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Measuring IT Contribution to Company's Competitive Advantages

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Abstract

The objectives of this research are to detail the history of business-IT alignment and develop a model to measure business-IT strategic alignment. The methodology involved defining and developing measures for the predictor variables of environmental uncertainty and importance of IT to the firm. A conceptual framework or strategic alignment model integrating key practices espoused by academics and practitioners regarding strategic alignment was developed. Measures for the strategic alignment model were defined and developed, and the relationships of the predictor variables with the degree of alignment as well as technology's contribution to organizational performance assessed.

1. Introduction

Business strategy and IT alignments and their contributions to business competitive advantages or performance have been much researched the early 1990s. Though most companies know that alignment is needed to facilitate optimum business benefit, it is difficult for them to know whether they have the strategy and technology aligned.

The literature review indicates that, to date, there does not appear to be a 'one-size-fits-all' solution to achieving agreement, coordination, and close cooperation between business strategy and IT strategy. Hence, this paper explores the history of business strategy-technology alignment (strategic alignment in short) and outlines the study being conducted by the authors to increase our knowledge of what the influences are upon business strategy-technology alignment and what impact such alignment has upon the organization. It reports only the preliminary findings as the research is still ongoing as this paper was written.

The overarching research objectives were set as

- define and develop measures for the predictor variables environmental uncertainty and importance of IT to the firm;
- develop a consolidated conceptual framework or model based on the key practices espoused by academics and practitioners that influence strategic alignment;
- define and develop measures for the strategic alignment model; and
- assess the relationship of the predictor variables with the degree of alignment and the degree of alignment with technology contribution to organizational performance.

Specific benefits of the research were seen as the following:

- This study's contribution to practice will result primarily from identifying key practices with organizational outcomes given the influence of the contingency variables. Identification and measurement of the relationships between the variables and the linkages in the consolidated strategy alignment model should have important consequences for practitioners seeking ways to improve their contribution.
- Contributions to research will derive from the completeness of the model, use of the model's IT's importance to the firm as a contingency variable, and the use of the Key IT practices construct to provide relationships heretofore unexplored. It is expected that the degree of IT and Business Strategy alignment and the impact of key IT practices upon organizational performance will be moderated by the importance of IT to the firm.
- The strength of these relationships should provide directions for future research. For example, studies could be undertaken on why is there a strong relationship between customer service level and the alignment of IT and business. Future research would also benefit from examining the feedback effect of outcomes on the importance of IT to the firm as proposed in the research model.

2. Literature review and conceptual framework

2.1 History of the strategic alignment model

Alignment of the information systems plan with a company's business plan has been the subject of much research and has been cited as one of the chief problems facing business and IT planners and managers [4][6][14]; The first attempt could be traced back to 1991, when the results of the MIT research program *Management in the 1990s* were published [12]. Among them, a rudimentary framework emerged whereby information technology (IT) was regarded as a variable linked with other variables such as strategy, organization and culture.

The strategic alignment model that was first proposed and which became a body of thought for leading researchers until today was postulated by Henderson and Venkatraman in 1993. In that year, 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 [5]. These authors developed the idea stemming from their research within the *Management in the 1990s* project, conducted under a grant by the IBM Consulting Group. The model that they created gained widespread following in the profession.

The *Henderson and Venkatraman* model expresses the interrelationship between business and IT. It is based on two distinct linkages: strategic fit and functional integration. Strategic fit is the linkage concerned with the integration of the external environment in which the firm competes (e.g., business partners, clients and customers, government agencies, regulatory bodies, financial or lending institutions, key suppliers) and the internal environment in which the firm performs (e.g., process technology, organizational structure, human resources, innovative processes). Functional integration is the corresponding link between business and IT. This linkage extends the notion of internal and external fit to IT. These two linkages are used to determine the relationships between IT and business. The model is divided into quadrants, comprising business strategy, IT strategy, organizational infrastructure and processes, and IT infrastructure and processes. These quadrants are interrelated; how they relate represents the organization's 'perspective' or alignment orientation. Effecting a change in any single domain requires the use of three out of the four domains to assure that both strategic fit and functional integration are properly addressed.

Between 1995 and 1997, many studies were conducted based on the Henderson and Venkatraman strategic alignment model. The model was developed further and enhanced by some major researchers such as Papp, Brier and Luftman [7][8]. In 1995, the latter identified a total of twelve perspectives. These included eight individual perspectives of strategy execution, technology potential, competitive potential, service level, organizational IT infrastructure, IT infrastructure strategy, IT organization infrastructure, and organization infrastructure strategy. In addition, four fusion perspectives were identified, namely, 'organization strategy fusion, IT strategy fusion, organization infrastructure fusion, IT infrastructure fusion' [7][8].

2.2 Maes' generic framework

Maes [9] felt that the Henderson and Venkatraman strategic alignment model was not perfect and proposed a modified strategic alignment framework, called the generic framework [9] in an attempt to counter the weaknesses in Henderson and Venkatraman model. Maes argued that the Henderson and Venkatraman model was incomplete because it only dealt with choices regarding organizational and technological infrastructure and processes. Because of this, Maes extended the 'information/communication' and 'operations' layers in the Henderson and Venkatraman strategic alignment model to include the critical links among the various quadrants.

2.3 CAP Gemini's Framework of Alignment

In May 2000, a white paper was published jointly by University of Amsterdam and CAP Gemini Institute that included the implementation component of the model and renamed the Unified Framework of Alignment [10]. In this paper, Maes' generic framework was enhanced to include the implementation components; namely, contextual, conceptual, logical, physical and transformational. This framework was created as a design tool aimed at development of mutually aligned business and IT systems through a unified architecture. Whilst Maes' generic framework is a tool for information management, the unified framework of alignment was created as a design tool aimed at development of a mutually aligned business and IT system through a unified architecture. Maes and CAP Gemini argued that business and IT alignment is a combined management and design concern. Thus, the combination of these two frameworks creates a complimentarily of results. For example, Maes' framework would be further enhanced when it includes the design components; namely, the contextual, conceptual, logical, physical and transformational phases.

While the researchers cited above have claimed that measurements are important to the usefulness of the model, no studies have been conducted to justify the claims. Bruce [3] claimed that successful alignment could be accomplished via coordination of strategic objectives with

a number of key components: resources, management processes, decision-making mechanisms, performance measures, rewards, and incentives. Measures of alignment will thus be different for firms of different sizes, in different growth phases, and in different industries.

Further, Bruce argued that, most likely, these measures would fall into the following categories - cost leadership, product leadership and outstanding customer service. Bruce's scorecards included the three categories above and were further broken down into following measures: price, quality, customers, markets, cost of operations, channels as well as goods and services. Almost simultaneously, the Balanced Scorecard organization came up with a performance measurement framework for IT and business outcomes [1] [2] which showed areas where IT could add value to existing activities of an organization, as shown in table 1 below.

Table 1: The value of corporate IT initiatives

Representative systems	Competitive advantage - Value metrics
Electronic commerce (EDI, supplier management, electronic shopping, secure protocols)	Market share; Price premium for products/services
Information-based products and services (financial, market, and industry-specific information services)	Operating margins, New business revenues, cash flow, knowledge retention
Information value added to existing products and services (customer information networks, electronic catalogue)	Relative return on equity

Source: The Balanced Scorecard Institute

2.3 Development of alignment model

Because of the lack of measurements of strategic alignment, the managers today are not fully aware of the implication of strategic alignment. This is a window of opportunity for research in order to create management awareness and to address the competency gap. An attempt was made by the present authors to develop and 'measure' an eclectic strategic alignment model developed using various schools of thought; namely, Henderson & Venkatraman 1993, Maes' Generic Framework and CAP Gemini's Unified Framework of Alignment.

For ease of measurement, a modified 'consolidated' strategic alignment model or CSA model (refer to figure 1 below) was produced that merges the key concepts of the models discussed.

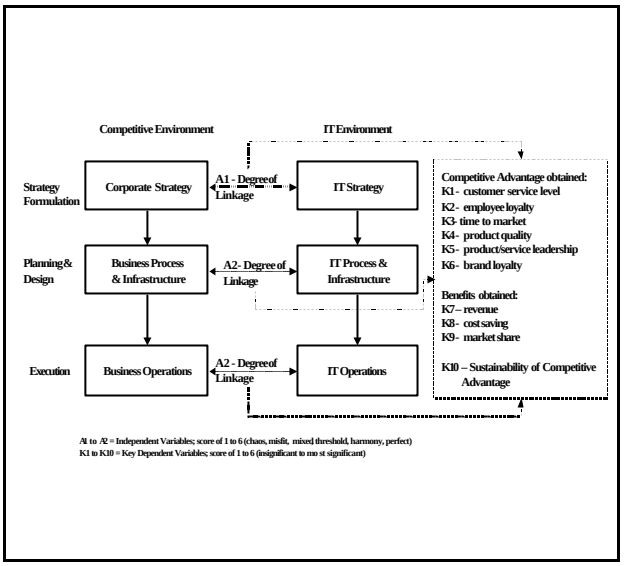

Figure 1: The CSA model

It closely resembles the McGee and Prusak [11] model, with adaptations to include the links as proposed by Henderson and Venkatraman, Maes and CAP Gemini and common variables on competitive advantages and benefits.

- *Independent variables*: The primary independent variables were constructed to identify the strategic alignment at the corporate strategy, business process/infrastructure and operation/implementation level ('*A' variables*: The measures of tightness of linkage between IT and business strategies and operations. The higher the score, the more the firm demonstrates greater strategic sustainability).

- *Dependent variables*: Combining Bruce's [3] measures of strategic alignment with the metrics of the Balanced Scored Institute yielded key dependent variables for potential competitive advantage or benefits obtained. These include revenue, cost saving, customer service level, employee loyalty and job satisfaction, time to market, market share, product quality, market/product/service leadership and brand loyalty ('*K' variables*: The dependent variables that were generated as a result of degree of linkage in the A variables).

- *Moderator variables*: Moderator variables introduced comprised the computer systems used at different levels of strategy planning; i.e. corporate, business unit or operations.

- *Control variables*: Control variables used comprised manufacturing companies, namely companies with more than five years' profitable operation and companies with turnover of more than AUD 20 million per year.

3. Methodology

3.1 Research approach

This research being an empirical study on the relationship between information technology, strategy planning and business processes design, the analytical survey method was adopted. Questionnaires were directed at senior information technology managers to obtain an organisational context and an understanding of the aims and critical success factors and their relationship to information technology strategy. In-depth questionnaire surveys were conducted for certain companies to provide contextual and broad understanding of business process and operation levels details.

The research methodology adopted for the pilot test was a field survey employing questionnaires. The latter were sent to senior IT executives and members of top management, within the same firm, in private corporations within Australia. This was hoped to facilitate statistical testing across a wide variety of organizations and reduce the effects of common source variance by measuring the independent and dependent variables from different respondents. Operationalisations of constructs was in the form of survey questions based on an extensive literature review and consideration of existing validated measures. Confirmatory factor analysis was used to measure the relationships among the variables.

3.2 Data gathering

The sample of firms that participated in the study included manufacturing companies located in Australia. Several criteria were employed to determine the specific population from which the sample was drawn: (1) to ensure a minimal degree of homogeneity among the respondents, the firms included in the sample were restricted to manufacturing firms; (2) to reduce the confounding effects of diversification, the sample was limited to those firms that generate at least 70 per cent of their sales from a single industry [13].

Rather than relying on secondary data, and following practice common in many 'empirical' studies, questionnaires were used to collect data directly from senior information technology managers. Managerial opinion and perceptions were hoped to provide information that secondary data would not necessarily reveal. In the first stage of the survey instrument development, extant literature was perused to generate a pool of items and variables describing information technology-enabled strategic advantages. In addition to this, some industry expert advice was sought to assess the validity of the measures, the conceptual and functional equivalence of the constructs. The items or variables generated from the measurement development processes were grouped, based on the literature review, into three categories:

- *Category 1*: Organisational arrangements: to understand organisational 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 any competitive advantages obtained 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 any competitive advantages obtained at this level.

The degree of linkage was measured on a 6-point Likert scale, ranging from 'chaotic' to 'perfect'. The degree of competitive advantage and benefits obtained due to the strength of the A1 and A2 variables was measured also on a 6-point Likert scale, ranging from 'insignificant' to 'most significant'.

The pre-test was conducted with IT personnel working in selected manufacturing companies, producing the pilot questionnaire. Two main groups of questions were asked. The first group of questions was posed to identify variables A1 and A2, and the executives were asked how strong the current alignment was in their companies between business strategies and IT strategies, and between business processes/operations and IT processes/operations. The second group of questions focused on aspects such as the current performance on variables K1 to K10. The main aim of this second group of questions was to obtain ratings on qualitative variables such as customer services and sustainability of competitiveness.

In the second stage, the questionnaire was test-run to ensure that the format was clear and logical and that the questions could be answered within half an hour. The refined questionnaire led to the actual implementation of data collection procedures.

To establish the significance of all the variables defined in the model and their effects on each other, data was collected by conducting in-depth interviews and by field surveys employing questionnaires sent to senior IT executives and members of top management within the selected firms. Quantitative data such as market share and revenue was obtained from the participating companies' financial statements and industry reports. As indicated above, information from various well-represented parties was obtained so as to facilitate statistical testing across a

wide variety of sources and to reduce the effects of common source variance by measuring the independent and dependent variables from different and informed respondents.

3.3 Data analysis

At the time of this analysis, of 200 survey questionnaires sent out, 37 responses had been received, yielding a response rate of 18.5%. The average number of years an IT manager had been in that position is 3.25 and for the CEO, it is 6.56. Based on simple descriptive statistical analysis, the strength of strategic alignment 'A1', at corporate strategy level, was found to be between mixed (rating 3) and threshold (rating 4) with a mean of 3.65; whereas strategic alignment 'A2', at business processes/operations level, was quite significant with a mean of 4.05, an above average score (rating 6 signifies most significant alignment). Analysing the means of data captured showed that 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. The frequency distributions of the scores for 'A' and 'K' variables were also analysed to find out the frequencies of the ratings on A1 and A2 variables (the strength of business and IT linkage) and the rating on the effect of IT Systems on competitive advantage (K1-K9) and benefits (K10).

Correlations between the dependent and independent variables were analysed using the one-tailed Pearson method. It was found that K1 (customer services) had a significant correlation with A1 (strategic alignment at corporate strategy level); K4 (product quality) and K10 (sustainability of competitive advantages) had a significant correlation (at 0.05 level) with A2 (strategic alignment at business processes/ operations level). It is to be noted that, when other data have been collected and collated, some inferential statistical methods will be used for further analyses in order to derive other meaningful relationships among the variables; for example, the relationship between cost saving and revenue generation and their impact on business-IT strategic alignment.

4. Findings and discussion

As indicated earlier, descriptive statistical analysis shows that the respondents perceived that their IT-strategy and IT-processes /operations alignment was above average (where, individually, A1 had a mean score of 3.65 and A2 had a mean score of 4.05). Most respondents appeared to be of the view that IT 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).

The frequency distributions analysis indicates that a total of 51% of the respondents regarded the alignment of IT strategy to corporate strategy as chaotic in their organisations, whilst a smaller number (27%) perceived the alignment of business process and operation to IT process and operation as chaotic. Only 14% of the respondents regarded the alignment of IT strategy to corporate strategy as harmonious in their organisations, whilst a larger number, at 41%, perceived the alignment of business process and infrastructure to IT process and infrastructure as harmonious or ideal in their organisations. The total score distributions among the K1 to K10 variables indicate that more than 40% of 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). 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).

When the relationships between strategic alignment (A1 and A2) and performance outcomes (competitive advantages, benefits and sustainability 'K' variables) were analysed, respondents were found to perceive that customer service (K1) had a direct positive relationship or link with IT-business alignment at corporate strategy level (A1); and product quality (K4) and competitive advantages sustainability (K10) were directly related with IT-business alignment at the process/operation level (A2).

The fourth research objective was posed as two hypotheses, namely:

- *Hypothesis 1*: Tighter integration of IT-business at strategic level has a positive relationship with business performance.

- *Hypothesis 2*: Tighter integration of IT-business at process/operation level has a positive relationship with business performance.

Table 2 below summarises the hypotheses tests.

Table 2: Summary of hypothesis testing

Competitive Advantages or Benefits	Hypothesis 1: ighter integration of IT-business at strategic level has a positive relationship with business performance	Hypothesis 2: ighter integration of IT-business at process/operation level has a positive relationship with business performance
K1	Supported	Not Supported
K2	Not Supported	Not Supported
K3	Not Supported	Not Supported
K4	Not Supported	Supported
K5	Not Supported	Not Supported
K6	Not Supported	Not Supported
K7	Not Supported	Not Supported
K8	Not Supported	Not Supported
K9	Not Supported	Not Supported
K10	Not Supported	Supported

It shows that even though more than 40% of respondents thought that IT could improve customer service (K1), product quality (K4), product/service leadership (K5), revenue gain (K7) and cost saving (K8), the correlation indicated 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, with the exception of product quality (K4) and competitive advantages sustainability (K10), there was no proof to suggest 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).

5. Conclusions

In most cases, ensuring right inputs for the program or services, together with efficient activities and processes and effective outputs and outcomes performance measures is no guarantee for the success of a particular program or service. The recognition of logic before measurement will be a key element in the future success of performance management initiatives. The CSA model aims to provide a logic that integrates all the elements in the performance measures from inputs and processes through to outcome measures.

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