993). To some extent, IT-business strategic alignment can be thought of as a company's linkage between its competitive environment and the available technologies that position the firm to achieve competitive advantages.

This chapter outlines a field of business strategy and technology alignment researches that concentrated on modelling IT-business relationships. It explores the definition, origin and the evolution of IT-business strategic alignment researches. Section 4.2 explained what IT-business strategic alignment is. Section 4.3 detailed various earlier theories leading to the 1993 Henderson and Venkatraman strategic alignment model, which is the cornerstone of modern strategic alignment model study and is the subject of detail discussion in section 4.4.
Section 4.5 onwards presented arguments against the Henderson and Venkatraman Strategic Alignment Model. Alternative IT-business strategic alignment theories to Henderson and Venkatraman's model were discussed.

4.2 Definitions of strategic alignment

As business and information technology have become increasingly intertwined, IT-business strategic alignment is an often discussed but frequently misunderstood term. In Webster's dictionary, alignment is defined as 'bringing parts or components into proper coordination; to bring into agreement and close cooperation'. The term 'strategic alignment' has been defined in many different ways in recent years in the mass media. In the information technology realm, it could be defined as 'the implementation of information technology with the aim of integrating and developing of business strategies and corporate goals' (Boar 1994).

In the field of management researches, there are various definitions given to 'strategic alignment'. Tallon and Kraemer (1998) commented that strategic alignment is the extent to which the information technology strategy supports, and is supported by, the business strategy. This explanation or definition serves the present study's objectives of focusing research efforts on activities central to the implementation of information technology and corporate strategies.
4.3 Strategic alignment theories (1970 - 1980s)

Attempts to identify the strategic relationship between the business and information technology could be chronicled to as far back as 1970s, when Nolan and Gibson first presented the four stages of electronics data processing (EDP) growth (Nolan & Gibson 1974, Nolan 1979). The graph showing the four stages of the EDP growth was coined as Nolan-curve. Since its inception, it has become one of the major models frequently cited and used in the evolution of computer-utilisation in organisations.

The original Nolan-curve showed a relation between budget for computing and time. Plotting the changes in budget showed that the budgets in companies grow according to an S-shaped curve. The turning points on this curve divided the curve into four stages: initiation, contagion, control and integration. The characteristics of the four stages are described as follows:

- Initiation stage - in which generally a new technology is introduced into low-level operational business processes.

- Contagion stage - the learning curve moves upward sharply as the organisation experiments widely with the new technology.
• Control stage - the transition occurs as budget increases exceed revenue growth, and become a control issue for senior managers which intervene to reduce growth of the use of the IT application to reduce budgeting slack.

• Integration stage – business managers strives for a proper balance between slack and control, and the new technology is integrated into the firm’s business practices.

A few years later, two stages were added to the Nolan-curve to cater for the post integration stage - data administration and maturity. The characteristics of these two stages are:

• Data administration stage - information requirements instead of data processing is driving the IT applications portfolio and information is shared within the organisation. Database capability is exploited, as users understand the value of information.

• Maturity – the planning and development of information technology in the company is closely coordinated with business development.

Over the years, Nolan changed the curve several times, due to technical development and a better insight into computer budgeting. The Nolan-curve later took on other names and forms including 'stage theory' (Nolan, Croson & Seger 1993). Basically the Nolan-curve and 'stage theory' refer to similar principles, used to explain the IT-business relationship by using a model that
seeks to explain the process of introduction of information technology in terms of stages. The model also takes note of the applications portfolio for the technology; the resources required such as cash, technology and people needed to apply the technology in business, management, and user awareness.

In 1980s, due to the rapid development of information technology business applications, researches on alignment of the information systems with the business have started gaining momentum. The IT-business relationship has been the subject of much research and has been cited as one of the chief problems facing business and IT planners and managers (Cresap, McCormick & Paget 1993, Parker & Benson 1989). Most of the researches at this period however, still evolved around Nolan's theories with some minor alternations.

From late 1980s to early 1990s, the importance of alignment between business and IT was voiced by several researchers including Keen (1991), Tapscott and Caston (1993). Parker and Benson (1989) discussed the need for strategic alignment between business and IT strategies and argued that information technology planning and strategic considerations are part of a circular process. There should be a distinction made between business and technology domains. The business planning should drives how an enterprise would be organised. And this should in turn drive the technology planning to support the business. Technology planning leads to the discovery of further opportunities for future uses of technology, which will influence further business planning and strategy.
Researchers such as Hendersen and Venkatraman further refined these views. Their views were discussed in the following sections.

4.4 Hendersen and Venkatraman strategic alignment model

Hendersen and Venkatraman (1993) first proposed an IT-business strategic alignment model which became a body of thought for leading researchers until today. In 1993, a special issue of the IBM Systems Journal featured a series of articles on the concept of 'strategic alignment', including the leading article by Henderson and Venkatraman, who developed the idea starting from their research within the 'Management in the 1990s' project from a grant by the IBM Consulting Group. The model (figure 4-1) they created gained widespread research interests and following in the IT and management profession.
Unlike the Nolan-curve, this model is focused on exploring the inter-relationship between business and IT during corporate strategy planning process. The model is based on two distinct linkages - strategic fit and functional integration.

Strategic fit is the vertical linkage concerned with the integration of the external environment in which the firm competes and the internal environment in which the firm performs. The external environments entail constituencies such as business scope, partnerships, alliances and core competencies. The internal
environments constitute elements such as organisational structure, human resources and business processes.

On the other hand, functional integration is the corresponding horizontal link between business and IT. This linkage extends the notion of internal company functions and external company functions fit to IT.

The strategic and functional fits or vertical and horizontal linkages are used to determine the relationships between IT and business.

In addition to the two distinct linkages, the model is divided into four quadrants. They are business strategy, IT strategy, organisational infrastructure and processes, and IT infrastructure and processes. These four quadrants are interrelated and how they relate represents the company's 'perspective' or alignment orientation. Effecting a change in any single domain requires the use of three out of the four domains to assure both strategic fit and functional integration are properly addressed.

Among the proponents of the Henderson and Venkatraman model are Broadbent and Weill (1993). Based on the Henderson & Venkatraman model, Broadbent and Weill conducted an empirical study on strategic alignment in the Australian banking industry. The aim of the study was 'to identify organisational practices that contribute to and enhance strategic alignment'. After finding such practices, the authors came up with a model of IT-business strategic alignment based on fifteen propositions as listed below:
1) Longer experience of firm-wide strategic planning processes
2) Planning that focuses on critical and long-term issues
3) More extensive participation in firm-wide planning
4) Executive manager consensus on firm-wide strategic orientation
5) Clarity and consistency in strategic orientation
6) More extensive executive manager experience reviewing IT strategy
7) Organisational structure that complements strategy
8) Decision-making processes appropriate to strategic orientation
9) Accountabilities appropriate to strategic orientation
10) Business management responsibilities for information-based developments
11) Extensive interaction between business and IT staff
12) Development of IT understanding in business managers
13) Development of business skills in IT managers
14) Appropriate technology architectures
15) IT to suit generation of required information products and services

Broadbent and Weill (1993) concluded that enhancing business and information strategy alignment will remain a key challenge for both business and information managers in the future.

Between 1995 and 1997 (Luftman, Papp & Brier 1995, Thomas & Dewitt 1996), many studies were developed based on the Henderson and Venkatraman strategic alignment model. The model was further developed and enhanced by some major researchers such as Luftman, Papp and Brier (1995). In 1995, expanding on the Henderson & Venkatraman IT-business strategic alignment
model, Papp developed a total of twelve perspectives. These include the eight individual perspectives of 'strategy execution, technology potential, competitive potential, service level, organisation IT infrastructure, IT infrastructure strategy, and IT organisation infrastructure and organisation infrastructure strategy'. In addition to the eight individual perspectives, four fusion perspectives were identified, namely 'organisation strategy fusion, IT strategy fusion, organisation infrastructure fusion, IT infrastructure fusion' (Luftman, Papp & Brier 1995, Papp 1995, Luftman 1996).

At the annual International Conference of Information Systems (ICIS) in Cleveland, USA in December 1996, Broadbent et al. (1996) won the best paper award with an empirical study on 'Firm Context and Patterns of IT Infrastructure Capability'. Based on international case studies, the authors showed how IT infrastructure was critical to firm competitiveness. Their findings focused on 'how companies link strategy and IT infrastructure formation processes. Again, the key concept was based on the Henderson and Venkatraman strategic alignment model.

In the late 1990s, the Henderson and Venkatraman IT-business strategic alignment model still had widespread research interests and practical applications (Luftman 1996, Luftman, Papp & Brier 1995, Chan et al 1997). The Henderson & Venkatraman IT-business strategic alignment model has been widely used as a management instrument (Labovitz & Rosansky 1997), for example, for the alignment of strategy, customers, people, and processes essential to the growth and profitability of a company.
4.5 IDG Strategic Alignment Framework

In early 2000s, one of the followers of Henderson and Venkatraman IT-business strategic alignment model, Duffy (2001) from International Data Group (IDG), postulated that, to have a successful IT-business strategic alignment, an organisation needs to develop and sustain a mutually symbiotic relationship between IT and business - a relationship that benefits both parties. This requires that IT executives be recognised as essential to the development of credible business strategies and operations and non-IT executives be considered equally essential to the development of credible IT strategies and operations. The extent to which IT and business are integrated is closely related to the way IT is viewed by the company's senior management and the context in which it is deployed.

Many of the conclusions reached by Duffy echo those of Henderson and Venkatraman (1993) but, instead of suggesting four, IDG suggested the need to consider additional six alignment perspectives as shown below:

- Human resources organisation and management – whether the organisational structure is sufficiently dynamic and its competencies both broad and deep enough to satisfy both the business and technical demands of a company's highly competitive and volatile business environment.
- Innovation and renewal – whether an organisation is better positioned to anticipate and capitalize on technology advances and business shifts than its competitors.
• IT and business architectures – whether the organisation’s business architecture encompass the vision, principles, guidelines, standards and best practices that govern the acquisition, use, and disposal of critical assets across the organisation.

• IT-business partnership – whether the organisation processes the related measurements recognising the strong inter-dependency between people, process, and technology.

• Operational excellence- whether the organisation has taken all the steps necessary to ensure that all internal and external facing processes and transactions are in harmony with each others.

• Return on IT investment strategy and management - whether the IT managers and staffs are measured and compensated based on achievement of the same goals as non-IT managers and staffs.

Duffy argued that the answers to the above perspective or questions provide an insight into the progress an organisation has made in achieving strategic symmetry between IT and business.

4.6 McGee & Prusak strategy alignment model

Almost at the same time when Henderson & Venkatraman released their IT-business strategic alignment theories, McGee and Prusak (1993) came up with an IT-Business strategic alignment model that closely resembled that of Henderson and Venkatraman. However, besides referring to their alignment
model (figure 4-1), describing various IT linkages at various business planning levels and mentioning briefly its relevance in corporate strategy planning, McGee and Prusak did not dwell on explaining how IT and business could best be aligned. Nonetheless, unlike the Henderson and Venkatraman model, which focuses on IT alignment at corporate strategy and process planning level, McGee and Prusak started the first attempts to link IT to lower business planning levels – at operations and execution level.

Figure 4-2: McGee & Prusak alignment model

4.7 Arguments against Henderson and Venkatraman model

In early 1994, while Henderson and Venkatraman’s IT-business strategic alignment model was gaining a huge following from the IT and management fields (Broadbent & Weill 1993, Boar 1994), some researchers especially among the academicians and consultants started to express concerns about the current and future efforts to extend the original Henderson and Venkatraman strategic alignment model. For example, there was a lack of measurement tools and methods to evaluate whether an organisation is aligned or not, and how to measure the alignment and the overall strength of the alignment.

In 1996, researchers (Thomas & Dewitt 1996) argued that the Henderson and Venkatraman’s IT-business strategic alignment model was not at all unequivocal. The major flaws in the model are that there are no measurements of various dimensions within the model and, hence, it is questionable where IT-business strategic alignment makes any difference in a company’s performance over time (Tallon & Kraemer 1998). The two major critiques of Henderson and Venkatraman model are Ciborra (1997) and Maes (1999) and the arguments against Henderson and Venkatraman’s IT-business strategic alignment model are discussed in the following sections.

4.8 Ciborra’s cultivation theory

One of the major critics of the Henderson & Venkatraman Model is Ciborra (Ciborra 1997, Ciborra & Hanselt 1998). Ciborra put up major arguments
against the Henderson and Venkatraman's IT-business strategic alignment model, commenting that the IT-business strategic alignment is highly illusory and the strategy was developed based on many factors, not only IT. Ciborra argued that information technology itself is autonomous and the IT infrastructure is rigid. In addition to this, the implicit dominance of strategy planning process and argument for strategic balance is questionable in the era of uncertainty and flexibility. Because of these, Ciborra argued, the strategic intent articulated in the Henderson & Venkatraman model is troublesome.

Ciborra commented that the key concept of Henderson and Venkatraman model started losing its representation since 1996, when the Internet usage started gaining momentum. She felt that the concept of 'cultivation' developed by Itami and Numagami (1992) should take centre stage (Ciborra 1997). According to Itami and Numagami (1992), cultivation is the dynamic interaction between current strategy and future technology. It is a process by which technology gets accumulated, often in an unplanned ways, with much greater future potential than necessary to meet current needs. Cultivation is thus based on frequent misalignment and misfit: the technology being accumulated is greater, or different in its potential, than current internal and external needs. It is also about destabilising current strategy and 'creating imbalances' with the current level of technology.

The concept of cultivation invites the research communities to reconsider the role played by the object of alignment, i.e. technology, looking at technical systems as 'organisms' with a life of their own. This concept changes the
whole notion of IT-business strategic alignment theories espoused by the Henderson and Venkatraman School of thought.

4.9 Maes’ generic framework

Another critic of the Henderson and Venkatraman’s IT-business strategic model, Maes (1999), while not disagreeing totally with the Henderson and Venkatraman strategic alignment model, did form a new school of thoughts that opposed the ‘pure’ Henderson and Venkatraman IT-business strategic alignment model. In 1999, a modified strategic alignment framework (Maes1999) based on Henderson and Venkatraman’s model, and called the generic framework (figure 4-3) was proposed with attempts to counter the weaknesses in the Henderson and Venkatraman model.

Maes argued that the Henderson and Venkatraman model was incomplete because it only dealt with choices regarding organisational and technological infrastructure and processes and ignore other important dimensions such as operations and information. For instance, the internal domain of the Henderson and Venkatraman model focuses only on infrastructure issues and Maes argued that it is important to include operational considerations as well. In additional to this, Maes argued that successful integration of the business strategy and technology is dependent on information and information sharing.
Based on these arguments, Maes extended the 'operations' (horizontal dimension) and 'information/communication' (vertical column) layer (shaded boxes in the figure 4-3) respectively to the Henderson and Venkatraman strategic alignment model to counter the inherent weaknesses between the domains.

Maes argued that the 'information/communication' column of the framework should be treated as key to successful alignment of business and IT; and should be considered as independent variables instead of dependent variables as viewed by many researchers and practitioners.
4.10 CAP Gemini's Integrated Architecture Framework

CAP Gemini (Maes et al. 2000) Integrated Architecture Framework or IAF (figure 4-4) is another IT-business strategic alignment model that strayed away from the pure Henderson and Venkatraman IT-business strategic alignment model that solely focused on IT and business strategic assignment at the corporate strategy and process planning level. The IAF was designed by the management consulting firm, CAP Gemini, with an aim to support the integrated architectural design of business and IT. Cap Gemini argued that architectural design plays a key role in the alignment of business and IT.

According to CAP Gemini, the alignment of the business and IT vision through architectural design should further more than only a simple supporting role for IT in the existing business processes but information technology should also be used in an innovative way as enabler for renewed business.
Figure 4-4: CAP Gemini’s Integrated Architecture Framework

Design Phases
- Contextual
  - vision, scope, environment
- Conceptual
  - products, services
- Logical
  - functions, co-operation
- Physical
  - people, components
- Transformational
  - Transformation, evolution

Business | Information | Information Systems | Technology Infrastructure


The IAF construct has three dimensions:

- The horizontal dimension – consists of four main architecture areas, ‘business processes, information provision system, information systems and the technology Infrastructure’. The business processes architecture is an organisation of one or more supply chains of individuals, organisational units and companies working together in delivering products or services to the customers. The information provision architecture supports the business
in the creation, processing, exchange, storage and use of information and knowledge. The information systems architecture encompassed a network of communicating and co-operating software components that deliver information system services to the people that have a business or IT role in the business. The technology infrastructure is a network of communicating and co-operating hardware devices and system software and middleware.

- The vertical dimension – consists of five design phases that are supported by the architectural description – ‘contextual, conceptual, logical, physical and transformational’. The contextual phase describes the mission and strategy of the enterprise, the role of the enterprise in the environment and the scope of the transformation of the business. The conceptual phase designs for the four architecture areas respectively. The logical phase designs the operation and structure of the business processes. The physical phase handles staffing issues in the designed business system or the technology platforms required performing the functions in the designed information system and technology infrastructure. The transformational phase designs the stages in transformation of the business system and the migration of the IT systems.

- The third dimension - consists of company-specific architectural viewpoints that need a holistic approach concerning all main architecture areas. For example, the system security consideration.
4.11 CAP Gemini's Unified Framework of Alignment

In May 2000, a white paper was published jointly by the University of Amsterdam and CAP Gemini Institute that combines CAP Gemini’s Integrated Architecture Framework (IAF) with Maes Generic Framework (Maes 1999) to form a Unified Framework of Alignment (Maes et al. 2000).

In this paper, Maes et al. argued that the IAF supports the aim of integration of architectural design of business and IT with Maes' generic framework. Whilst Maes' generic framework is a tool for information management, IAF was conceptualised as a system implementation tool. Maes et al. argued that combining IAF and Maes' generic framework would create a unified framework which could be used as an integration management and design tool aiming at development of mutually aligned business and IT system as business and IT alignment is a combined management and design concern so it is complementary when these two frameworks are combined. Integrating IAF to Maes' generic framework entails the incorporation of the design components, namely contextual, conceptual, logical, physical and transformational phases of IAF into Maes' generic framework.

The combined framework is called 'Unified Framework of Alignment' and is shown in figure 4-5.

4.12 Conclusion

In 1993, a new school of thought appears with the concepts of IT-business strategic alignment modelling that replaces the traditional IT strategy planning practices. Among the pioneers in this new school of thought were Henderson and Venkatraman with their IT-business strategic alignment model. The Henderson and Venkatraman’s alignment model gained widespread following in the 1990s even though there were some critics about its usefulness and measurability. Some critics such as Maes et al. (2000) argued that the
Henderson and Venkatraman alignment model is too simplistic for use in real business environment and expanded the model to include lower business planning levels and other business and technology dimensions.

4.13 Conclusion for part II

Part II has explored the common practices adopted in the three levels of business planning – corporate strategy, business process and operations management. The IT applications available today that support these three business-planning levels were discussed.

Contributions of information technology to corporate strategy planning practices were discussed, starting with the traditional IT strategy planning processes pre-1993 era. Post-1992 era is the realm of IT-business strategic alignment theories and models, the core research area of the present study. Undoubtedly, the Henderson and Venkatraman school of thought still forms the mainstream of IT-business strategic alignment researches up till today, even though the measurement metrics and tools are lacking behind in supporting the use of the IT-business strategic alignment models.

There are variations of models stemming from Henderson and Venkatraman’s model. These include CAP Gemini and Maes’ models. Each of the models being developed, although with the good intention of trying to mimic real life
business scenarios, unfortunately added increasing degree of complexity to the models. The more complex the models become, the more difficult it is for businesses to measure the performance outcomes of IT-business strategic alignment. And it goes without saying that, if the relationship between business outcomes and the IT-business strategic alignment is difficult to measure, the model is of no practical usage value.

Because of the various inherent weaknesses found in these models and the lack of measurement tools and methods, a new simplified IT-business strategic alignment conceptual research model was constructed and a measurement methodology was proposed in the present study. These are discussed in the following chapters.
Part III. Theoretical framework and research questions
Chapter 5

THEORETICAL FRAMEWORK AND RESEARCH QUESTIONS

5.1 Introduction

As discussed in earlier chapters, many companies today seek sustainable competitive advantage through their ability to provide a dynamic and unique mix of product, pricing, promotion, and distribution channel with the help of technology (Duffy 2001). This happens in a business environment where marketplace is increasingly globalising. This environment has created some very highly competitive markets which bear pressure on companies to reduce product life cycles and to identify and penetrate new market segments with speed while trying to reduce costs by increasing the operational efficiencies across supply chains and distribution channels. Many of these business strategies are highly dependent on leveraging technology to the fullest extent. Many leading companies believe that alignment between the business strategy and information technology (IT) is not a luxury but a cost of entry.

As seen in previous chapters, there is a flood of theories and models (Henderson & Venkatraman 1993, Luftman, Papp & Brier 1995) articulating the importance of IT-business strategic alignment since 1993. While these new theories and models encouraged increasing number of companies to accept the needs of strategic alignment to business success, the models did not help the companies to establish whether they have the strategy and technology aligned,
nor providing simple tools for the companies to measure the relationships between strategic alignment and business performances (Cresap, McCormick & Paget 1993, Tallon, Kraemer & Gurbaxani 1998).

This situation is ironic as many researchers (Tapscott & Caston 1993, Luftman, Papp & Brier 1995) argued that the consequences of companies not aligning their business strategies with IT could lead to many business shortcomings, among them as missing strategic opportunities to expand markets, innovate new products, capture new distribution channels, leverage customer, increase productivity, increase profitability, costs control and increase speed and responsiveness. At the same time, the importance of study on the practical uses and measurement IT and business strategic alignment has not been emphasised (Ciborra 1997, Maes 1999).

To be fair, from an academic point of view, the advance of information technology and the widespread usage of IT have prompted an explosion of new researches on the impact of information technology on business and corporate strategy planning (Thomas & Dewitt 1996). However, the researches on IT-business alignment are prevalently conducted from American and European companies’ perspectives. There are relatively few similar researches being conducted for companies in the Asia Pacific region, including Australia (Haley & Tan 1996, Lasserre & Schutte 1995).

As seen in previous chapters, the IT-business strategic alignment researches are so diverse that there is no single accepted theory, model or solution to
achieve agreement, coordination, and close cooperation between business strategy and IT strategy. Notwithstanding, there have been several researches that have attempted to align IT to business strategies to bring about improved business performance. It is the aim of this research to consolidate the key principles of the strategic alignment researches into a simple practical model and to render that model useful by accompanying it with a measurement and analysis methodology. This chapter outlines the new strategy alignment framework developed by the author to achieve those purposes.

This chapter discusses the research questions and performance measures used in the new strategy alignment framework and explains the construct of the framework and the variables used therein.

5.2 Research questions and hypotheses

The espoused positive relationship between IT-business strategic alignment and its impacts on performance outcomes has been a core belief of IT and management researchers (Tapscott & Caston 1993, Luftman, Papp & Brier 1995) even though there have been little empirical evidence to confirm or refute this belief. It seems that much has been said about the importance of IT-business strategic alignment. But when it comes to measuring the importance of IT-business strategic alignment, there are still many lingering questions unanswered. For examples, is there any empirical proof – especially from an
Australian context – to ascertain this claim? At which levels of business planning will IT-business strategic alignment bring out the most business outcomes? If it could be proved that IT-business strategic alignment does bring about better business performance, would a stronger IT-business strategic alignment automatically increase the magnitude of business performance?

Answering these questions would require an investigation as follows:

- Finding out if the business performance outcomes or competitive advantages and benefits could be obtained by having a strong link between corporate strategy and IT strategy.

- Establishing if the business performance outcomes or competitive advantages and benefits could be obtained by having a link between business process/operations and IT processes/operations.

These two broad research aspects were translated into the following hypotheses for this research:

- **Hypothesis 1** - The stronger the linkage or strategic alignment between corporate strategy and IT strategy, the higher the performance outcomes (competitive advantages and benefits) that could be obtained and sustained.
• **Hypothesis 2** - The stronger the linkage or strategic alignment between business process/operations and IT processes/operations, the higher the performance outcomes (competitive advantages and benefits) that could be obtained and sustained.

The two hypothesis test whether stronger IT-business strategic alignment brings greater business performance outcomes. The first hypothesis test is for the IT-business strategic alignment exercises conducted at corporate planning level. The second hypothesis test is for the IT-business strategic alignment exercises performed at business planning level *i.e.* processes and operations. The reason that processes and operations are merged into one group shows the integrative nature of business processes and operations management in practice, as discussed in the literature review.

The test of the hypotheses satisfied the **first research objective** of answering the IT-business strategic alignment questions about 'what IT-business strategic alignment could do to business performance outcomes especially from the Australian businesses perspective'.

The **second objective** of the research was to devise an IT-business strategic alignment measurement conceptual research model that is simple and practical to use by businesses. This model includes the key principles of the major strategic alignment theories and models available today. As different organisations have their own unique ways of running their business, it is
important to uncover and address the common competitive and technology strategy issues facing the business.

To achieve these two objectives, the commonly used performance measures used in industry were identified (as discussed in section 5.3) before any conceptual framework and measurement methodology was developed.

5.3 Deriving strategic alignment performance measures

While most IT-business strategic alignment researches claimed that the measurements of business performance outcomes as a result of IT-business strategic alignment are important to the utility of the IT-business strategic alignment model, with the exception of some preliminary work by Chan et al. (1997), there are not many study attempts that have been conducted to justify the claims.

The researches that did measure the performance impacts of IT employed mostly used econometric methods (Bakos & Kemerer 1992). Bakos and Kemerer argued that although econometric studies could provide some useful insights into a range of IT impacts using theories of production economics, information processing or industrial organisation, the studies however tend to view IT impacts from one-dimensional angle such as value added or productivity. In reality, the performance impacts of IT could affect multiple dimensions (Tallon et al. 1997) beyond the impacts on an organisation's economics alone. Therefore, it could be argued that econometrics has its
limitations in capturing non-economics strategic performance outcomes such as increased managerial effectiveness and improved customer services.

Also, while econometric studies offer a high level of objectivity, they provide limited insights into how IT-business strategic alignment impacts on ultimate strategy competitive advantages. Therefore, this study advocates a managerial perception-based approach to IT-business strategic alignment impacts on business performances as espoused by DeLone and McLean (1992).

Bruce (1998) and Boar (1994) are among some of the management practitioners that proposed measuring IT and business strategy alignment using managerial perception-based approach. Bruce claimed that successful alignment could be accomplished via coordination of strategic objectives with a number of key components, namely resources, management processes, decision-making mechanisms, performance measures, rewards and incentives.

In practice, business performance contributions by IT-business strategic alignment could be different for organisations of different sizes, in different growth phases and industries. However, these different measurements could be generally grouped into the following categories and were used to construct some of the variables in the CSA model:

- Cost leadership – for example; price, cost of operations.
- Product and services leadership – for example; quality, markets.
- Outstanding customer service – for example; customers, channels.
In 1997, Gartner Group (1997) conducted a survey with senior business managers showing that, despite the availability of the IT-business strategic alignment model, most companies still do not have a well-articulated and measurable strategy. The survey showed that most companies have a vision, a loose set of major goals and a focus on short-term financial numbers such as earnings per share and measuring IT-business strategic alignment using economic-value-added analysis.

The Gartner Group argued that the multiple measures or balanced scorecard approach (table 5-1) is a preferable set of measures to construct a methodology for IT-business strategic measurement.

<table>
<thead>
<tr>
<th>Financial Goals</th>
<th>Market and Satisfaction Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Improvement Goals</td>
<td>Learning and Innovation Goals</td>
</tr>
</tbody>
</table>

**Table 5-1: Multiple measures in balance**

**Source:** Gartner Group 1997, ‘IT-enabled enterprise’, Presentation Materials from the Gartner Group Conference

The Balanced Scorecard Institute (2001) came up with a performance measurement framework for IT and business performance outcomes which shows areas where IT can add value to an organisation. The framework provides a simple framework showing that IT systems could have impacts on
the areas of competitive advantages under which an organisation operate. The framework is shown in table 5-2.

<table>
<thead>
<tr>
<th>Representative Systems</th>
<th>Competitive Advantage - Value Metrics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic commerce</td>
<td>Market share</td>
</tr>
<tr>
<td>(EDI, supplier management, electronic shopping, secure protocols)</td>
<td>Price premium for products/services</td>
</tr>
<tr>
<td>Information-based products and services</td>
<td>Operating margins, New business revenues, cash flow, knowledge retention</td>
</tr>
<tr>
<td>(financial, market, and industry-specific information services)</td>
<td></td>
</tr>
<tr>
<td>Information value added to existing products and services</td>
<td>Relative return on equity</td>
</tr>
<tr>
<td>(Customer information networks, electronic catalogs)</td>
<td></td>
</tr>
</tbody>
</table>

Source: www.thebalancedscorecard.org

Combining the metrics from Bruce, Boar and The Balanced Scorecard Institute and ignoring the econometrics variables from the selection, the following metric or variables of measuring the business outcomes due to IT-business strategic alignment were obtained for the purposes of the present study:

- Revenue
- Cost saving
- Customer service level
- Employee loyalty and job satisfaction
- Time to market
- Market share
- Product quality
- Product/service leadership
- Brand loyalty

These variables are the basis of the business performance measurement (sub-classified into competitive advantages and benefits) used in the CSA model.

5.4 The consolidated strategy alignment (CSA) model

Although there are some criticisms about having an IT-business strategic alignment model at all, especially from critics such as Ciborra (1997), as discussed in the chapter on ‘literature review’, most academics and practitioners accept that there should be some form of structure in IT-business strategic alignment in analysing the relationships of various variables at play in the area of IT-business strategic alignment.

Because of the lack or inadequacy of practical measurements tools and methods on strategic alignment, the business managers today, while fully understanding the huge impact of IT on businesses, are not fully aware of the implication of IT-business strategic alignment on areas of business performance in order to make better informed business decisions.
It is based on this background that one of the research objectives was to devise a conceptual research model (figure 5-1) to measure the relationships between IT-business strategic alignment and business performance. As a measurement model, it offers the ability to describe and categorise the logic of measures based on the metric as postulated by Bruce (1998) and The Balanced Scorecard Institute (2001) as discussed in the previous section.

The model is termed 'Consolidated Strategic Alignment Model or CSA model' because it is built based on the key IT-business strategic alignment concepts postulated by various schools of thoughts including Henderson and Venkatraman (1993), Maes’ Generic Framework (Maes 1999) and Cap Gemini’s Unified Framework of Alignment (Maes et al. 2000). The CSA model omitted the complexity of the details such as IT infrastructures and implementations. This is achievable by focusing on IT-business relationships and business activities at the highest levels. For example, the model should only capture variables at the IT business applications level only, such as enterprise resources planning software applications that bring about direct business benefits and ignore supporting IT infrastructure or procedures that go with the IT applications.

The CSA model was developed with the aim of simplifying IT-business strategic alignment so that it could be used practically for the business. Besides practicality, there is another reason that a simpler model is necessary. Even though there are different ways to model the IT-business strategic alignment, research by Chan et al. (1997) revealed that interaction was more appropriate
and parsimonious than more complex polynomial forms. Therefore, the CSA model seems to be an appropriate framework since this captures the essence of interaction between the IT and business strategies.

Another feature of the CSA model is that it covers the three business planning levels – from corporate strategy to operation management. While most previous research on IT-business strategic alignment considered IT and business strategy either at corporate strategy planning level or business process level, they normally fall short on providing an understanding on how IT-business strategic alignment behaved on both corporate strategy planning and business process/operations level. Focusing on how IT supports corporate strategy planning and key business processes/operations would provide a comprehensive and ‘full-picture’ assessment of the link between IT and business strategic alignment.
The IT-business strategic alignment model mirrors the common three businesses planning levels (from corporate strategy planning down to business processes and operations management) as depicted in the CSA model in figure 5-1. At various planning levels, IT plays the roles as described below:

- **Level 1** - IT strategy formulation, which includes ad-hoc and routine corporate strategy re-alignment activities.

- **Level 2** - IT planning, which includes IT budgeting, project and resources planning.
5.4.1 Independent variables

Within the CSA model (figure 5-1), the primary independent variables have been constructed to identify the IT-business strategic alignment at:

- Level 1 (represented as variable A1) and,
- Levels 2 and 3 (represented as variable A2).

In the CSA model, variable A2 is used to measure level 2 and level 3 relationships as, in practice, business processes and operation management are normally conducted as one business planning cycle. Whilst Henderson and Venkatraman (1993), Maes (1999) and McGee & Prusak (1993) all proposed a separate level for business process and operation, in practice, these two levels seldom work independently. For example, it is not possible to differentiate and measure the business outcomes differently for a purchasing clerk who enters a purchase order in the computer to a procurement process that has a step that includes entering purchase order in the system.

Also, the separation of these entities would indicate that there are inherent differences between business processes and operations; for example, in the area of IT infrastructure, organisation structure and the reporting lines. This
separation of entity is normally not the case in practice and, therefore, not the study object of this research.

For these reasons, this study measured the outcomes and strategic alignment as a single variable even though the conceptual model shows two separate entities.

The business performance variables in this case are dependent variables (sub-classified into competitive advantages and benefits and coded from K1 to K10) that react to the degree of intensity exerted on independent variables (coded A1 and A2).

5.4.2 Dependent variables

This research used the measures for competitive advantages and benefits as proposed by Bruce (1998) and The Balanced Scorecard Institute (2001). Whilst there are many other studies that would argue for other representative performance measures, this study stayed away from other traditional study that relied heavily on past financial performance but instead focussed on the basic empirical study that relied heavily on managers' past experience and intuition. The set of measures listed below would allow the chief executive officer, chief information officer, strategy planner or IT manager to provide their inputs to this research without sifting through mountains of financial and past performance data.
Based on Bruce’s (1998) measures of IT-business strategic alignment and the performance framework developed by The Balanced Scorecard Institute (2001), as discussed in the previous section, key dependent variables have been developed for potential competitive advantages obtained. The variables are listed below:

- **Customer service level (represented by variable K1)** - it is assumed that IT applications such as client relationship management (CRM) system could direct impact on these competitive advantages.

- **Employee loyalty (represented by variable K2)** – information system as a knowledge management tool has the potential to disseminate corporate information to motivate its employees and is a competitive advantage in a knowledge economy.

- **Time to market (represented by variable K3)** – IT applications such as advanced planning system (APS) enable accurate demand forecasts, thus improving production and distribution planning leading to time reduction in products or services delivery.

- **Product quality (represented by variable K4)** – improved product is possible through the use of better information flow between departments and the use of quality management software.
• Product/service leadership (represented variable K5) – innovation via quicker design turnover is possible with various IT applications such as computer-aided design tools and intelligence gathering applications.

• Brand loyalty (represented by variable K6) – customer-keeping strategy via information technology means such as internet-enabled marketing and communications with customers.

Customer service level, employee loyalty and job satisfaction, time to market, product quality, product/service leadership and brand loyalty are grouped under variables 'competitive advantage' as these variables are differentiators between a leading corporation and the followers.

Revenue, cost saving and market are considered as 'benefit' outcomes as these variables are easily copied by the other companies and normally advantages gained are short-term in nature. In other words, these variables contributed by IT-business strategic alignment, whilst not enhancing an organisation's competitive advantages, may bring about business benefits. These benefits, however, unlike competitive advantages are not unique to a company and are normally replicable by other companies. These variables are listed below:

• Revenue (represented by variable K7) – business could use information technology to open up new sales channel such as Internet shop to generate additional stream of revenue.
- Cost saving (represented by variable K8) - information systems could improve company's revenue by automating certain manual tasks, thus reducing payrolls requirements.

- Market share (represented by symbol K9) – similar to variable K7, information system could be used to developed new markets. Unlike K7, having biggest market share does not necessarily mean an increased revenue automatically due to other factors in play; for example, internet marketing to a market with no physical branch office could increase the market share but the logistical costs in shipping the goods to that market eroded the revenue.

Another variable, 'sustainability of competitive advantage' represented by symbol K10 was introduced to measure whether variables K1 and K6 could be sustained by using IT applications. This is an important measure because most companies today used packaged IT applications that are dominated by a few heavyweight software vendors (e.g. SAP, JDEdwards). Although the packaged IT applications, once purchased, although could be configured and modified to a company's requirements, most of the standard functionalities of the IT applications remained the same across all companies. This raises the question whether the competitive advantages obtained by a company using particular type of packaged IT applications could be mimicked by other company using the same IT applications. It is because of this reason variable K10 is introduced into the CSA model.
5.4.3 Control variables

The roles of control variables are not explicitly stated in the conceptual framework or in the CSA model but were incorporated in the research methodology. One of the most important control variables is the type of IT applications used at each level of strategic alignment A1 and A2.

The type of IT applications a company uses serves different purposes at different levels of strategic management processes. For example, some software application, by its nature, only supported internal finance and administration and it should be treated as an IT system used at business process/operation alignment level (A2) and not at IT-business strategy level. Care was taken during the study to make sure that IT systems used by the organisation were slotted into appropriate level to ensure consistent representation of cases or scenarios in study.

There are many ways to classify the IT systems according to their usage; this study used the AMR Research E-Business Model (2001), as discussed in the literature review chapter.
5.5 Conclusion

The variables described in this section represent key business performance outcomes sufficient to cover most of the measurement scope in common IT-business strategic alignment initiatives.

With the IT and business relationships structured into the CSA model, the resulting business outcomes defined, the CSA model was then used to examine the relationships between the IT and the strategy management components and their contributions to competitive advantages and benefits.

'Practical usage' is one the key contributions of the CSA model. It is envisaged that this CSA model provides the managers with the measurement tools and findings that could be used as a guideline in reducing the gap between IT and business strategy. The gap could be IT under-utilisation or management unawareness.

Another contributions of the CSA model is to provide an operational conceptual framework (in the form of CSA model) and practices that could help to identify the factors influencing a company's IT-business strategic alignment and their contributions to the company's corporate performance. The methodology used in deriving the various variables and the construct of the CSA model, plus the subsequent use of the CSA model in measuring the relationships between the variables and the linkages in the CSA model should have important
consequences for IT and business practitioners seeking ways to improve their company's IT-business strategic alignment initiatives.

With the CSA model now in place, the following chapter details the instruments and methodology used to measure the impact of IT-strategic alignment on business performances.
Part IV. Research design
Chapter 6

RESEARCH METHODOLOGY

6.1 Introduction

The previous chapter introduced the theoretical framework of the CSA model and identified the research questions and hypotheses. The aim of this chapter is to describe the methodology used in this research. It builds upon the methodology aspects discussed in chapter 1 and gives a detailed description of the methodological approach. This chapter is organised into two main areas - the research procedures and the data analysis methods.

6.2 Research procedures

As discussed in earlier chapters, besides the objective of building a simple and practical IT-business strategic alignment construct, the other aim of this research is to use the CSA model, to conduct an empirical study on the relationships between information technology strategy, corporate strategy planning and business processes/operation planning.

In this study, it is important to identify and understand the organisation's business strategy and its managers' basic views about the role of IT in executing that strategy, while recognising that IT can influence the strategy, as well as be influenced by it. Developing an IT strategy normally begins the
important task of developing an effective partnership between IT and business managers, by ensuring that each side understands the problems and opportunities facing the business. The IT strategy forms the policy framework for the company's use of IT, and it describes how business executives will work with IT staff. An IT strategy planner who lives in the IT and business strategy planning worlds is an important interface in aligning the IT and business strategy. The most senior IT manager in the company normally plays these roles.

Based on this assumption, an analytical survey method directed to IT managers was adopted (Howard & Sharp 1983, Jennings 1997). Survey questionnaires were developed on the variables as defined in the CSA model. The questionnaires were directed at senior IT managers to provide an organisational context and an understanding of the aims and critical success factors and their relationship to information technology strategy.

In depth one-to-one interview for companies who responded to the questionnaires was conducted to provide context and broad understanding of business process and operation levels details, as well as to validate some of the data collected.

6.2.1 Survey instrument and design

Survey research is appropriate when research and theory are beyond early stages and small sample size and generalisation of results are major concerns
(Premkumar & King 1994a). The literature review (Gottschalk & Lederer 1997) provides evidence that research and theory in the field of IT strategy are beyond early stages. Furthermore, given the researcher's own experience in the area and extensive consulting network in the IT management consulting field, which provided some background insight to the companies, a survey approach was selected for this research.

This study avoided secondary data collection used by many other studies for reasons stated in previous chapters, to avoid the shortcoming of econometrics-based research. For this study, data were collected directly from senior IT managers through questionnaire survey rather than relying on secondary data as is common in empirical studies (Dillman 1978). Past research experiences indicated that IT managers formed the management group most likely to be well informed about IT evaluation practices. It was recognised that other managers may well have different views on IT evaluation, but for purposes of sampling consistency, it was decided not to investigate those other groups in the present study.

Leaving the econometric shortcomings aside, the use of perceptual measures as a proxy for objective measures of performance outcomes has been criticised by some researchers. These researchers feel that IT managers may provide an inaccurate assessment of performance outcomes due to personal biases and complex nature of the IT payoffs evaluation process. The matter of fact is managerial opinion and perceptions may provide information that secondary data are unable to reveal. A few researches have eliminated some of these
concerns by showing, for example, that manager perceptions correlate with objective measures of firm performance, as shown in study done by Venkatraman and Ramanujam (1987). Venkatraman and Ramanujam showed that where senior IT managers were asked to rate their company's performance against that of major competitors using criteria such as sales growth, income growth and return on investment, a strong correlation between perceptual and objective measures was obtained. Venkatraman and Ramanujam suggested that perceptual data from senior IT managers could be employed as acceptable operationalisations of business economic performance. Besides Venkatraman and Ramanujam's study, there are other researches also confirming managers' perceptions of IT business value being correlated with economic and non-economic measures of IT performances such as revenues per IT dollar, net income per IT dollar and firm-wide productivity (Tallon et al. 1998).

Other researches further supported the use of managers' perceptions in evaluating payoffs from IT, including DeLone and McLean (1992), where they argued that business executives are ideally positioned to act as key informants in a qualitative assessment of IT impacts in their companies. There is a twofold basis for DeLone and McLean's argument. First, as direct users of IT, managers can rely on personal experience when forming an overall perception of how IT has impacted different aspects of firm performance at the process level (Davis & Olson 1985, Rockart & Flannery 1983). Second, as managers become more involved in IT investment decisions, they are increasingly exposed to the views of peers and subordinates as to the performance of previous IT investments (Watson 1990). Taken together, these arguments
confirm that managers are an important source of information on the impacts of IT on performance, thereby supporting the use of manager's perceptions in evaluating payoff from IT investment.

Based on the variables defined in the CSA model, literature review was conducted to generate a pool of questions containing items describing variables in the CSA model and other information technology-enabled strategic advantages. To ensure the usefulness of the survey instrument constructs, some industry expert advice was sought to assess the validity of the questions, measures used, and the conceptual and functional equivalence of the survey instrument constructs.

The questions or items generated were then grouped theoretically into two headings: the first group containing questions related to corporate strategy planning level and the second group contained business processes/operation planning level related questions.

In the questionnaires, these two groups of questions and items were arranged into sections 2 and 3. Section 1 of the survey instrument contained several questions attempting to get an understanding of general information of the participants and corporate strategy planning practice. Appendix A1 shows the detailed design of the survey instruments and basically the design logic could be summarised into three sections, as follows:
- Section 1 – questions related to general information of the participants and corporate strategy planning practices and organisation arrangements: to grasp an understanding of organisational structure, policies, procedures, systems, general corporate strategies.

- Section 2 – questions related to strategic alignment between information technology and corporate strategy: to understand the strategic intent, the type of systems used the degree of alignments and its associated benefits and competitive advantages obtained, if any, at this level.

- Section 3 – questions related to strategic alignment between information technology and business processes/operations: to understand the strategic intent, the type of systems used, the degree of alignments and its associated benefits and competitive advantages obtained, if any, at this level.

The questions used a six-point Likert scale to measure the degree or extent of severity, to derive intensiveness scores. A six-point scale was adopted to avoid possible compromise answers from respondents. These questions were basically designed to measure the independent and dependent variables as defined in the CSA model, as described below:

- Questions measuring 'A' variables (refer section 5.4.1 and figure 5-1) - the measures of tightness of linkage between IT and business strategies and business processes/operations. The scale starts from a lowest score of 1-
tagged as chaotic IT-business strategic alignment to the highest score of 6 – a state where perfect IT-business strategic alignment has been achieved. In other words, the higher the score, the greater degree of IT-business strategic alignment demonstrated/achieved by the firm.

- Questions measuring 'K' Variables (refer section 5.4.2 figure 5-1) – measuring the degree of influence or impact on dependent variables as a result of strategic alignment of ‘A’ variables. The scale starts from lowest score of 1 (meaning IT-business strategic alignment has the lowest impact on business performances) to the highest score of 6 (the IT-business strategic alignment has greatest influence on business performance).

Based on these variables, questions were then coded for each of the measures as shown in appendix A2.

When designing the survey instrument, a perimeter was set around the type of information systems used and questions were developed based on the business software applications classified by the AMR Research's E-Business Model (AMR 2001). This model was used because it provided a framework for incorporating IT strategies and products into a company's overall business strategy. The model shows how various business applications and technologies fit into the business functions landscape. AMR (2001) has its own research unit on the IT application markets and the research shows that most companies' adopted information technology uses IT applications that broadly
fall into this model. Therefore, the model is well suited to be used to identify which systems were used to align business strategy with IT deployment.

6.2.2 Population definition and sample selection

Various ways of selecting samples for this study were considered. Although the CSA model could be used in several circumstances, the study was thought to yield different results depending on the sample selected. For example, randomised samples could be obtained for all companies for all industries within a country or region, which in this case, would yield a general overview on how IT-business strategic alignment impact on business performance for a country. That study result would not be useful or representative as it hides the facts that each industry has unique competitive strategies to pursue and thus influences the IT-business strategic alignment practices.

In the present study, samples from a particular industry segment that shared similar strategic goals were selected (see appendix A3). The boundaries of the research area or samples in this research cover only public limited companies within the manufacturing industry in Australia. The selection of companies from one industry and of certain size was made to ensure that most of the variables defined in the CSA model could be captured consistently without distortion, and that the audit standards were universal across the samples.
Also, when administering the survey questionnaires, the environment variables have to be controlled. As such, industry effect has to be controlled by collecting data only from a singular almost homogeneous industry. This is another reason, in this case, why the manufacturing industry was chosen.

This approach was considered important in that the strategy planning process should be similar across the companies studied so that it would be appropriate to pool them together. While a restricted sampling approach may limit the generalisation of the research, it enhances confidence that the findings are a result of the proposed relationships. Besides, for the selection stated earlier, this consideration led to the use of several criteria to identify the sample.

First, as stated earlier, for it to be included in this study, the company had to be active in the manufacturing business. Therefore, the sampling perimeter in the study consisted not only of manufacturing companies located in Australia, but also other criteria to determine the specific population from which the sample was drawn. For example, to reduce the confounding effects of diversification, the companies in the sample were limited to those that generated most of their sales from a single industry (Rumelt 1974). The IBIS (2001) Australian companies database (better known as IBISWorld, IBIS is an leading Australian-based industry, company and business environment analysis and information provider) classification of companies into industry satisfied this criteria and thus samples/companies could be taken directly within a single industry from the IBIS (2001) database.
In terms of company size, consideration was only given to midsize and large public organisations. For this study, the midsize company was defined with a cut-off point of sales turnover in excess of AUD5 million. This cut-off point used is arbitrary, but deemed important because investment in information systems, especially those defined in the AMR E-Business model (AMR 2001), requires huge capital and most business applications software nowadays costs at least half-a-million Australian dollars to get them installed, not to mention the continuous maintenance and license costs involved. Companies with less than AUD5 millions would be less likely to commit huge sums of money on information systems. Because of this reason, a general cut-off point of AUD5 million was established as a minimum entry level for this study.

All public companies listed in IBIS (2001) database falling into the categories mentioned above were chosen. The sample companies were then chosen randomly from IBIS (2001) manufacturing companies listing.

Two hundred companies (the name of the 200 companies are listed in appendix A3) were invited to participate in the survey of a total of 490 Australian-based public manufacturing companies listed on IBIS database as of April 2001 (X2100 Manufacturing vol. 7, Apr. 01, IBIS Business Information Pty Ltd).

The non-responding companies were gently provided with a reminder letter four weeks after the initial mailing of survey questionnaires.
Of the two hundred survey questionnaires and reminder letters mailed out, only thirty-seven (37) fully useable questionnaires were returned.

6.2.3 Pre-testing survey instrument

The survey instrument or questionnaires were pre-tested to ensure that the format was clear and logical and that the questions could be answered within half an hour. This time limit was set because, when contacted by phone, most respondents indicated that they would not spend more than half-an-hour in answering questionnaires due to work commitment. Figure 6-1 shows the stages leading to data collection.
The pre-test was conducted with three IT managers and consultants who had worked with international manufacturing outfits in Australia. All of the three respondents had more than four years of working experience in IT strategic planning areas. The survey was administered following the completion of the pilot study for a random sample of 50 Victorian companies in April 2001.
6.2.4 Data collection procedures

For the pilot study, a random sample of 50 companies within the State of Victoria was selected and survey questionnaires were mailed out. The returned questionnaires were reviewed and found to have no major reworks required for the questionnaires. Only eight companies responded to the survey and it was found that the respondents had no problem understanding and answering the questions although concerns were raised about confidentiality of information provided. Because of this concern, some respondents withheld personal and company information by not returning the cover page that contains the name of the participants and company. The survey questionnaire layout was redesigned to include coding for company name within the content pages to avoid unidentifiable questionnaires returns.

No statistical analysis was conducted for the pilot study, as the sample size of eight was too small to justify the analysis. The pilot study was meant to gauge the user-friendliness of the survey instrument and to identify other possible unforeseen trouble spots.

Subsequent to the pilot study and once the survey questionnaire was refined, the final survey was administered by selecting a further random sample of 150 companies within Australia. The initial eight questionnaires were included in the final data analysis.
As discussed in the previous section, the participating companies were taken from manufacturing companies listed in the IBIS (2001) public listed manufacturing companies and the most senior IT managers in the companies are identified as questionnaire respondents. The companies were selected randomly from diverse sub industry group ranging from food to automotive manufacturers.

All the initial data collection was done mainly from a single source: a self report mail survey. The public records from ASX (ABI) on financial performance and demography data were only used initially to shortlist samples that fitted into the selection criteria as discussed previous section.

All measures including strategic intents, competitive advantages obtained and degree of alignment were obtained directly from the survey instrument.

The final data collection started in June 2001, when a refined survey instrument together with a confidentiality agreement (refer appendix A4) and cover letter (refer appendix A5) was mailed to members of top IT management teams in a sample of 150 randomly selected manufacturing companies within Australia. Four weeks later, a second copy of the survey was sent to the non-respondents together with a reminder letter (refer appendix A6). To increase the response rate, we offered several incentives for participation, including a research report or published articles as a result of the survey.
6.2.5 Instrument validations

Most of the measures employed to test the CSA model could normally be validated using reliability tests such as Cronbach's $\alpha$ (that allows one to test if the construct measures are formative) and factor analysis or structural equation modelling techniques (if the construct measures are reflective). The style of measures in the study determines which type of reliability analysis could be performed in order to examine the psychometric properties of the instrument. Cronbach's $\alpha$ could be used to assess the reliability of the managerial view measures and structural equation modelling such as partial least square loadings could be used to assess the extent to which all measures are reflective of the construct to which they have been assigned.

However, because of the small sample size, this study did not use statistical reliability analysis but rather adopted some qualitative instrument validation methods. Two data validation strategies were devised to ensure all questionnaire returns were valid for use before including them for data analysis.

**Data validation strategy 1 – Embedded checks in questionnaire**

The first strategy was to build in embedded checks within the questionnaires to ensure that the respondents knew the subject matter being asked. Questions were included that enquire about concrete information on the IT applications used (based on AMR Research E-Business Model 2001) and the business functions supported. Any paired entries that did not match the IT-applications
and business functions were noted (by cross-checking the software used and business functions performed, as reported in table 7-5) and further investigation by phone, email or personal interviews were conducted.

**Data validation strategy 2 – interview fieldwork**

The second validation strategy involved interview fieldwork with the respondents and current or ex-consultants to the companies. It was realized in the early stage of receiving survey questionnaire returns that the small response rate would present a problem to this research. Smaller sample size rendered a lot of sophisticated quantitative data analysis useless. The focus then was to ensure that the quality and accuracy of the returns are high.

Due to the small sample size, it was possible to conduct selective structured in depth interviews with respondents (via emails, tele-interviews) and discussions with consulting colleagues who were working or had worked in the respondents’ companies, to validate the feedback from the questionnaire returns.

The author first arranged an interview (initially via email, then telephoned when no reply) with the person who responded to the survey questionnaires or the consultant who had worked in the company’s IT strategy projects. The consultant was only used in the absence of acceptance of interview from the responded companies. An interview time, duration and interview format (either tele-interview or face-to-face) was set with each individual. The author did not use the group interview, or the focus group method because the participants
were reluctant to be known by the other participant due to sensitivity of the information presented.

The focus feels that one-to-one interview was appropriate since popular qualitative research methods such as focus group, despite its merit, like one-to-one interview, could come with strong ideological predispositions (Boeree 2000). Because of the dynamics of the groups, it is quite likely that a group might be dominated by a strong personality. The effectiveness of either one-to-one interview or focus groups interview eventually all boiled down to fact that whether the researcher is well trained and open-minded.

The author interviewed the participants based on the ratings given in the returned questionnaire. The 'true' meanings of the questions and scales were discussed and ratings were revised upwards or downwards based on mutually agreed rating.

6.2.6 Ethical considerations

The Swinburne Human Research Ethics Committee has responsibility for ensuring that research within the university has met ethical principles. All research and similar projects within the university are subject to the requirements of the National Statement on Ethical Conduct in Research Involving Humans.
Swinburne University's research policy stipulates that no data may be collected from any human participants without approval from appropriate bodies. To ensure that ethics approval was obtained prior to the start of the data collection process, an application to Swinburne University Human Research Ethics Committee was submitted in early 2002 and was approved few weeks later.

The data collection process is this study followed the University's Guidelines for Ethics Approval of a Research Protocol and the Privacy Act 1988 – Section 14 - Information Privacy Principles.

6.2.7 Data analysis

The following procedures were used to analyse the quantitative data obtained:

- General information and participants profile scanning to ascertain suitability of the returned questionnaires. This information resides in section 1 of the questionnaires. A quick check on entries for questions in section 2 and 3 was conducted to filter out errors and unusable questionnaires.

- The data analysis applied a number of statistical methods. Simple descriptive statistics followed by inferential and correlations statistical analysis were conducted for the returned samples. Descriptive statistics
were used to describe and summarize the characteristics of the samples. The first technique available for this purpose was univariate analysis, which provides information about the distribution of single variables. The variables were evaluated in terms of range and outliers, central tendency and variance. The results of these analyses were used to make decisions about subsequent statistical tests.

- The next level of analysis involved statistical analysis of relationships between dependent variables and independent variables. Multivariate statistical analysis was conducted to examine complex relationship systematically. Pearson correlation coefficient was used to quantify the strength of the linear relationship between ‘A’ variables and the ‘K’ variables.

In this study, the descriptive statistical analysis methods were used to present the general information about the sample, and inference statistical analysis was used to project most likely characteristics of a population and their relationships to various variables in study. These were expressed in statistical significance.

6.2.8 Methodology issues

The research has methodological issues similar to other research that has small sample size and large number of variables. This type of research has two inherent statistical analysis problems. Firstly, the use of simple parametric and
non-parametric statistical significance tests inhibits the use of more powerful statistical analysis methods associated with large samples. Secondly, it was difficult to use conventional multivariate statistical methods to identify patterns in the entire set of measurements.

To counter these problems, one of the strategies used when preparing the survey instrument was to build in safeguards to ensure the measurements obtained were reliable. These were handled by having multiple questions, answered by the same participants that yielded measures for the same item or variable. For example, for the variables that measured IT-business strategic alignment at corporate strategy planning level ('A1' variables) and at business processes/operations level ('A2' variables), several questions were constructed for each measure and asked to be completed by the same respondent in the company.

The first measure (A1) was assessed using three anchored 6-point Likert scale questions (refer table 6-1). The scores for the three questions were averaged to give a single score for A1. Similar approach was used for the second measure (A2). Again, two 6-point Likert scales questions were designed asking the IT manager of the company to rate his organisation level of alignment between IT and business processes and operations (refer table 6-2) and the average score for the two obtained.

'A1' and 'A2', with separate scales, measured different aspects of the alignment; 'A1' for alignment at corporate level and 'A2' for alignment at
business processes/operations level. These scores are the core variables of this study. Averaging the scores from the questions to produce a composite score for each of the strategic alignments would enhance the validity of the result.

Table 6-1: ‘A1’ variables - alignment at corporate strategy level

<table>
<thead>
<tr>
<th></th>
<th>(chaotic)</th>
<th>(misfit)</th>
<th>(mixed)</th>
<th>(threshold)</th>
<th>(harmonious)</th>
<th>(perfect)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q11</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Q12</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Q26</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

Source: Survey questionnaire

Table 6-2: ‘A2’ variables - alignment at processes/operations level

<table>
<thead>
<tr>
<th></th>
<th>(chaotic)</th>
<th>(misfit)</th>
<th>(mixed)</th>
<th>(threshold)</th>
<th>(harmonious)</th>
<th>(perfect)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q25</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Q27</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

Source: Survey questionnaire
6.3 Conclusion

This chapter has described the methodology that was used to investigate the research questions and to put the CSA model into practice. It has given an outline of the research procedures, specifying the selection criteria for the research participants, the survey instrument, pre-testing and pilot study and the data collection procedures. Finally, it has described the data analysis aspects for the two main parts of the investigation: relationships between IT-business strategic alignment at corporate level and business performances; and IT-business strategic alignment at business processes/operations level and business performance.

This chapter also identified a number of methodological constraints mainly due to large number of variables in study and with relatively small response rate and samples. This chapter explained how these methodological constraints were handled and overcome. The next chapter details the data analysis.
Part V. Data analysis and test results
Chapter 7

DATA ANALYSIS AND TEST RESULTS

7.1 Introduction

This chapter details the analysis of data collected by the survey questionnaires.

This chapter serves to:

(1) Provide the some background information about the survey participants (while not disclosing the identify of the participants due to confidentiality agreement);

(2) Investigate various characteristics of the variables in study: A1, A2 and K1 to K10. Where A1 and A2 are independent variables and K1 to K10 are dependent variables; and

(3) Describe and infer statistically the relationships between independent variables (where A1 is the degree of IT-Business alignment at corporate strategy level and A2 is degree of IT-Business alignment at business processes and operations level) and dependent variables (where K1 to K9 are performance measures for competitive advantages and benefits and K10 is performance measure for sustainability).
The following approach and steps were taken to conduct analysis of the data obtained.

(1) Using descriptive statistical methods, to establish the means and distribution and graphical representation in charts, in order to provide an overall sample characteristics.

(2) Correlating the independent variables (A1 and A2) and dependent variables (K1 to K10) using the Pearson correlation analysis.

As mentioned in earlier chapters, one of the key objectives of this study was to develop a new IT-business strategic alignment model. In this case, a CSA model was developed and was tested for its applicability in practice to identify and measure business performances or business resulting from IT-business strategic alignment. Therefore, among the results of the analysis, questions such as ‘what business performances or business outcomes (i.e. competitive advantages and benefits) are impacted by IT-business strategic alignment at corporate strategy and business process/operation planning level?’ were answered.

In addition to this, the two hypotheses (H1) and (H2) were tested during the data analysis process.
7.2 Analysis and results

7.2.1 Industry classification

About 490 Australian-based public manufacturing companies listed on IBIS database as of April 2001 (X2100 Manufacturing, vol. 7, Apr. 01, IBIS Business Information Pty Ltd) were chosen at random from various states in Australia in order to get a fair spread around the states. From these 490 companies, 200 companies were again randomly selected and invited to participate in the survey. Of the 200 invited, only 37 companies responded to the survey. The thirty-seven companies represented in the study broadly fall into various manufacturing industry sub-segments and are classified into industries as shown in table 7-1 (according to IBIS Business Information Pty Ltd industry classification as at April 2001).

<table>
<thead>
<tr>
<th>Sub-industry</th>
<th>No. of Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food, Beverage and Tobacco</td>
<td>4</td>
</tr>
<tr>
<td>Basic Chemical Manufacturing</td>
<td>5</td>
</tr>
<tr>
<td>Aircraft Mfg.</td>
<td>1</td>
</tr>
<tr>
<td>Telecommunication, Broadcasting and Transceiving Equipment</td>
<td>1</td>
</tr>
<tr>
<td>Pharmaceutical and Toiletry</td>
<td>4</td>
</tr>
<tr>
<td>Photographic and Optical Good Mfg.</td>
<td>1</td>
</tr>
<tr>
<td>Dairy Product Manufacturing</td>
<td>1</td>
</tr>
<tr>
<td>Electronic Equipment Manufacturing</td>
<td>2</td>
</tr>
<tr>
<td>Motor Vehicle and Part Manufacturing</td>
<td>5</td>
</tr>
<tr>
<td>Paper and Paper Product Manufacturing in Australia</td>
<td>3</td>
</tr>
<tr>
<td>Petroleum, Coal, Chemical and Associated Product</td>
<td>2</td>
</tr>
<tr>
<td>Fruit and Vegetable Processing in Australia</td>
<td>2</td>
</tr>
<tr>
<td>Tobacco Product Manufacturing</td>
<td>1</td>
</tr>
<tr>
<td>Other manufacturing industry (respondents not known)</td>
<td>5</td>
</tr>
<tr>
<td><strong>TOTAL RESPONDENTS</strong></td>
<td><strong>37</strong></td>
</tr>
</tbody>
</table>

Source: Survey data
7.2.2 Profile of respondents

Of 200 survey questionnaires sent out, 37 responses were received, yielding a response rate of 18.5%. Of the 37 participants who replied to the survey questionnaires, three respondents during the pilot stage did not identify themselves, as they did not submit the cover page detailing company names. This could be due to unwillingness of the respondent to be identified but still wanting to participate in the survey. The three survey questionnaires were used in final analysis anyway, as the name of the company had no bearing on the analysis. Subsequent survey questionnaires were coded with company names in the contents to avoid recurrence of similar incidents.

The respondents completing the questionnaires consisted of mostly IT executives or non-IT executives who had the IT portfolio. These executives were asked about the number of years experience their chief executive officer (CEO) had in the current position. The average number of years an IT manager had been in the position was 3.25 and for the CEO, it was 6.56. This analysis was carried out to ensure that the respondents had stayed long enough in their position and the company to answer the questionnaire. Table 7-2 shows the title of the respondents and table 7-3 describes the respondents’ background.
### Table 7-2: Title of respondents

<table>
<thead>
<tr>
<th>Title</th>
<th>No. of Respondent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chief information officer (CIO)</td>
<td>5</td>
</tr>
<tr>
<td>Vice president - IT</td>
<td>3</td>
</tr>
<tr>
<td>IT director</td>
<td>4</td>
</tr>
<tr>
<td>Non-IT director (e.g. operation, finance)</td>
<td>2</td>
</tr>
<tr>
<td>IT manager/senior manager</td>
<td>15</td>
</tr>
<tr>
<td>Strategic planning manager/senior manager</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
</tr>
<tr>
<td>Total respondents</td>
<td>37</td>
</tr>
</tbody>
</table>

**Source:** Survey data

### Table 7-3: Response analysis

<table>
<thead>
<tr>
<th>Manufacturing Companies</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total companies considered</td>
<td>490</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total companies Invited</td>
<td>200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total companies participated</td>
<td>37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refused to participate or no response</td>
<td>163</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response rate (%)</td>
<td>18.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT managers’ years in present position (mean)</td>
<td>3.25</td>
<td>1.49</td>
<td></td>
</tr>
<tr>
<td>CEO years in position (mean)</td>
<td>6.56</td>
<td>1.51</td>
<td></td>
</tr>
</tbody>
</table>

**Source:** Survey data
7.2.3 Data validation

Questions 13 to 23 in section 2 of the survey questionnaires were designed to find out the type of IT applications used by the respondent’s company.

Based on AMR E-Business Model classification (AMR 2001), the IT applications used by the respondent companies were classified as in table 7-4.

<table>
<thead>
<tr>
<th>Group</th>
<th>Software types</th>
<th>No. of Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Packaged Back-Office Software (eg. ERP -SAP, Oracle)</td>
<td>31</td>
</tr>
<tr>
<td>B</td>
<td>Packaged Relationships Application Software (eg. CRM - Siebel, SAP-CRM, SCM APS -i2, manugistics)</td>
<td>2</td>
</tr>
<tr>
<td>C</td>
<td>Packaged E-Commerce Applications (eg. Internet-based procurement)</td>
<td>5</td>
</tr>
<tr>
<td>D</td>
<td>In-house Developed Software to cater for back-office functions</td>
<td>6</td>
</tr>
<tr>
<td>E</td>
<td>In-house Developed Software to cater for relationship applications</td>
<td>3</td>
</tr>
<tr>
<td>F</td>
<td>In-house Developed Software to cater for e-commerce applications</td>
<td>10</td>
</tr>
<tr>
<td>G</td>
<td>Other softwares not in group A to F (eg. Drafting – CAD/CAM, etc)</td>
<td>12</td>
</tr>
</tbody>
</table>

Note:
- Packaged software = off the shelf applications that requires little programming efforts but rather functionalities configuration to get it started,
- APS = advanced planning system,
- SCM = supply chain management,
- ERP = enterprise resources planning,
- CRM = client relationship management.

Source: Survey data
Not unexpectedly, most companies (numbering 31) used packaged back-office or enterprise resources planning (ERP) software as their backbone corporate system. Companies that did not use packaged back-office software retained either legacy systems that were developed in-house or some hybrid of in-house systems and packaged software.

The analysis of IT applications used was important as it served as part of data validation strategy to ensure that the respondents were not claiming business functions that were not supported by the appropriate IT applications. Question 23 allowed the respondents to name the business process or operations supported by the IT applications. By crosschecking the software used and business functions performed as shown in table 7-5, the validity of the responses was verified. For example, a company that claimed to have technology to manage customer services but had not implemented any software from group B and E would raise doubt about the validity of the survey response, and warranted follow-up questions.
Table 7-5: Business functions supported by software

<table>
<thead>
<tr>
<th>Business Functions</th>
<th>Supporting Software types (grouping as defined in table 7-4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perform Marketing</td>
<td>B, E</td>
</tr>
<tr>
<td>Develop product</td>
<td>G</td>
</tr>
<tr>
<td>Perform sales</td>
<td>A, C, D, F</td>
</tr>
<tr>
<td>Manage customer orders</td>
<td>A, B, D, E</td>
</tr>
<tr>
<td>Procure material/services</td>
<td>A, C, D, F</td>
</tr>
<tr>
<td>Produce products</td>
<td>A, D, G</td>
</tr>
<tr>
<td>Manage logistics/distribution</td>
<td>A, B, D, E</td>
</tr>
<tr>
<td>Manage customer services</td>
<td>B, E</td>
</tr>
</tbody>
</table>

Source: Author

7.2.4 Obtaining and calculating scores for key variables

In the survey questionnaires, questions Q11, Q12 and Q13 were structured to measure the independent variable A1, whilst Q25 and Q27 were structured to measure independent variable A2. The scores for these questions were averaged to give a single score. For example:

\[
\frac{(Q11+Q12+Q26)}{3} = A1\text{ score},
\]

Where Q11, Q12 and Q26 were scores obtained directly from question 11, question 12 and question 26 respectively in the questionnaires.
Similarly, scores were obtained for variable A2 using the formula:

\[
\frac{(Q25+Q27)}{2} = A2 \text{ score,}
\]

Where Q25 and Q27 are scores obtained directly from question 25 and question 27 respectively in the questionnaires.

Unlike independent variables A1 and A2, no manipulations of the survey questions were required to obtain scores for the dependent variables. The scores for dependent variables K1 to K10 were taken directly from the questionnaires from question 24.1 to question 24.10. Each question related directly to a single dependent variable, as shown in table 7-6.
Table 7-6: Allocation of questions variables

<table>
<thead>
<tr>
<th>Survey Question</th>
<th>Dependent Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q24.1</td>
<td>K1 - customer service level</td>
</tr>
<tr>
<td>Q24.2</td>
<td>K2 - employee loyalty</td>
</tr>
<tr>
<td>Q24.3</td>
<td>K3 - time to market</td>
</tr>
<tr>
<td>Q24.4</td>
<td>K4 - product quality</td>
</tr>
<tr>
<td>Q24.5</td>
<td>K5 - product/service leadership</td>
</tr>
<tr>
<td>Q24.6</td>
<td>K6 - brand loyalty</td>
</tr>
<tr>
<td>Q24.7</td>
<td>K7 - revenue</td>
</tr>
<tr>
<td>Q24.8</td>
<td>K8 - cost saving</td>
</tr>
<tr>
<td>Q24.9</td>
<td>K9 - market share</td>
</tr>
<tr>
<td>Q24.10</td>
<td>K10 - sustainability of competitive advantages</td>
</tr>
</tbody>
</table>

**Source: Survey questionnaire**

7.2.5 Descriptive statistics for independent variables

In order to obtain a general view on how respondents rated IT-business strategic alignment strength at corporate strategy planning (A1) and business process/operations (A2) levels, frequency tables were constructed and pie charts were developed. The rating or strategic alignment strength as described in the CSA model and the survey questionnaire was tagged as follows:

- Rating 1: Chaotic
- Rating 2: Misfit
• Rating 3: Mixed
• Rating 4: Threshold
• Rating 5: Harmonious
• Rating 6: Perfect

Using SPSS software, the frequency and percentage of variables A1 and A2 appearing on each scale or rating were obtained as shown in table 7-7.

<table>
<thead>
<tr>
<th>Table 7-7: IT-business strategic alignment strength</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>1  2  3  4  5  6  Total N</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
</tr>
<tr>
<td>A1</td>
</tr>
<tr>
<td>% at rating</td>
</tr>
<tr>
<td>A2</td>
</tr>
<tr>
<td>% at rating</td>
</tr>
</tbody>
</table>

Source: Data analysis

The frequency distribution table 7-7 shows that:

• A total of 51% of the respondents regarded the current level of IT-business strategic alignment at corporate strategy planning phase as below 'threshold' standard in their organisations. However, a smaller number, 27% of the respondents perceived the current level of IT-business strategic alignment at business/operation planning phase as below 'threshold' standard.
Only 14% of the respondents regarded the current level of IT-business strategic alignment at corporate strategy planning stage as being 'harmonious' in their organisations, whilst 41% of respondents perceived the current level of IT-business strategic alignment at business/operation planning phase as 'harmonious' or 'prefect' in their organisations.

The frequencies seems to indicate that the respondents were more satisfied with the standard of strategic alignment at business process/operations than at the corporate strategy planning level.

To measure the central tendency of the responses for the independent variables, again by using the average scores for independent variable A1 and A2, statistics software SPSS calculated the descriptive statistics of the 37 respondents as shown in table 7-8.

<table>
<thead>
<tr>
<th>Table 7-8: Independent variables descriptive statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent Variable</td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>A1 - IT &amp; Corporate Strategy Alignment</td>
</tr>
<tr>
<td>A2 – IT &amp; Process/Operations Alignment</td>
</tr>
<tr>
<td>Valid N (listwise)</td>
</tr>
</tbody>
</table>

Source: Survey data

From table 7-8, it can be seen that the strength of IT-business strategic alignment at corporate strategy level (represented by variable A1), is between a
minimum rating 3 (according to the definition in CSA model, this means IT-business strategic alignment yielded 'mixed' result) and a maximum rating of 5 (IT-business strategic alignment is in 'harmony') with a mean of 3.65, approaching 'threshold' value.

Whereas, the IT-business strategic alignment at business process/operation level represented by variable A2, is between a minimum rating 3 ('mixed') and a maximum rating of 6 ('harmony') with a mean of 4.05, a score above the 'threshold' value.

The mean score of 3.65 for A1 and 4.05 for A2 could be interpreted that the respondents perceived that their IT-business strategic alignment at corporate strategy planning level and at process /operation level are above the 'mixed' or 'above average' standard.

7.2.6 Descriptive statistics for dependent variables

To understand respondents' perceptions on how deeply the business performances were impacted by IT-business strategic alignment strength at corporate strategy planning (A1) level and business process/operations (A2) level, frequency tables were constructed.

Using SPSS software, score frequencies for each K variable were compiled (refer to table 7-9).
### Table 7-9: Effect of alignment on business performance indicators

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Total N</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>K1 - Customer Service</strong></td>
<td>0</td>
<td>3</td>
<td>11</td>
<td>21</td>
<td>2</td>
<td>0</td>
<td>37</td>
</tr>
<tr>
<td>% at rating</td>
<td>0.0</td>
<td>8.1</td>
<td>29.7</td>
<td>56.8</td>
<td>5.4</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td><strong>K2 – Employee Loyalty</strong></td>
<td>8</td>
<td>16</td>
<td>11</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>37</td>
</tr>
<tr>
<td>% at rating</td>
<td>21.6</td>
<td>43.2</td>
<td>29.7</td>
<td>5.4</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td><strong>K3 –Time to Market</strong></td>
<td>6</td>
<td>10</td>
<td>9</td>
<td>9</td>
<td>3</td>
<td>0</td>
<td>37</td>
</tr>
<tr>
<td>% at rating</td>
<td>16.2</td>
<td>27.0</td>
<td>24.3</td>
<td>24.3</td>
<td>8.1</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td><strong>K4 – Product Quality</strong></td>
<td>0</td>
<td>1</td>
<td>11</td>
<td>15</td>
<td>10</td>
<td>0</td>
<td>37</td>
</tr>
<tr>
<td>% at rating</td>
<td>0.0</td>
<td>2.7</td>
<td>29.7</td>
<td>40.5</td>
<td>27.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td><strong>K5 – Prod/Sev. Leaders.</strong></td>
<td>1</td>
<td>10</td>
<td>14</td>
<td>11</td>
<td>1</td>
<td>0</td>
<td>37</td>
</tr>
<tr>
<td>% at rating</td>
<td>2.7</td>
<td>27.0</td>
<td>37.8</td>
<td>29.7</td>
<td>2.7</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td><strong>K6 – Brand Loyalty</strong></td>
<td>13</td>
<td>16</td>
<td>6</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>37</td>
</tr>
<tr>
<td>% at rating</td>
<td>35.1</td>
<td>43.2</td>
<td>16.2</td>
<td>5.4</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td><strong>K7 – Revenue Gain</strong></td>
<td>1</td>
<td>8</td>
<td>11</td>
<td>17</td>
<td>0</td>
<td>0</td>
<td>37</td>
</tr>
<tr>
<td>% at rating</td>
<td>2.7</td>
<td>21.6</td>
<td>29.7</td>
<td>45.9</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td><strong>K8 – Cost Saving</strong></td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>13</td>
<td>12</td>
<td>8</td>
<td>37</td>
</tr>
<tr>
<td>% at rating</td>
<td>0.0</td>
<td>2.7</td>
<td>8.1</td>
<td>35.1</td>
<td>32.4</td>
<td>21.6</td>
<td></td>
</tr>
<tr>
<td><strong>K9 – Market Share</strong></td>
<td>12</td>
<td>16</td>
<td>5</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>37</td>
</tr>
<tr>
<td>% at rating</td>
<td>32.4</td>
<td>43.2</td>
<td>13.5</td>
<td>10.8</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td><strong>K10 - Sustainability</strong></td>
<td>6</td>
<td>4</td>
<td>12</td>
<td>8</td>
<td>4</td>
<td>3</td>
<td>37</td>
</tr>
<tr>
<td>% at rating</td>
<td>16.2</td>
<td>10.8</td>
<td>32.4</td>
<td>21.6</td>
<td>10.8</td>
<td>8.1</td>
<td></td>
</tr>
</tbody>
</table>

**Source: Survey data**

From the total score distributions (table 7-9), it is seen that:
• More than 40% of respondents thought IT-business strategic alignment could help them achieve better customer service (K1), product quality (K4), product/service leadership (K5), revenue gain (K7) and cost saving (K8);

• More than 50% said IT-business strategic alignment had no effect on employee loyalty (K2), time to market (K3), brand loyalty (K6), market share (K9) or on sustainability of competitive advantages or benefits obtained (K10).

To measure the central tendency and the spread of the responses for the dependent variables from K1 to K10, again using SPSS software, the distribution of the 37 respondents’ responses are shown in table 7-10 below.

Table 7-10: Dependent variables descriptive statistics

<table>
<thead>
<tr>
<th>Dependent variables</th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Std Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>K1 - Customer Services</td>
<td>37</td>
<td>2</td>
<td>5</td>
<td>3.59</td>
<td>.72</td>
</tr>
<tr>
<td>K2 - Employee Loyalty</td>
<td>37</td>
<td>1</td>
<td>4</td>
<td>2.19</td>
<td>.84</td>
</tr>
<tr>
<td>K3 - Time to Market</td>
<td>37</td>
<td>1</td>
<td>5</td>
<td>2.81</td>
<td>1.22</td>
</tr>
<tr>
<td>K4 - Product Quality</td>
<td>37</td>
<td>2</td>
<td>5</td>
<td>3.92</td>
<td>.83</td>
</tr>
<tr>
<td>K5 - Prod/Service Leadership</td>
<td>37</td>
<td>1</td>
<td>5</td>
<td>3.03</td>
<td>.90</td>
</tr>
<tr>
<td>K6 - Brand Loyalty</td>
<td>37</td>
<td>1</td>
<td>4</td>
<td>1.92</td>
<td>.86</td>
</tr>
<tr>
<td>K7 - Revenue Gain</td>
<td>37</td>
<td>1</td>
<td>4</td>
<td>3.19</td>
<td>.88</td>
</tr>
<tr>
<td>K8 - Cost Saving</td>
<td>37</td>
<td>2</td>
<td>6</td>
<td>4.62</td>
<td>1.01</td>
</tr>
<tr>
<td>K9 - Market Share</td>
<td>37</td>
<td>1</td>
<td>4</td>
<td>2.03</td>
<td>.96</td>
</tr>
<tr>
<td>K10 - Sustainability</td>
<td>37</td>
<td>1</td>
<td>6</td>
<td>3.24</td>
<td>1.46</td>
</tr>
</tbody>
</table>

Valid N (listwise) 37

Source: Survey data
From table 7-10, it can be seen that the mean for K1 (customer services), K4 (product quality), K5 (product/service leadership), K7 (revenue gain), K8 (cost saving) and K10 (sustainability of competitive advantages) were accorded above average (i.e. higher than rating 3) scores.

From these figures, most respondents were seen to be of the view that IT-business strategic alignment could bring above average benefits to business performance in the area of customer service, (K1 – mean score 3.59), product quality (K4 – mean score 3.92), product & service leadership (K5 – mean score 3.03), revenue gain (K7 – mean score 3.19), cost saving (K8 – mean score 4.62) and sustainability of competitive advantages (K10 – mean score 3.24). K10 has an exceptionally wide spread (standard deviation of 1.46) distribution which might indicate that respondents have extreme diverse views on the impact on IT-business strategic alignment on business performances.

7.2.7 Data examination and data cleansing consideration

Before proceeding with the correlation analysis, the following data examination and data cleansing procedures were applied:

(1) Test of normality: ideally, either a visual examination using histogram or Kolmogorov-Smirnov or Shapiro-Wilks' W test should be conducted to find out if data are in fact normally distributed. However, due to the small sample size, the end-results would not be conclusive even if it turned out to be that data were
not normally distributed. Therefore, assumption has been made that the data were normally distributed.

(2) Outlier effect: to identify outliers, commonly used methods such as scatter plot or standard deviation within the range of negative and positive value of 2 could be used. However, this study did not treat extreme cases as outliers or 'random error'. In this study, all data collected were considered valid as they were examined individually and any extraordinary items were followed-up by interviews to ensure that the outlier was not a random error but rather 'extreme' value.

(3) Non-homogenous group correlations analysis – cluster group analysis was not conducted because homogeneity was assured during sample selection process where companies within one industry with similar size were chosen. This study therefore assumed the data was homogenous.

(4) Missing data – again similar to point (2) above, commonly used missing data methods such as casewise, pairwise missing data deletion or mean substitution method were not conducted or deemed necessary as all samples were checked individually to ensure there was no missing data in any variable.

(5) Reliability and item analysis: reliability and item analysis methods are commonly used to construct measurement scales, to improve existing scales, and to provide an estimate the reliability of scales already in use. With a small sample size, reliability and item analysis were not considered appropriate. This
study went a long way to supplement this shortcoming toward improving the reliability through detailed individual questionnaire scrutiny and followed up, where necessary, by interviews with each individual company to ensure consistent understanding of the questions and responses.

7.2.8 Correlationship analysis

To test hypothesis H1 and H2 (where hypothesis H1 postulated that there is a direct positive relationship between IT-business strategic alignment at corporate strategy planning level and business performances and hypothesis H2 postulated that there is a direct positive relationship between IT-business strategic alignment at business processes/operations planning level and business performances), the correlation between the dependent and independent variables was analysed using the one-tailed Pearson method (Webster 1995).

Table 7-11 shows the results of the analysis.
Table 7-11: Correlations among the A and K variables (one-tailed Pearson)

<table>
<thead>
<tr>
<th></th>
<th>K1 CUSTOMER SERVICES</th>
<th>K2 EMPLOYEE LOYALTY</th>
<th>K3 TIME TO MARKET</th>
<th>K4 PRODUCT QUALITY</th>
<th>K5 PROD/SERVIC E LEADERSHIP</th>
<th>K6 BRAND LOYALTY</th>
<th>K7 REVENUE GAIN</th>
<th>K8 COST SAVING</th>
<th>K9 MARKET SHARE</th>
<th>K10 SUSTAINABILITY</th>
<th>A1 Mean IT &amp; Corporation Strategy Linkage</th>
<th>A2 Mean IT &amp; Operations Linkage</th>
</tr>
</thead>
<tbody>
<tr>
<td>K1 CUSTOMER SERVICES</td>
<td>Correlation</td>
<td>.174</td>
<td>-.309</td>
<td>.036</td>
<td>.060</td>
<td>.302</td>
<td>-.313</td>
<td>-.026</td>
<td>.296</td>
<td>.043</td>
<td>.369*</td>
<td>.080</td>
</tr>
<tr>
<td>Sig (1-tailed)</td>
<td>.151</td>
<td>.032</td>
<td>.416</td>
<td>.362</td>
<td>.035</td>
<td>.030</td>
<td>.440</td>
<td>.037</td>
<td>.400</td>
<td>.031</td>
<td>.320</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>37</td>
<td>37</td>
<td>37</td>
<td>37</td>
<td>37</td>
<td>37</td>
<td>37</td>
<td>37</td>
<td>37</td>
<td>37</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>K2 EMPLOYEE LOYALTY</td>
<td>Correlation</td>
<td>1.000</td>
<td>.063</td>
<td>-.176</td>
<td>.250</td>
<td>.289</td>
<td>-.125</td>
<td>-.239</td>
<td>.303</td>
<td>.119</td>
<td>.094</td>
<td>.212</td>
</tr>
<tr>
<td>Sig (1-tailed)</td>
<td>356</td>
<td>149</td>
<td>.068</td>
<td>.042</td>
<td>231</td>
<td>.077</td>
<td>.034</td>
<td>.241</td>
<td>.290</td>
<td>.104</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>37</td>
<td>37</td>
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<td>37</td>
<td>37</td>
<td>37</td>
<td>37</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>K3 - TIME TO MARKET</td>
<td>Correlation</td>
<td>1.000</td>
<td>-.208</td>
<td>.005</td>
<td>-.094</td>
<td>.034</td>
<td>.076</td>
<td>.218</td>
<td>.136</td>
<td>.261</td>
<td>-.199</td>
<td></td>
</tr>
<tr>
<td>Sig (1-tailed)</td>
<td>109</td>
<td>.469</td>
<td>.290</td>
<td>.420</td>
<td>.328</td>
<td>.097</td>
<td>.212</td>
<td>.059</td>
<td>.119</td>
<td></td>
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<tr>
<td>N</td>
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<td>37</td>
<td>37</td>
<td>37</td>
<td>37</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>K4 PRODUCT QUALITY</td>
<td>Correlation</td>
<td>1.000</td>
<td>-.221</td>
<td>.029</td>
<td>-.017</td>
<td>.460</td>
<td>.003</td>
<td>.131</td>
<td>.210</td>
<td>.352</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig (1-tailed)</td>
<td>.044</td>
<td>.431</td>
<td>.461</td>
<td>.002</td>
<td>.463</td>
<td>.219</td>
<td>.166</td>
<td>.114</td>
<td>.105</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>37</td>
<td>37</td>
<td>37</td>
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<td>37</td>
<td>37</td>
<td>37</td>
<td>37</td>
<td>37</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>K5 PROD/SERVIC E LEADERSHIP</td>
<td>Correlation</td>
<td>1.000</td>
<td>.075</td>
<td>-.113</td>
<td>-.264</td>
<td>.064</td>
<td>.166</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig (1-tailed)</td>
<td>.330</td>
<td>.253</td>
<td>.057</td>
<td>.354</td>
<td>.136</td>
<td>.251</td>
<td>.269</td>
<td></td>
<td></td>
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<tr>
<td>K6 - BRAND LOYALTY</td>
<td>Correlation</td>
<td>1.000</td>
<td>.058</td>
<td>-.132</td>
<td>.743</td>
<td>.050</td>
<td>.020</td>
<td>.024</td>
<td>.043</td>
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<tr>
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<td>367</td>
<td>218</td>
<td>.000</td>
<td>.384</td>
<td>.454</td>
<td>.443</td>
<td>.159</td>
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<td>Correlation</td>
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<td>.020</td>
<td>.225</td>
<td>-.167</td>
<td>-.010</td>
<td>-.159</td>
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<td>.090</td>
<td>.162</td>
<td>.476</td>
<td>.174</td>
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<tr>
<td>K8 - COST SAVING</td>
<td>Correlation</td>
<td>1.000</td>
<td>.018</td>
<td>.196</td>
<td>-.026</td>
<td>.008</td>
<td>.152</td>
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<tr>
<td>Sig (1-tailed)</td>
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<td>.123</td>
<td>.440</td>
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<tr>
<td>K9 - MARKET SHARE</td>
<td>Correlation</td>
<td>1.000</td>
<td>-.104</td>
<td>.166</td>
<td>-.152</td>
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<tr>
<td>Sig (1-tailed)</td>
<td>.270</td>
<td>.136</td>
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<td>.185</td>
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<tr>
<td>K10 SUSTAINABILITY</td>
<td>K1 CUSTOMER SERVICES</td>
<td>K2 EMPLOYEE LOYALTY</td>
<td>K3 TIME TO MARKET</td>
<td>K4 PRODUCT QUALITY</td>
<td>K5 PROD/SERVICE LEADERSHIP</td>
<td>K6 BRAND LOYALTY</td>
<td>K7 REVENUE GAIN</td>
<td>K8 COST SAVING</td>
<td>K9 MARKET SHARE</td>
<td>K10 SUSTAINABILITY</td>
<td>A1 Mean IT &amp; Corporation Strategy Linkage</td>
<td>A2 Mean IT &amp; Operations Linkage</td>
</tr>
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<td>-------------------</td>
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<td></td>
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<td>1.000</td>
<td>.136</td>
<td>.306*</td>
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<tr>
<td>Sig (1-tailed)</td>
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</tbody>
</table>

| A1 - Mean IT & Corporation Strategy Linkage | Pearson Correlation |                     |                     |                   |                          |                 |                |                |                 | 1.000             | .213                           |                   |
| Sig (1-tailed)     |                     |                     |                   |                   |                          |                 |                |                |                 |                   |                               |                               |
| N                  | 37                  | 37                  | 37                | 37                | 37                       | 37              | 37             | 37             | 37              | 37                |                               | .103                           |

| A2 - Mean IT & Operations Linkage | Pearson Correlation |                     |                     |                   |                          |                 |                |                |                 | 1.000             |                   |                                   |
| Sig (1-tailed)     |                     |                     |                   |                   |                          |                 |                |                |                 |                   |                               |                               |
| N                  | 37                  | 37                  | 37                | 37                | 37                       | 37              | 37             | 37             | 37              | 37                |                               |                               |

* Correlation is significant at the 0.05 level (1-tailed).

Source: Survey data
NOTE

Page 164 omitted from both the print and digital thesis.
It was decided earlier that hypothesis may be regarded as supported if the scores were significantly different in the hypothesized direction at the 5 per cent significance level.

For hypothesis H1, table 7-11 indicated that only K1 (customer services) has a significant correlation with A1 (IT-business strategic alignment at corporate strategy level). All other variables, from K2 to K10 were found to have no strong direct relationships with A1.

For hypothesis H2, table 7-11 indicated that both K4 (product quality) and K10 (sustainability of competitive advantages) have a significant correlation (at 0.05 level) with A2 (IT-business strategic alignment at business processes/operations level). Variables K1, K2, K3, K5, K6, K7, K8 and K9 were found to have no strong direct relationship with A2.

It should be pointed out that the above observations obtained could be due to chance fluctuation (correlation due to pure chance). Bonferonni’s error might occur since many correlations were tested. This study undertook to test two hypotheses but there were actually twenty tests conducted (two independent variables times ten dependent variables equate to twenty tests) and by definition, a coefficient significant at the 0.05 level could potentially occur by chance once in every 20 coefficients. There is no ‘automatic’ way to weed out the ‘true’ correlations. Ideally, Bonferonni test with alpha level adjusted downward to consider chance capitalisation should be used. However, because of the small sample size, reducing the chance on type one errors using
Bonferonni's method would inevitably increase the chance of a type two error. This research therefore did not use Bonferonni test but rather made certain practical assumptions related to this limitation and these are discussed in the following sections.

7.2.9 Informal observation

During the data validation process, the author conducted one-to-one structured in-depth interviews with the senior IT manager or the consultant involved in the companies. During the process, some key questions were asked based on the items in the survey instruments. Presented below are the key observations/responses relevant to this research:

- A majority of the participants (34 out of 37 companies) accepted that the selected key variables (competitive advantages and benefits) covered most if not all the key business success factors pursued by their companies.

- A majority of the participants (30 out of 37 companies) were well aware that IT and business strategic alignment is one of the key components for their business success.

- Most companies (23 out of 37 companies) thought that IT should be embedded into the corporate strategy planning process more efficiently.
• A majority of the participants (32 out of 37 companies) have some enterprise resources planning (ERP) system already installed or at the implementation stage. The commonly cited benefits that an ERP system could bring include driving operation efficiencies (i.e. cost savings, improving revenue, customer services, product quality) through business process re-engineering or supply chain optimization.

• The ERP programs are mostly initiated (28 out of 37 companies) at board level and often conceived as part of corporate strategy initiatives.

• The interviews also highlighted that even within a ‘single’ manufacturing industry, the business objectives are quite diverse. For example, while most manufacturers shared the same business drivers such as product quality and cost competitiveness, others such as car manufacturers are especially obsessed with cost competitiveness, while pharmaceutical companies are brand loyalty focused. This gives rise to the suspicion that further industry segmentation may be necessary for more homogenous samples.

The structured interviews not only ensured the quality and the accuracy of the data collected, they also provided a likely scenario about the outcomes of this study. In this case, these observations fit well with the quantitative data analysis results as shown in the previous section.
7.2.10 Assumptions, limitations and practical considerations

As with any other research, there are various limitations of this study. Certain assumptions have been made on data analysis and considerations were made to overcome some of the limitations. These are discussed below:

(1) Relationship between a pair of independent and dependent variables – the analysis on the relationship between the independent variable A1 or A2 to a dependent variable in isolation without the influence of other variables was not conducted. For example, analysing how A1 (IT-business strategic alignment at corporate planning level) has an impact on K1 (customer satisfaction) if K3 (time to market) factor was ignored. In the author's view, analysing this type of relationship yields no benefits to this study, as all variables, in practice, would have influence on the other. For example, a high score in employee loyalty would have direct influence on improved customer satisfaction and this phenomenon is not caused by IT-business strategic alignment alone.

(2) The use of strategic enterprise management (SEM) software - section 1 of the survey questionnaires is designed to find out how strategic enterprise management software has an influence on IT-business strategic alignment practice. However, all respondents bar one indicated that they did not use strategic enterprise management software in their strategic management process. Because of this, this study assumed that SEM does not play any key role in IT-business strategic alignment practice.
(3) The use of multiple linear regression statistical method - many basic assumptions of the use of multiple linear regression methods were also made in this study. For example:

- Assumption of linearity – the relationship between variables is assumed to be linear although in practice this assumption could not be confirmed.

- Assumption of normality - assumed that the multiple regression is distributed normally, in other words, it follows normal distribution. To ensure that this assumption was correct for the present study, major variables of interest were reviewed before drawing this conclusion. Histograms were constructed to inspect the distribution shape.

- Assumption of inherent relationships between variables - another limitation of all regression techniques - is that it assumes there are always relationships between variables. In practice, the underlying causal mechanism is always not clear. In the present correlation research, however, every effort had been made to rule out any alternative causal explanations, including the use of multivariate analysis, as discussed in point (1) above.

- Multicollinearity and matrix Ill-conditioning: this is a common problem in correlation analyses when there are many variables involved. There are risks where variables are completely redundant. But care was taken to
make sure this problem did not exist. Variables that yielded the same outcomes were combined and the means were obtained for use as one variable; for example, questions 25 and 27, that touched on strength of alignment between information technology and business strategy.

- **Outliers**: outliers are extreme cases that could seriously bias the results by dragging the regression line in a particular direction and, therefore, lead to biased regression coefficients, were excluded. As mentioned in an earlier section, the minimisation the outliers’ effect, was done, by carefully reviewing all data and excluding or correcting any single extreme case that could yield a completely different set of results.

(4) The use of simple descriptive statistics - this research used straightforward simple statistical methods generally used in business environment to uncover some major business performances impact by IT-business strategic alignment and test the two hypotheses H1 and H2. The methods were intentionally chosen to reflect the common practices used –which is one of the main objectives of this research, namely ‘to develop an IT-business strategic alignment model (CSA model) that is simple and practical to use by business users for strategic alignment measurement and decision making’. However, the simplified statistical approaches forgo the use of more powerful statistical methods and, hence, could potentially leave some stones unturned.

(5) The CSA model was built with the aim of helping IT managers to predict the outcomes of IT-business alignment with greater accuracy. Even though
considerable care has been taken during the sample selection process to make sure that the data collected were homogenous, the data collected somehow was still quite cross-sectional. The fact that IT-business strategic alignments do evolve over time added another dimension of difficulty in capturing representative data.

(6) The choice of the terms used for measuring IT-business strategic alignment - the terms used to describe the degree of IT-business linkage such as 'chaotic' to 'perfect', has some degree of social desirability which could be the causes of why so few companies responded with rating to the lower end of the scale.

(7) Small sample size – perhaps one of the most important shortcomings of the research, is that a sample size of 37 is too small for any meaningful industry analysis. The mean alignment scores of 3.65 and 4.05 on a 6-point scale could be due to the averaging effects of small samples. Also, small sample size hindered the use of more powerful and fact-revising statistical methods and, thus, in itself raised the question of meaningfulness of the data analysis. This shortcoming, therefore, confirmed the author's view that CSA model is only useful in any practical sense if used to measure strategic alignment for a single company over time. The other alternative to overcome small sample size is to collect much bigger samples or to offer much better incentives to attract better responses – which are something well beyond the financial means of the author.
7.3 Conclusion

This chapter discussed the general profile of the respondents and data analysis process for the survey questionnaire data captured on the variables in the conceptual framework/CSA model. Using simple descriptive and correlation statistical methods commonly used in the business, the results showing the strength of IT-business strategic alignment of the sample companies and the effects of IT-business strategic alignment on certain business performances were obtained and discussed. The data analysis results also show that

- for hypothesis H1, there was no evidence to support this hypothesis except for variable K1 (customer services), which has a significant correlation with A1 (IT-business strategic alignment at corporate strategy level); and

- for hypothesis H2, there was definitely evidence to support this hypothesis for variables K4 (product quality) and K10 (sustainability of competitive advantages) only.

The limitations faced by the choice of statistical methods used were discussed at the end of this section. Data analysis assumptions made and countermeasures taken to overcome some of the limitations were discussed.
The following section builds on the data analysis results obtained in this section by discussing the key findings in further detail.
Part VI. Conclusion and implications
Chapter 8

CONCLUSIONS

8.1 Introduction

The core objective of this research was to develop an IT-business strategic alignment measurement model (the CSA model) and its associated measurement methodology that is practical and easy to use by the business for better decision making in the realm of IT-business strategic alignment.

Due to the uniqueness of IT-business strategic alignment practice in each company, the CSA model was mainly developed to measure IT-business strategic alignment effectiveness for an individual company over time.

Nonetheless, the author feels that the CSA model could also be used to answer one of the central questions in IT-business strategic alignment, namely, whether the extent of IT-business strategic alignment at corporate level and business operation level were predictors of a company’s competitiveness.

The research was exploratory in that no previous empirical studies have investigated a company by examining the variables as described in the CSA model. Therefore, both research questions and hypotheses were developed in the present study.
The first research question dealt with finding out the overall strength of IT-business strategic alignment at corporate strategy planning and business process/operations planning level in a particular industry – in this case, Australian manufacturing industry.

The second question dealt with finding out the contribution of IT-business strategic alignment to business performance, as represented by identified criteria.

Two hypotheses postulating that IT-business strategic alignment has positive relationships with business performance were tested.

Besides consolidating the findings for the above questions and hypotheses, the purposes of this chapter are also to bring together the empirical findings and interpret their relevance both to the theory and practice of IT-business strategy management.

Sections below present some conclusions about the use of the CSA model, the research questions and hypotheses, and address explicitly the contributions to knowledge which this research has provided and implication of this research for IT-business strategy management theory and practice. The final section discusses opportunities for further research.
8.2 Conclusions for the research questions and hypotheses

8.2.1 Strength of IT-business strategic alignment

In answer to the first and second research questions that dealt with the overall strength of IT-business strategic alignment at corporate strategy planning and business process/operations planning level in Australian manufacturing industry, it was found that:

(1) More than half (51%) of the respondents felt that the current level of IT-business strategic alignment at corporate strategy planning phase was below ‘threshold’ standard in their organisations and only a little over 14% of the respondents gave it a ‘harmonious’ rating. Assuming that the sample represents Australian industry as a whole, this suggests that IT-business strategic alignment at corporate strategy planning stage is incoherent. There are many scenarios that may cause the IT-business misalignment, including the business strategic planning exercise not entailing IT planning or the IT being designed into the corporate strategy but strategy and IT projects being poorly implemented.

(2) On the other hand, only 27% of the respondents perceived the current level of IT-business strategic alignment at business processes/operations planning phase as inadequate or worse than ‘chaotic’, and about two-fifth (41%) of the respondents gave that alignment a rating above the ‘harmonious’ level. The frequency distribution seems to indicate that respondents agreed that the IT-business strategic alignment at business process/operations is adequate.
Apparently, for some reasons, maybe due to the fact that a typical IT managers' job portfolio has direct responsibilities for all IT projects below corporate planning level, managers are rather happy with their IT initiatives at business process/operations planning level compared with the IT initiatives at corporate strategy planning level.

In this case, the CSA model may be used in measuring the strategic alignment level for an industry. However, the CSA model could not be used to explain the reasons for the strength of strategic alignment for an industry as there are other variables such as the IT life cycle and leadership qualities that must be included in the CSA model to make sense out of the measures. To measure these additional variables, sensitive and subjective data are required and these data are normally difficult to obtain in external research. This is one of the reasons why the CSA model is more useful for analysis of a company over time, instead of an industry.

8.2.2 Contributions of strategic alignment to business performance

To answer the third question that dealt with finding out the contributions of IT-business strategic alignment to business performance as indicated by specified criteria. It was found that:

(1) More than 40% of the respondents thought IT could help them achieve better customer service (K1), product quality (K4), product/service leadership (K5), revenue gain (K7) and cost saving (K8). On the other hand, more than 50% said IT had no effect on employee loyalty (K2), time to market (K3), brand
loyalty (K6), market share (K9) or on sustainability of competitive advantages or benefits obtained (K10).

(2) When central tendency was analysed, the mean for K1 (customer services), K4 (product quality), K5 (product/service leadership), K7 (revenue gain), K8 (cost saving) and K10 (sustainability of competitive advantages) were accorded above average (i.e. higher than rating 3) scores. Strategic alignment impact on K10 is questionable due to its exceptional widely spread (standard deviation of 1.46) distribution. This could be an indication that respondents have extremely diverse views on the impact on IT-business strategic alignment on business performances. As such, it was deduced that strategic alignment does not impact positively on K10.

Table 8-1 summarises key variables that were positively influenced by IT-business strategic alignment.
Table 8-1: Variables positively impacted by alignment

<table>
<thead>
<tr>
<th>Business performances indicators/criteria</th>
<th>Type of influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>K1 - Customer Services</td>
<td>Positive effect</td>
</tr>
<tr>
<td>K2 - Employee Loyalty</td>
<td>No effect</td>
</tr>
<tr>
<td>K3 - Time to Market</td>
<td>No effect</td>
</tr>
<tr>
<td>K4 - Product Quality</td>
<td>Positive effect</td>
</tr>
<tr>
<td>K5 - Prod/Service Leadership</td>
<td>Positive effect</td>
</tr>
<tr>
<td>K6 - Brand Loyalty</td>
<td>No effect</td>
</tr>
<tr>
<td>K7 - Revenue Gain</td>
<td>Positive effect</td>
</tr>
<tr>
<td>K8 - Cost Saving</td>
<td>Positive effect</td>
</tr>
<tr>
<td>K9 - Market Share</td>
<td>No effect</td>
</tr>
<tr>
<td>K10 - Sustainability</td>
<td>No effect</td>
</tr>
</tbody>
</table>

Source: Author

In this case, CSA model is useful in measuring the impact of strategic alignment on business performance indicators. One can simply conclude that the CSA model could be used to show what variables (business performances or competitive advantages) are positively impacted as a result of IT-business strategic alignment for an industry as a whole. However, to explain whether there are positive relationships between IT-business strategic alignment and business performance measures, one needs to test the hypotheses as discussed below.
8.2.3 Results of hypotheses testing

The final research question and one of the key research objectives was to determine whether there was direct positive relationship between the degree of IT-business strategic alignment and business performance. This research objective was posited as two hypotheses, namely H1 and H2.

To test these hypotheses, correlation analyses between A and K variables were conducted. It was found that K1 variable (customer service) has a direct positive relationship with IT-business strategic alignment at corporate strategy level (A1); and, K4 (product quality) and K10 (competitive advantages sustainability) variables were directly related with IT-business strategic alignment at the processes/operations level (A2).

All other variables, K2, K3, K5, K6, K7, K8 and K9 were not correlated to IT-business strategic alignment. Table 8-2 below summarises the hypotheses tests.
Table 8-2: Summary of hypothesis testing

<table>
<thead>
<tr>
<th>Hypothesis H1</th>
<th>Hypothesis H2</th>
</tr>
</thead>
<tbody>
<tr>
<td>K1 - Customer Services</td>
<td>Supported</td>
</tr>
<tr>
<td>K2 - Employee Loyalty</td>
<td>Not Supported</td>
</tr>
<tr>
<td>K3 - Time to Market</td>
<td>Not Supported</td>
</tr>
<tr>
<td>K4 - Product Quality</td>
<td>Not Supported</td>
</tr>
<tr>
<td>K5 - Prd/Serv. Leadership</td>
<td>Not Supported</td>
</tr>
<tr>
<td>K6 - Brand Loyalty</td>
<td>Not Supported</td>
</tr>
<tr>
<td>K7 - Revenue Gain</td>
<td>Not Supported</td>
</tr>
<tr>
<td>K8 - Cost Saving</td>
<td>Not Supported</td>
</tr>
<tr>
<td>K9 - Market Share</td>
<td>Not Supported</td>
</tr>
<tr>
<td>K10 - Sustainability</td>
<td>Supported</td>
</tr>
</tbody>
</table>

Source: Data analysis

The hypotheses testing results confirmed again that the CSA model has a shortcoming when used to explain industry-wide IT-business relationships. The CSA model is useful when used purely to measure the correlations between variables but it could not be used to explain the reasons why certain business performances are impacted by IT-business strategic alignment at certain business planning levels. Obviously, all companies are unique, as other variables such as the strategic goals and leadership vision among companies are so different that deriving common underlying factors to explain a specific set of business performance outcomes for an industry is meaningless if not impossible. This is another reason why the CSA model is probably more useful for analysis of a company instead of an industry.
Combining the findings in the research questions and the hypotheses test results shows that

- At corporate strategy planning level, even though most respondents thought that IT could improve on customer service (K1), product quality (K4), product/service leadership (K5), revenue gain (K7) and cost saving (K8), the correlation postulated that, with the exception of customer service (K1), there was no evidence to suggest that tighter integration of strategy and IT planning would yield higher performance outcomes for product quality (K4), product/service leadership (K5), revenue gain (K7) and cost saving (K8).

- Similarly, at business processes/operations level, with the exception of product quality (K4), there was no support to suggest a higher degree of IT-business strategic alignment or tighter integration between IT and business processes/operations would bring higher business performance outcome for customer service (K1), product/service leadership (K5), revenue gain (K7) and cost saving (K8) even though most respondent feel IT-business strategic alignment contributes to better (K1), (K5), (K7) and (K8) performance outcomes.

8.3 Conclusion

The findings and conclusions above shows that although management practitioners and researchers have frequently argued that IT-business strategic
alignment enables organisations to realise better performance outcomes (described in the CSA model as variables K1 to K10), the results of the present analyses confirm that not all the performance outcomes are related to IT-business strategic alignment. From this, one could conclude that organisations that use IT to provide greater support for business strategy will not always achieve all the desired performance outcomes. This comes back to the key point that the author has raised all along, that IT-business strategic alignment is unique to a company and any study on this area of practice has to recognise this fact and design the research accordingly.

The next chapter presents the contributions and implications of the present study.
Chapter 9

CONTRIBUTIONS AND IMPLICATIONS

9.1 Contributions of this research

This research was initiated to achieve several objectives and among them were the following:

(1) Building of a simple and practical consolidated strategic alignment (CSA) model for use by businesses; and

(2) Answering key research questions about IT-business strategic alignment impacts on business performance and testing hypotheses that postulated that IT-business strategic alignment is correlated to business performance outcomes.

The conclusions presented in the previous sections have implicitly shown that this thesis has made a number of contributions to knowledge. The aim of this section is to state these contributions more explicitly.

First, this research has provided new evidence about the determinants of a company's IT-business strategic alignment relationships with performance outcomes. It has developed a comprehensive framework, the CSA model,
acknowledging the multidimensional and complex nature of organisational reality.

Second, while not disputing that the suggestions of management theorists who claimed that IT is an important element in the strategy management approach of an organisation, this research demonstrated empirically that for large manufacturing companies in Australia pursuing a better strategic alignment between the development of IT and business strategies, the emphasis on performance outcome was somehow vastly different. The different emphasis on performance outcomes may be originated at corporate strategy planning stage and is unique to each company. This research confirms that researching IT-business strategic alignment relationships has to be done at a company level and any attempts to research a group of companies even within a seemingly homogeneous backgrounds would be inconclusive.

Third, perhaps the most important contribution of this research is that, it provides not only a theoretical framework but a practical IT-business strategic alignment model and measurement methodology, which practising managers would be able to use to measure and ascertain the degree of IT-business strategic alignment in their companies over time, thus allowing better business decisions to be taken.

Finally, this research has provided a comprehensive data base which can be used for conducting comparisons with other industries, for testing alternative
theories and explanations and for investigating the characteristics of a company's competitiveness with their IT investment.

9.2 Implication for strategic alignment theories and practices

This research has several implications for IT and strategy management theory.

First, the conceptual framework and the CSA model, which was developed to depict the multidimensional and complex nature of organisation reality, could be used by managers and academics to develop further concepts of IT-driven competitiveness and to test their relevance in other industries or other countries. For example, the variables in the CSA model could be adapted to measure the influence IT-government strategic alignment on certain service programs (Ho & Thandi 2002).

Second, this research has demonstrated that part of a company's competitiveness is the result of tight IT-business strategic alignment. This result clarifies some of the discussions about IT contributions to competitiveness.

Thirdly, this research demonstrated that ensuring appropriate inputs for an IT or strategy planning programs, together with efficient activities and processes and effective outputs and outcomes performance measures, is no guarantee for the success of a particular program. The recognition of logic before measurement would be a key element in the success of any performance management initiatives (Ho & Thandi 2002). The CSA model provides a logic that integrates
all the elements in the business performance measures from inputs and processes through to outcome measures.

Fourthly, this research shows that there is no confirmation of certainty in achieving certain business performance outcomes or competitive advantages if information systems are closely aligned to corporate strategy. If the same methodology was being employed in a future period, different correlation results might be obtained indicating that there is no standard fixed predictable IT-business strategic alignment contribution to business performance outcomes. This could due to several factors; for example, corporate culture and stage of IT infrastructure.

Finally, the above arguments lead to the core objective of this study - the question of applicability of the CSA model. As discussed earlier, although it might be possible to use the CSA model for an individual company, it seems that studying companies within the same industry presents some difficulties, due to the differing strategic visions and competitive advantages being pursued. The question is, if the strategic objectives for a group of companies within the same industry are similar, could the CSA model still be used?

One of the ways to test this is when the CSA model is used for performance measurement, the measurement process should be done by sub-dividing the companies into various logical divisions and the division should be based on the mode of a company's response to external economic situation. The impact of the Asian economic crisis in 1997-98 and US economic recession in 2001 on IT
investment is well known in the IT arena. Many companies are reducing investment on IT due to financial difficulties and other related considerations. The impact of these divestment activities on the overall IT-business strategic alignment necessitates re-coupling of the strategic alignment to the revised corporate strategy. In any given economic situation, there are several modes of response in terms of information system strategy by most corporations. They are categorised in figure 9-1.

**Figure 9-1: Mode of IT responses**

![Diagram showing modes of IT responses](image)

- **Precautionary-defensive mode** - In times where companies may not be doing well they see IT as a crucial differentiating tool in future company growth. They capitalise on the potential of IT to address their primary competitive advantage. The IT department is driven by a forward-looking mentality.
- **Troubled-reactive mode** - when companies are facing severe financial difficulties, the company revenue drastically drops and senior managers
become action-orientated with a short-term financial focus. The typical approach is to suspend all unnecessary information system activities. If there is any information technology investment at all, it is aimed at achieving short-term cost-cutting measures. These companies tend to refocus their efforts on improving their profits by aggressively selling company product/services and cutting costs. And, they concentrated solely on utilising financial measures to ride out the storm.

- **Precautionary-defensive mode** – companies in this mode foresee that trouble is over the horizon. To conserve their financial resources, these companies will take a defensive approach. The typical characteristics are that they start reducing spending on IT if possible and re-deploying their resources into non-IT related activities to protect their business. Some companies would invest in IT marginally for essential IT operations.

- **Growth-aggressive mode** - The companies may or may not be doing well financially, but they see IT as a crucial enabling tool to future company growth. These companies are willing to explore and bring in latest technology and they see IT as their primary competitive advantage. The cost consideration of implementing IT takes a back seat.

- **Overconfident-inert mode** - in contrast to companies in the troubled-reactive mode, these companies’ revenues are sound and the ‘feel-good’ mentality is widespread. The economic crisis actually turns the business
situation into their favour. However, investment in information technology is still seen as frills and deemed not necessary.

Different IT response modes require different types of IT-business strategic alignment. In these four business environments, companies share similar strategic objectives and business performance measurement goals by grouping the companies into their respective IT response modes. The CSA model could then be used relatively accurately to predict the relationships between IT-business strategic alignment and the performance outcomes.

Besides the points raised above about the usability of the CSA model, other care should be taken as well with the use of the CSA model. Similar to many other information systems planning tools and methodologies, in order to develop a successful IT-business strategic alignment, the involvement and participation of senior managers' strategic alignment activities are crucial. To do this, an explicit and formal incorporation of structures for management involvement is necessary. A model is only useful if combined with the skilful mix and deployment of people, technology, knowledge and methodology in order to come up with a well aligned IT and corporate strategy.
9.3 Limitations and research issues

Various limitations and shortcomings of this research were discussed throughout chapter five on data analysis and previous sections in this chapter. This section serves to discuss some other research issues and also to consolidate the major research issues.

(1) Small sample size and large number of variables – besides the problems of small sample size as discussed in the data analysis limitation section, the small sample size also leads to other statistical analysis problems throughout the study such as inhibiting the use of more powerful statistical analysis methods associated with large samples. It becomes difficult to use conventional multivariate statistical methods to identify patterns in the entire set of measurements.

Also, too many variables and testing too many hypotheses (in this study, two main hypotheses were tested but in effect relationships between twenty variables were tested) would lead to Bonferoni’s error – a situation where relationships were proved positive due to chance because of too many variables in the statistical tests.

(2) Applicability to small medium size companies – this study only dealt with large companies published in IBIS (2001) database and the CSA model may not apply to smaller companies or may require further modification to adapt to
companies with limited resources and possibly with strategic goals differing from those of the large companies.

(3) Multinational companies - some of the companies under study, while operating their business in Australia, actually belong to international group of companies with headquarters overseas. Some companies in this category have little influence over corporate strategy and, in some cases, even on IT system selection. Large companies like Cadbury Schweppes and Johnson & Johnson (which the author used to work for as IT management consultant) designed and planned IT-business strategies in headquarters and rolled out the pre-designed corporate enterprise system throughout the world with minor local customisation.

(4) Sensitivity of information – the nature of the present study required that the respondents disclose some sensitive data, which could reveal corporate strategic position. There is no guarantee that the respondents provided the true assessment of their IT-business relationships and this unbalanced view could distort the final findings of this study.

(5) Dependency on single respondent - this research relied on data from a single respondent in the participating company. Ideally a full range of interviewees would have been preferred. This might cause following effects including inaccurate perception of situation, biased opinion or vested interest.
(6) Respondent familiarity of the business - trusting the chief information officer (CIO) or IT manager to give us the right answers could be an imperfect method. Some of the ways to minimize the bias have been introduced such as checking the years of experience the respondent has worked in the company to ensure that the respondents were, in fact, familiar with the current business environment (Collins & Porras 1996). In this study, no managers with less than 2 years experience in the present position responded to the survey questionnaire.

(7) Correlations versus causation – as in all empirical studies, according to Collins and Porras (1996), proving the existence of correlations does not necessary claim a causal link between the variables. For example, even if hypothesis H1 or H2 were supported, that may not prove tight integration causes improved business performance. Superior business management might cause both and/or other variables. It is also difficult to attribute improved business performance to any one factor.

(8) Troubled times and IT response mode at the responding companies – as discussed in previous section, respondents’ companies may be in different modes of economic progress and IT investment cycle. This may bring uneven responses or information to the survey questions that would otherwise give perfect correlations to some variables.

(9) Uniqueness of each company- as discussed previously, each company is unique and applying the CSA model for a group a companies could be
problematic. IT-business strategic alignment is normally developed through an ongoing dialogue among business managers and key IT managers. The answers will probably be different from organisations of different sizes and at different growth stages.

(10) The choice of variables in the CSA model - in order to identify the relevant business performance measures to be used for the CSA model, the literature review conducted showed that there were a number of ways that IT strategy and business strategy may be misaligned. Because of the initial aim of research was to identify causal links between IT-business strategic alignment and business performances for companies for an industry, some of the variables that were company-specific were not built into the CSA model. These variables generally could be classified into dimensions such as:

- Company objectives and values – IT-business misalignment occurs when the objectives and values of the business managers are inconsistent with the objectives and values of IT managers. This often occurs because a single 'corporate' IT strategy is applied across business units with different business strategies and plans, or because IT performance measures are inconsistent with business objectives.

- Time - the extent to which the time horizon and pace of change is consistent between the IT and business. One typical example is that the business expects to compete on the basis of the speedy introduction of new products
or product configuration, and IT could not be developed in time to keep pace with the business demand.

- Ends and means - the purpose of a strategy and plan is to ensure that the company has the means such as resources, organisation, and process to reach its objectives. Therefore, one measure of alignment is the extent to which the organisation can reach its desired ends, given existing IT capabilities.

These variables need to be incorporated into the CSA model for future research on a single company.

9.4 Conclusion

This chapter details the contributions and implications of the present study and some of the limitations faced. As a whole, the present study had met the research objectives set out to be albeit encountering some research issues. Following chapter discussed possible future researches to overcome the current research issues and that could advance research areas not explored in the present study.
Chapter 10

GENERAL RECOMMENDATIONS AND FURTHER RESEARCH

Several avenues for further research are opened up by this study. The identification of important variables for IT-business strategic alignment should provide an impetus to further investigation to add on to existing variables.

The CSA model and the methodology provided by this research could be used to replicate, extend and refine further researches. This includes replication to a single company case study albeit the CSA model's inherent limitation on other industries such as banking and finance, as well as comparison in international settings given than the selection of companies satisfying certain criteria as discussed in previous section. Further extensions could also collect data from a number of different functions and hierarchical levels within the companies in order to assure the representativeness of the data. Also, since this research has concentrated on the large Australian-based manufacturing companies, and further research could examine to what extent the findings applied to smaller 'small-medium size' companies.

As discussed in previous sections, further research also needs to confirm the impact of other strategic variables such as industry, environmental conditions, and company structures. Also, there is a need to explore different variables to test the IT-business strategic alignment paradox that may negate or dispel so
many popular beliefs that IT-business strategic alignment is related to performance outcomes.

In addition to this, there is also a need to investigate the relationship between IT-business strategic alignment and company flexibility and to identify if better management practice could reduce any of the negative consequence of IT-business strategic alignment. Management decisions involving IT may have long-term implications that restrict or limit a company's ability to affect future business strategy changes. For example, companies may adopt an integrated enterprise resources planning system to support its business strategy and find later that the integrated system such as SAP was like cement, 'flexible when poured but rigid once it hardens' (Kraemer, Dedrick & Yamashiro 2000).

The above statement points to the need for further studies which investigate in more detail the underlying reasons which cause companies to adopt certain IT-business strategic alignment portfolio and IT infrastructure.

And finally, the three relationship frameworks proposed by Itami and Numagami (1992) should be fully explored. The study so far focused more on the conventional and economics-oriented strategic analysis and less on internal, developmental and psychology-oriented. Itami and Numagami proposed that the study of interaction between strategy and technology should be done in three perspectives. First perspective should be looking at the impact of existing technology on a company's current strategy, second perspective examining the
effect of current strategy on the development of future technology and the third perspective depicting the impact of current technology on future strategy.

This research constructed a model and methodology based on the first perspective. Further research should be extended to build models and methodologies for the second and third perspectives.
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Appendix A1: Survey questionnaire
APPENDIX A1: SURVEY QUESTIONNAIRE

Please supply your contact details below.

ID Number _____________________________ (to be filled by Swinburne)

Name ________________________________

Job Title ______________________________

Contact Number _________________________

Mailing Address ____________________________________________________________
________________________________________________________________________

Title of person you report to ______________________________

This questionnaire is intended for the most senior information systems executive within your firm. If you are not that individual, please forward the entire packet to him or her. Thank you.
Please complete all questions by circling the scale most suitable to your situation. For example, consider the following sample item:

Q-1 I could complete the job using the software package...

...if there was someone giving me ........ 1 2 3 4 5 6
Step-by-step instructions.

NOT AT ALL
CONFIDENT

TOTALLY CONFIDENT

The sample response shows that the individual felt he or she could complete the job using the software with step-by-step instructions and was confident that he or she could do so.

Please return the questionnaires using the envelope provided to,

Edward Ho
Australian Graduate School of Entrepreneurship
Swinburne University of Technology
P.O. Box 235, Kerrimuir,
VIC 3129 Australia
QUESTIONNAIRE

Part I: Corporate Strategy Formulation

Q-1. How many levels are you from the Chief Executive Officer of the corporation?

1  2  3  4  5  6

Please specify title of the personnel above you _______________________

Q-2. How many years have you held your current position?

1  2  3  4  5  more than 5 years

Q-3. To the best of your knowledge, how many years has your firm's Chief Executive Officer been in his or her current position?

1  2  3  4  5  6  7  8  9  10  more than 10 years
Q-4. Which of the following statements best describes the importance that your CEO perceives IT to have for your firm?

1  2  3  4  5
Has little concern for Considers IT to be the concern of technology
the potential to be one of many ways to cut costs in
utility of IT concern of functioning of operations
but supportive of IT

Optional comment

Q-5. How often do you assist in reviewing Corporate Strategy?

1  2  3  4  5
Only when needed Yearly Half-yearly Quarterly Continuously monitoring

Optional comment
Q-6. Please name the common strategic intent (i.e. long term ambition) in your corporate strategy? (Please mark all those that apply)

1 2 3 4 5 6 7 8 9
Customer Employee Time Product Product Brand Revenue Cost Market
service loyalty to quality /service loyalty saving Share
leadership market leadership

Others, please specify
________________________________________________________

Q-7. Do you have a business intelligence or strategic enterprise management (SEM) system in place to help with your strategic management process?

1 2
Yes No

If answer is no, please skip questions below and go directly to question 10.
If answer is 'YES' please name IT system used (e.g. SAP BW, Oracle SEM)___________________________________________
Q-8. How significant has the IT system named above being, either directly or indirectly, to bring the following competitive advantages or benefits to your company? (Please circle only one number)

Q-8.1. Customer service level?

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Q-8.2. Employee loyalty?

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Q-8.3. Time to market?

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Q-8.4. Product quality?

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Q-8.5. Product/service leadership?

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Q-8.6. Brand loyalty?

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Q-8.7. Revenue gain?

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Q-8.8. Cost saving?

1  2  3  4  5  6
insignificant  very  significant

Q-8.9. Market share?

1  2  3  4  5  6
insignificant  very  significant

Q-8.10. Sustainability of your company’s strategic intent as listed in Q6 above?

1  2  3  4  5  6
insignificant  very  significant

Q-9. How well aligned to your company’s business strategy, in your view, is the business intelligence or strategic enterprise management (SEM) system in place?

1  2  3  4  5  6
Chaotic  Misfit  Mixed  Threshold  Harmonious  Perfect
Q-10. If your company does not have a strategic enterprise management (SEM) system in place, how do you measure your IT system’s contribution to business strategy?

1 2 3 4 5
Ad-hoc Frequent Ad-hoc In Frequent In No
External External House House Measurement
Consultant Consultant Management Management System In
Review Review Review Review Place

Other methods

Q-11. To what degree, in your view, has IT been considered in your firm’s corporate planning process?

1 2 3 4 5 6
Chaotic Misfit Mixed Threshold Harmonious Perfect

Q-12. To what extent do you believe that the relationship between the business strategy and the IT strategy is defined, communicated, effective, efficient and valuable?

1 2 3 4 5 6
Small Large
Extent Extent
Part II - Business Processes – Planning, Design & Execution

Q-13. What types of enterprise resource planning (ERP) software is your company using? (please mark all those that apply)

1  2  3  4  5
SAP  Oracle  PeopleSoft  JD  None
Edwards
Others, please specify

Q-14. How many years has the system been in operation?

1  2  3  4  5  more than 5 years

Q-15. What types of Supply Chain Planning or Advance Planning System (APS) software is your companies using? (please mark all those that apply)

1  2  3  4  5
i2  Manugistics  APO  JD Edwards  None
Others, please specify

217
Q-16. How many years has the system been in operation?

1 2 3 4 5 more than 5 years

Q-17. What types of Customer Relationship Management (CRM) software is your company using? (please mark all those that apply)

1 2 3 4 5
Siebel Vantive SAP Oracle None
Others, please specify

Q-18. How many years has the system been in operation?

1 2 3 4 5 more than 5 years

Q-19. What types of Manufacturing Execution System (MES) is your company using? (please mark all those that apply)

1 2 3 4 5
EMS Camstar ICC Synquest None
Others, please specify
Q-20. How many years has the system being in operation?

1  2  3  4  5  more than 5 years

Q-21. What types of Internet solutions does your company have in place?
(please mark all those that apply)

1  2  3  4  5

Web    Online sales/ E-    Marketplace/ Business to     None
Presentatio Commerce       E-    Business

n/  (Taking orders       Procurement (vertical industry
Information from internet  (horizontal collaboration

Site    direct from industry from product
customer or procurement design to
distributors)  via internet ) delivery)

Others, please specify

Q-22. How many years has the system being in operation?

1  2  3  4  5  more than 5
Q-23. Please name the major business processes and operations that were supported by the software covered in Q13 to Q21 above? (please mark all that applied)? (please mark all that applied)

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Q-24. How significant was the IT system named in question 13 to 21 above, either directly or indirectly, in bringing the following competitive advantages or benefits to your company? (please circle only one number)

Q-24.1. Customer service level?

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Q-24.2. Employee loyalty?

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Q-24.3. Time to market?

1  2  3  4  5  6

insignificant  
very  
significant

Q-24.4. Product quality?

1  2  3  4  5  6

insignificant  
very  
significant

Q-24.5. Product/service leadership?

1  2  3  4  5  6

insignificant  
very  
significant

Q-24.6. Brand loyalty?

1  2  3  4  5  6

insignificant  
very  
significant
Q-24.7. Revenue gain?

1 2 3 4 5 6
insignificant very significant

Q-24.8. Cost saving?

1 2 3 4 5 6
insignificant very significant

Q-24.9. Market share?

1 2 3 4 5 6
insignificant very significant

Q-24.10. Sustainability of your companies' strategic intent as listed in Q6 above?

1 2 3 4 5 6
insignificant very significant
Q-25. How well aligned to your company’s business processes and operations, in your view, was the IT system (i.e. ERP, SCM, CRM, MES and internet solutions) in place? (please circle only one number)

1 2 3 4 5 6
Chaotic  Misfit  Mixed  Threshold  Harmonious  Perfect

Q-26. To what degree, in your view, have the IT solutions above (i.e. ERP, SCM, CRM, MES and internet solutions) been considered in your firm's corporate planning process? (please circle only one number)

1 2 3 4 5 6
Chaotic  Misfit  Mixed  Threshold  Harmonious  Perfect

Q-27. To what extent do you believe that the relationship between the business processes/operations and the IT infrastructure are defined, communicated, effective, efficient and valuable?

1 2 3 4 5 6
Small  Large
Extent  Extent

------------------------- END OF QUESTIONNAIRE -------------------------
Appendix A2: Scale items of the questionnaire
**APPENDIX A2: SCALE ITEMS OF THE QUESTIONNAIRE**

### 'A' Variables: A1 - Alignment of IT and Corporate Strategies

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### 'A' Variables: A2 - Alignment of IT and Business Processes/Operations

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<th>(threshold)</th>
<th>(harmony)</th>
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### 'K' Variables: Key Competitiveness or Benefits Obtained

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<tr>
<td>Q24.1 K1</td>
<td>1 2 3 4 5 6</td>
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<td>Q24.3 K3</td>
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<tr>
<td>Q24.1 K10</td>
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K1 - customer service level  
K2 - employee loyalty  
K3 - time to market  
K4 - product quality  
K5 - product/service leadership  
K6 - brand loyalty  
K7 - revenue  
K8 - cost saving  
K9 - market share  
K10 - sustainability of competitive advantages
Appendix A3: Companies invited to the research
APPENDIX A3: COMPANIES INVITED TO THE RESEARCH

3M Australia Pty Limited
Abbott Australasia Pty Limited
Air Liquide Australia Limited
Albright & Wilson (Australia) Limited
Alcatel Australia Limited
Amcor Limited
APV Limited
ARB Corporation Limited
Ardmona Foods Limited
Arnotts Limited
Arthur Yates & Co Limited
Asea Brown Boveri Pty Limited
AstraZeneca Pty Limited
Austral Limited
Australian Automotive Air Pty Ltd
Australian Cement Holdings Pty Ltd
Austrim Nylex Limited
Autoliv Australia Pty Ltd
Automotive Components Limited
Avatar Industries Limited
Avel Pty Ltd
BAE Systems Australia Holdings Limited
Baker Hughes Australia Pty Limited
BASF Australia Ltd
Bayer Australia Limited
Bendon Group Limited
Berri Limited
BGC (Australia) Pty Ltd
Boeing Australia Limited
Bonlac Foods Limited
Boral Limited
BP Australia Holdings Limited
Bradnam's Windows & Doors Pty Ltd
Bridgestone Australia Ltd
Brintons Pty Limited
Bristile Ltd
Bristol-Myers Squibb Australia Pty Ltd
British American Tobacco Australasia
BRL Hardy Limited
Brumby's Bakeries Holdings Limited
Cadbury Schweppes Australia Limited
Caltex Australia Limited
Carrier Air Conditioning
Carter Holt Harvey Limited
Clariant (Australia) Pty Ltd
Clark Equipment Australia Pty Ltd
Clarks Shoes Australia Pty Ltd
Coca-Cola Amatil Limited
Colgate-Palmolive Pty Limited
ConAgra Holdings (Australia) Pty Ltd
Coopers Brewery Limited
Cork International Pty Limited
CPN Holdings Pty Limited
CSL Limited
Cussons Australia Pty Limited
Dalton Packaging Pty Limited
Dana Australia (Holdings) Limited
David Mitchell Limited
Delta Group Australia Pty Ltd
DENSO Manufacturing Australia Pty Ltd
Detmold Holdings Pty Ltd
Dexion (Australia) Pty Limited
Dow Chemical (Australia) Limited
Du Pont (Australia) Limited
Dyno Nobel Asia Pacific Limited
E G Green & Sons Pty Ltd
Electrolux Pty Ltd
ELI Lilly Australia Pty Limited
Email Limited
EMI Group (Australia) Holdings Pty Ltd
ERG Limited
Ericsson Australia Pty Ltd
Estee Lauder Pty Limited
Evans Deakin Industries Limited
F & M Vodusek Pty Ltd
F H Faulding & Co Limited
Finasure Investments (Australia)
Finewrap Australia Pty Limited
Fisher & Paykel Industries Limited
Fletcher Challenge Limited
Ford Motor Company of Australia Limited
Foster's Brewing Group Limited
George Weston Foods Limited
Glaxo Wellcome Australia Ltd
<table>
<thead>
<tr>
<th>Company Name</th>
<th>Company Name</th>
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<tr>
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<td>Monsanto Australia Limited</td>
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<tr>
<td>GUD Holdings Limited</td>
<td>Montana Group (NZ) Limited</td>
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<td>Hallmark Cards Australia Limited</td>
<td>Murray Goulburn Co-operative Co Limited</td>
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<td>Hanson Australia Pty Limited</td>
<td>National Can Industries Limited</td>
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<td>Heinz Wattie's Limited</td>
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<td>Henkel Australia Pty Limited</td>
<td>NEC Australia Pty Ltd</td>
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<td>Holden Ltd</td>
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<td>Honeywell Holdings Pty Limited</td>
<td>Nonferral Recyclers Limited</td>
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<tr>
<td>Ingersoll-Rand (Australia) Limited</td>
<td>Nortel Networks Australia Pty Limited</td>
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<td>Inghams Enterprises Pty Limited</td>
<td>Novartis Australia Proprietary Limited</td>
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<td>International Trucks Australia Limited</td>
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<td>Oakmoore Pty Ltd</td>
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<tr>
<td>Joy Manufacturing Co Pty Ltd</td>
<td>O'Brien Glass Holdings Pty Limited</td>
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<td>Oldfields Holdings Limited</td>
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<td>Keycorp Limited</td>
<td>Oliver J Nilsen (Australia) Limited</td>
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<td>Kilcoy Pastoral Company Limited</td>
<td>OneSteel Limited</td>
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<td>Kimberly-Clark Australia Pty Limited</td>
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<td>King Island Company Ltd</td>
<td>Orlando Wyndham Group Pty Ltd</td>
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<tr>
<td>Kodak (Australasia) Proprietary Limited</td>
<td>Owens-Illinois (Australia) Pty Limited</td>
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<td>Koppers Australia Pty Limited</td>
<td>PACCAR Australia Pty Ltd</td>
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<td>Kraft Foods (Australia) Limited</td>
<td>Pacific Access Pty Limited</td>
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<td>Kreglinger (Australia) Pty Ltd</td>
<td>Pacifica Group Limited</td>
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<td>Pan Pharmaceuticals Limited</td>
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<td>Lemaerne Corporation Limited</td>
<td>Parke Davis Pty Limited</td>
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<td>Parker Hannifin (Australia) Pty Limited</td>
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<tr>
<td>Levi Strauss (Australia) Pty Ltd</td>
<td>Pechiney Pacific Pty Limited</td>
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<tr>
<td>Lincoln Electric Company (Australia)</td>
<td>Pharmacia Australia Pty Limited</td>
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<tr>
<td>Lion Nathan Limited</td>
<td>Philip Morris (Australia) Limited</td>
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<td>Lucent Technologies Australia Pty Limited</td>
<td>Pilkington Australasia Limited</td>
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<tr>
<td>Ludowici Limited</td>
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<td>M C Herd Proprietary Limited</td>
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<tr>
<td>Macquarie Textiles Group Limited</td>
<td>PMP Limited</td>
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<td>Marconi Commerce Systems Australia</td>
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<td>Marley Plastics Australia Holdings Pty Ltd</td>
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<td>Marven Poultry Pty Ltd</td>
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<td>Metal manufactures Limited</td>
<td>Reed Elsevier Australia Pty Limited</td>
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<td>Mitsubishi Australia Limited</td>
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<td>Mobil Oil Australia Pty Ltd</td>
<td>Ridley Corporation Limited</td>
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<td>Robert Bosch (Australia) Pty Ltd</td>
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Roche Products Pty Limited
Rolls-Royce Australia Limited
Samuel Smith & Son Pty Limited
Sancelia Pty Limited
Sandvik Australia Pty Limited
Sara Lee Holdings (Australia) Pty Ltd
Shell Australia Limited
Siemens Ltd
Simplot Australia (Holdings) Pty Limited
Simsmetal Limited
SmithKline Beecham Holdings (Australia) Pty Limited
Smorgon Steel Group Ltd
Solectron Australia Pty Limited
South Pacific Tyres Partnership
Southcorp Limited
SPC Limited
Sulzer Australia Pty Limited
Svedala Australia Limited
Tenix Pty Limited
Tetra Pak Manufacturing Pty Limited
Teys Bros (Holdings) Pty Ltd
Thomson Corporation (Australia) Pty Ltd
Toyota Motor Corporation Australia
Unilever Australia (Holdings) Proprietary Limited
VAW Australia Pty Limited
VDO Australia Pty Limited
Vision Systems Limited
Appendix A4: Confidentiality agreement with participants
APPENDIX A4: CONFIDENTIALITY AGREEMENT WITH PARTICIPANTS

Form of Disclosure and Informed Consent

Project Title: Alignment of Information Technology - Business Strategy and its Contributions to Competitive Advantages

This is a study on how information technology (IT) has been used in enabling implementation of corporate strategy and the impact of IT-business strategy alignment on company competitive advantages in Australia. The research focus is on the relationship between strategy planning and information technology planning – or the alignment of IT at strategy planning level.

1.1.1 Investigators/Researchers

All investigators belong to Australian Graduate School of Entrepreneurship, Swinburne University of Technology. The names and roles are listed below,

- Edward Cheong-Tsair Ho. MSc (Warwick), CPEng, MIEAust - Researcher
- Dr Harchand Singh Thandi. PhD, MEd, BA (Hons), CertEd (L’pool) – Primary Supervisor
- Dr Sheikh Rahman. BCom (Hons), MCom (Rajshahi), MA (Econ), PhD (Manchester) – Second Supervisor

1.1.2 Why this survey and your contribution

This research project attempts to 'measure' the relationship of IT and business strategy alignment to the company's competitive advantages based on the strategic alignment framework developed by the investigators. The 'product' of this project should make contribution to the understanding of linkage between IT and business strategy to the academia, practicing IT and business strategy planners.

You are required to complete the questionnaires prepared. It should take no more than 30 minutes of your time to complete the questionnaires. Follow-up interviews or telephone enquires may be conducted if clarification is required as a result of the questionnaires feedback.

You are free to withdraw consent and to discontinue participation in the study at any time for any reason by writing to the principal investigator.

Any questions regarding this project can be directed to the Principal Investigator - Edward Ho of the Australian School of Entrepreneurship on 0418 542 306, email 140038@swin.edu.au or Dr Harch Thandi 03 9214 5285, hthandi@swin.edu.au.
1.1.3 Intended audience/participants
Senior managers in IT and strategic planning.

1.1.4 Feedback to you
A copy of the finding will be provided to all responded participants.

1.1.5 Confidentiality and Privacy Protection

We will keep all data provided by you in private and only accessed by you and/or someone who will collate answers.

Your feedback will be stored in the private storage area and only the investigators/researchers listed in this document will have access to it. You and your company identity will not be released under any circumstances and in any publication as a result from the research.

Only the principal investigator should have knowledge of the names and code numbers (if any) used. It is the responsibility of the principal Investigator to destroy this information at the end of the study. If confidentiality is required to be broken, this may only be done by the principal investigator after consultation with you in writing.

1.1.6 Complaint Procedures

If you are dissatisfied with the way you have been treated during the study, or a query that the investigator has been unable to satisfy. You should contact the Head of the School or Research Institute involved and also that complaints can be directed to:

The Chair
Human Research Ethics Committee
Swinburne University of Technology
P O Box 218
HAWTHORN, VIC. 3122
Phone: (03) 9214 5223
CONFIDENTIALITY AGREEMENT

I <insert name and address of the participant>,

Have read and understood the information above. Any questions I have asked have been answered to my satisfaction.

I agree to participate in this activity, realising that I may withdraw at any time.

[I agree that the further interview / activity if any, may be recorded on audio /and/or video tape as data on the condition that no part of it is included in any presentation or public display. ]

I agree that research data collected for the study may be published or provided to other researchers on the condition that anonymity is preserved and that I cannot be identified.

NAME OF PARTICIPANT .......................................................... ........................................

SIGNATURE ............................................................................. DATE..........................

* NAME OF AUTHORISED REPRESENTATIVE .................. ........................................

POSITION .................................................................................. ......................................

SIGNATURE ............................................................................. DATE..........................

Please make a copy and return this agreement together with the questionnaires on enclosed return envelope.
Appendix A5: Initial letter to the IT manager
APPENDIX A5: INITIAL LETTER TO THE IT MANAGER

<<Title>> <<First Name>> <<Surname>>
<<Position>>
<<Company Name>>
<<Address>>

15 June 2001

Edward Ho
Australian Graduate School of Entrepreneurship
Swinburne University of Technology
P.O. Box 235, Kerimuir,
VIC 3129 Australia
Mobile 0418 542 306
Email: 140038@swin.edu.au

Dear Sir,

Subj: Participation in the Questionnaire Survey

Thank you for indicating your interest to participate in this survey in our recent telephone/email discussion.

Before you proceed to answer the questionnaires, I would like to bring to your attention that I have attached the 'Form of Disclosure and Informed Consent'. This document describes the purpose of this study and our duties to you on confidentiality. If you agree with the document, could you please sign the attached agreement and return it to me to the address above together with the completed questionnaires?

Your participation will greatly contribute to our understanding of IT and business strategy alignment's contribution to a company's competitive advantages. As indicated earlier, a copy of the finding will be sent to you as a token of appreciation for your time and effort in answering the questionnaires. If you have any question, please feel free to contact the university or me.

Thank you.

Best regards,

Edward Ho
Principal Investigator/Researcher
Appendix A6: Follow-up letter to the IT managers
APPENDIX A6: FOLLOW-UP LETTER TO THE IT MANAGERS

9 August 2001

<<Title>> << First Name >> << Surname >>
<< Position >>
<< Company Name >>
<< Address >>

Dear sir/madam,

SURVEY: Alignment of IT and strategy

I am a supervisor of students pursuing their doctoral level studies at the Australian Graduate School of Entrepreneurship, and am writing this letter personally to request your help in responding to a questionnaire already sent to you earlier in June/July this year by one of my students, Mr Edward Ho.

Edward is conducting a study on how information technology (IT) has been used in enabling implementation of corporate strategy and the impact of IT on competitive advantages of companies in Australia. The research focus is on the relationship between strategy planning and information technology planning – or the alignment of IT at strategy planning level.

No study can be complete or be reliable/valid if there is not enough data to draw conclusions and make recommendations for the improved use of IT in business strategy. Thus, I am personally soliciting your participation as a respondent to the questionnaires already posted to you. I can assure you that your inputs will greatly contribute to our understanding on IT and business strategy alignment contribution to a company’s competitive advantages.

As indicated earlier, a copy of the findings will be sent to you as a token of appreciation for your time and effort in answering the questionnaires.

In case the questionnaire has not reached you, could you kindly contact Mr. Edward Ho on edwardho@iee.org so that he can send you a replacement?

For your time and trouble, I thank you.

Kindest regards,

(Dr Harch Thandi)
Senior Lecturer
List of publications by the author
LIST OF PUBLICATIONS BY THE AUTHOR


