Information Technology Executives’ View on the Factors that Influence the Success of Information Technology Investments

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ABSTRACT

Although information technology investments in business organizations are growing rapidly, IT executives in business organizations have great difficulties in justifying increasing IT spending and in measuring the benefits of these investments. This research study aims to investigate current practices and norms in managing, governing, and evaluating IT investments by IT executives in business organizations. The survey findings revealed that the effectiveness and support of business-to-business electronic commerce did not have a significant positive impact on the use of IT investment evaluation methodologies. The results also suggested that business organizations’ level of IT capabilities is positively related to their level of B2BEC effectiveness, (re)source accessibility, and support. Finally, most of the responding business organizations did not possess a high level of IT capabilities.

INTRODUCTION

Business-to-business electronic commerce (B2BEC) represents the largest growth sector, that is, 80% of revenues - in e-commerce (Pires and Aisbett, 2003). Goldman Sachs’ investment research report on B2BEC has rated Australia as one of the economies best placed to benefit from B2BEC revolution as it will contribute an average of 0.24% annually to Australia’s growth over the next decade (DFAT, 2003). In addition, IDC predicts that Australian business-to-business electronic commerce (B2BEC) spending will grow at 70% annually and is likely to reach A$166.25 billion by 2006 (Pearce, 2002). Information technology (IT) investments in B2BEC are used to assist in the inter-organization acquisition of goods into the value chain and to provide interfaces between customers, vendors, suppliers and sellers (Barua et al., 2004; Kleist, 2003). Although B2BEC provides the organizations a wealth of new opportunities and ways of doing business, it is extremely difficult to evaluate and therefore, have yet to prove enduring sources of profit (Laudon and Laudon, 2004). In particular, organizations often take the short-term view of evaluating their electronic commerce initiatives by only looking at the potential advantages of IT use while at the same time are unaware of the factors that may hinder the benefits attainment in the long term (Quaddus and Achjari, 2003) such as managing the relationship between the justification of the B2BEC initiatives to stakeholders and the level of commitment towards project success (Irani, 2002).

In the past, several research studies often report contradictory findings on the effect of the IT expenditures on organizational productivity (Osei-Bryson and Ko, 2004; Thatcher and Pingry, 2004). Therefore, it is not difficult to see that the measurement of the business value of IT investment has been the subject of considerable debate by many academics and practitioners (Brynjolfsson and Hitt, 2003;
Sugumaran and Arogyaswamy, 2004). Although some IT productivity studies have produced inconclusive and negative results (Shin, 2001; Zhu, 2004), many research indicated that spending in IT is directly related to organizational performance (eg. Hu and Quan, 2005; Serafeimidis and Smithson, 2003). Given the financial stakes involved, determining the impact of IT investment evaluation and benefits realization has been and will continue to be an important research concern for both practitioners and senior managers. Given the complexity of the decisions and the large expenditure involved, better understanding of the basis and practice of IT investment and evaluation in large Australian B2BEC organizations is warranted. Therefore, the aims of this paper are to: (1) investigate the current practices, norms, and difficulties in managing IT benefits and evaluation by large Australian organizations; and (2) examine the IT capabilities level and the degree of satisfaction with the adoption of B2B electronic commerce in large Australian organizations.

LITERATURE REVIEW

Information Technology Investment Evaluation

According to the 2003 SIM survey, measuring the value of IT investment is one of the top five management concerns (Luftman and McLean, 2004). The evaluation of these IT investments is a complex tangle of financial, organizational, social, procedural and technical threads, many of which are currently either avoided or dealt with ineffectively (Love et al., 2005; Mirtidis and Serafeimidis, 1994). There appears to be no consistent evaluation and measurement of IT investment by most organizations (Lin et al., 2005; Tam, 1998). Furthermore, evaluation of IT infrastructure in electronic commerce initiatives such as B2BEC has been shown to be critical to successful implementation (Lewis and Byrd, 2003).

However, the major benefits organizations can gain from IT investments are inherently qualitative and cannot be easily assessed beforehand and calculated in monetary terms (Giaglis et al., 1999). The problem becomes more evident as IT is used to link the supply chain or to change the structure of industries, and costs and benefits have to be tracked across functional and organizational boundaries (Lin et al., 2007; McKay and Marshall, 2004). This is because that the nature of electronic commerce technology makes it harder for organizations to allocate and assign costs and benefits to IT projects, further blurring the lines of capital investment and return from IT spending in the B2B channel (Kleist, 2003; Subramani, 2004). The less precisely bounded environment of B2B electronic commerce technology adds more complexity to the IT measurement problem as this type of investment is physically distributed between suppliers and customers (Torkzadeh and Dhillon, 2002).

Furthermore, many organizations have found that these IT investment costs and benefits can be difficult to estimate and control (Giaglis et al., 1999; Schneider, 2003). For instance, many organizations face a challenge of measuring and monitoring the performance of the specific contribution of inputs in generating outputs as well as its associated Internet channels (Kim and Umanath, 2005; King and Liou, 2004). Moreover, other less quantifiable items such as loyalty, trust, knowledge, brand awareness, relationships, the boundaries of inter-organizational networks, value creation and customer satisfaction all makes the evaluation even more difficult (Straub et al., 2004; Subramani, 2004). Some new and old measures need to be differentially applied for evaluating phenomena such as electronic commerce and the Internet (Standing and Lin, 2007; Straub et al., 2004). Efforts to identify the relationship between the evaluation practices and the organizational constraints and benefits and develop measures for B2B electronic commerce initiatives have been hindered by the lack of necessary conceptual bases (Torkzadeh and Dhillon, 2002).
The inability of many organizations to measure and apply IT both, inter-and-intra organizationally is resulting in missed opportunities and a lack of business value (Standing et al., 2006; van Grembergen and van Bruggen, 1998). Indeed, investigation by Sohal and Ng (1998) found that in large Australian organizations the potential of IT has not been utilized to meet the competitive challenges due to inadequate and inappropriate appraisals/evaluation of the proposed IT investment projects. Moreover, they reported that 45% of the responding organizations did not evaluate whether IT systems were still consistent with business objectives and 59% did not determine whether expected benefits were being achieved. Similarly, Ezingear et al. (1998) reported that half of the organizations did not formally identify expected benefits and justified the IT investment as an act of faith. Some of the major problems associated with IT investment evaluation are:

- Traditional financially oriented evaluation methods (e.g. ROI, NPV) can be problematic in measuring IT investments and quantifying relevant benefits and costs (Bardhan et al., 2004; Willcocks and Lester, 1997);
- There is a lack of understanding of the impact of the proper IT investments evaluation and benefits realization processes in most of the organizations (Lin and Pervan, 2003; Lin et al., 2007);
- It is very difficult to evaluate intangibles and make relationship between IT and profitability explicit (Murphy and Simon, 2002).
- Organizations often have neglected to devote appropriate evaluation time and effort to IT as well as to deal with the extended investment time frame (Stamoulis et al., 2002; Ward et al., 1996); and
- Working with new technology introduces higher levels of risk, which affects timing, costs and delivery deadlines (Peacock and Tanniru, 2005; Seddon et al., 2002).

As noted earlier, the difficulty in evaluation centers on the facts that both benefits and costs are difficult to quantify and inappropriate evaluation data and approaches continue to hamper the researchers (Kohli and Sherer, 2002; Sugumaran and Arogyaswamy, 2004). As a result, evaluation is often ignored or carried out inefficiently or ineffectively because it is deemed an elusive and complex process (Serafeimidis and Smithson, 2003).

**Information Technology Benefits Realization**

IT investment evaluations along are insufficient in terms of ensuring that the benefits identified and expected by organizations are realized and delivered (Ward and Griffiths, 1996). This is because IT is just one enabler of process change (Grover et al., 1998) and it only enables or creates a capability to derive benefits. The essence of benefits realization is to organize and manage so that the potential benefits arising from the use of IT can actually be realized (Ward and Elvin, 1999). Benefits realization and identification are also seen as a function of strategic information systems planning (Changchit et al., 1998). Benefits may be considered as the effect of the changes, the difference between the current and proposed way that work is done (Ward and Griffiths, 1996). Things only get better when people start doing things differently. Indeed, good management of organizational change is important to ensure successful IT evaluation and benefits realization processes (Sherer et al., 2003).

IT cost identification, measurement and control remains a significant challenge for organizations. To overcome this problem, IT projects should be evaluated in the context of accumulated costs and benefits from related initiatives, not solely judged on single initiatives (Galliers et al., 1996). Research by Seddon et al. (2002) and Teo and Ranganathan (2004) indicate that identifying and measuring benefits as the most difficult issue in evaluating IT. In addition, a survey by CIE (Norris, 1996) found that vague statement of benefits, leading to an uncertain allocation of responsibility for managing their delivery, as the number
one cause for IT project failure. Some of the main reasons put forward for the failure to monitor whether 
the projected benefits of IT were being realized by the organizations are:

- A lot of organizations tend to give very little attention to the intangible benefits when investment 
decisions are made (Dehning et al., 2004);
- For most organizations, it is difficult to assess benefits after a project has been implemented as benefits 
are often experienced later (Murphy and Simon, 2002);
- It is too costly to undertake the proper post-implementation reviews on benefits (Norris, 1996).
- A lot of organizations have poor IT adoption practices (Fink, 1998); and
- It is not necessary as the project was implemented according to plan (Norris, 1996).

In addition, organizations have often found it difficult to evaluate them and as a result tend to use 
arbitrary values for assessing benefits. Few organizations have a rigorous benefits realization approach 
and, while much attention is paid to justifying investments, little effort is extended to ensuring that the 
benefits are realized. To determine if the desired IT benefits have been achieved in practice, it is 
necessary to undertake an ex-post evaluation of benefits (Ward et al., 1996). If no measurable effects can 
be identified other than the implementation of the technology itself, then it can be assumed that no 
benefits have been realized (Ward et al., 1996).

Information Technology Capability

Organizations that employ IT benefit realization methodology would be likely to also employ IT 
investment evaluation methodology, but the converse may not necessarily be the case (Lin et al., 2005). 
Organizations that display more willingness to use such processes are more likely to have higher IT 
capabilities (Galliers and Sutherland, 1991). Similarly, organizations which used an IT benefit realization 
methodology may be classified as having high IT capability and those that did not, low IT capability. 
Organizations with high IT capability would be more likely to be able to implement a benefits realization 
methodology while organizations with lower IT capabilities may be less likely to.

Critical Success Factors for B2BEC

Critical success factors for B2BEC adoption are the functions or areas where things must go right to 
ensure successful adoption of B2BEC for an organization. Several ways of identifying such factors are in 
use, including analysis of industrial structure, scanning of environments, industrial expert opinion, best 
practice analysis, analysis of competitors, assessing the internal feeling or judgment of companies, and 
data gathering about profit impact on market strategy (Leidecker and Bruno, 1984; Tsao et al., 2004). The 
literature furnishes many attempts at critical factor identification. For example, Eid et al. (2002) list 
twenty-one and classify them into five categories: marketing strategy, web site, global, internal, and 
external. Hope et al. (2001) and Thatcher and Foster (2003) identify several critical factors related to 
B2BEC adoption such as organizational readiness, enterprise culture, marketing strategy, internal factors, 
information technology, and governmental support.

RESEARCH METHODOLOGY

Research Hypotheses

The current practices of the Australian organizations to manage and evaluate their IT investments and 
their ability to realise the benefits from these investments in an increasingly competitive market are of 
interests to the researchers and senior executives. Thus, one significant aspect of this research is to better
understand the current trends in the effective utilization of IT in Australia. Therefore, there is a pressing need for research to investigate how organizations’ level of IT capability and the adoption of B2BEC affect the use of IT investment evaluation and benefits realization methodologies. The following seven hypotheses are proposed:

**H1:** Organizations with higher level of IT capability will lead to higher level of B2BEC effectiveness.

**H2:** Organizations with higher level of IT capability will lead to higher level of B2BEC (re)source accessibility.

**H3:** Organizations with higher level of IT capability will lead to higher level of B2BEC supports.

**H4:** Organizations with higher level of usage for IT investment evaluation methodology will lead to higher level of usage for IT benefits realization methodology.

**H5:** Organizations with higher level of B2BEC effectiveness will lead to higher level of usage for IT investment evaluation methodology.

**H6:** Organizations with higher level of B2BEC (re)source accessibility will lead to higher level of usage for IT investment evaluation methodology.

**H7:** Organizations with higher level of B2BEC support will lead to higher level of usage for IT investment evaluation methodology.

**Data Collection**

Questionnaires were sent to IT executives of large Australian business organizations. The survey was conducted to investigate many aspects of IT investment evaluation and benefits management processes and practices in large Australian organizations. Specifically, the survey sought to determine: (1) how benefits from IT investments are identified, evaluated, structured, delivered and realized by organizations; (2) what criteria and methodologies are used to evaluate as well as to realize appropriate and adequate benefits; and (3) the level of IT capability and the degree of satisfaction with the adoption of B2B electronic commerce in these large Australian organizations. Respondents were asked to indicate the extent to which they agreed or disagreed with the questions listed in the survey. Two follow-up mailings were then carried out to increase the response rate. In addition, late returns were compared with other response received earlier in order to check for non-response bias (Armstrong and Overton, 1977). No significant differences were detected between two samples.

**Measurement**

Respondents were asked to indicate their agreement with statements concerning six main constructs: (1) IT capability; (2) B2BEC effectiveness; (3) B2BEC (re)source accessibility; (4) B2BEC support; (5) IT investment evaluation methodology; and (6) IT benefits realization methodology. The reliability analysis was conducted on these six main constructs (see Table 1).

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Scale reliability</th>
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<tr>
<td>IT capability</td>
<td>0.87</td>
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<tr>
<td>B2BEC effectiveness</td>
<td>0.86</td>
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<tr>
<td>B2BEC (re)source accessibility</td>
<td>0.73</td>
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<tr>
<td>B2BEC support</td>
<td>0.69</td>
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<tr>
<td>IT investment evaluation methodology</td>
<td>0.86</td>
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<tr>
<td>IT benefits realization methodology</td>
<td>0.88</td>
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*Table 1: Scale reliabilities for the six main constructs*
The IT capability scale was derived from Galliers and Sutherland (1991). The scale was revised into a seven-item measurement and the alpha value for this scale was 0.87, indicating acceptable values of internal consistency (Nunnally, 1978). One measurement item had a low Cronbach’s alpha and was, therefore, deleted from the analysis. This scale measured the IT capability of an organization in terms of its stage of growth for each of the six elements – strategy, structure, systems, style, skills and overall goals.

The B2BEC effectiveness, (re)source accessibility, and support scales were derived from scales used by Chan and Swatman (2000), Choo (1999), Eid et al. (2002), Hope et al. (2001), and Thatcher and Foster (2002). These scales measured the organizations’ B2BEC effectiveness and quality in terms of its (re)source accessibility and support obtained. B2BEC (re)source accessibility is influenced by situational attributes such as time and effort to locate, contact, and interact with them (Choo, 1999).

The IT investment evaluation and benefits realization methodologies scales were derived from Lin et al. (2005), Ward et al. (1996), and Willcocks (1992). These scales measured the organizations’ usage, wide use and effective use of IT investment evaluation methodology and IT benefits realization methodology.

Sample Characteristics

Most of the respondents were from wholesale and retail, government and utilities, construction, mining and engineering, health and pharmaceutical services, education, and manufacturing. These respondents were typically large in revenue and number of employees by Australian standards. Approximately half of the responding organizations had an IT budget of more than A$5 million. The ANOVA not only revealed that annual turnover did significantly vary with firm size in terms of employee numbers ($p < 0.000$), but also found significant differences between annual turnover and the IT budget ($p < 0.000$). This indicates that organizations with larger annual turnover and employees generally could afford to spend more on IT projects.

RESEARCH FINDINGS

In the following discussion of results the percentages referred to normally represent the proportion of valid cases only and did not indicate missing values. SPSS and LISREL (Jöreskog and Sörbom, 1993) were used to analyse the data collected. Most of the information presented below was based on descriptive statistics, but some comparisons between groups were made using one-way ANOVA tests, and Structural Equation Model (SEM).

IT Capability

The respondents were also asked about where they thought their organizations stood in terms of its six stages for each of the six elements (strategy, structure, systems, style, skills, and superordinate goals) as described in Galliers and Sutherland (1991).

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<thead>
<tr>
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<th>E1</th>
<th>E2</th>
<th>E3</th>
<th>E4</th>
<th>E5</th>
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<tbody>
<tr>
<td>Mean Stage</td>
<td>3.7</td>
<td>4.1</td>
<td>3.8</td>
<td>4.5</td>
<td>4.0</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Table 2: Results for IT Capability
Table 2 shows for each element what percentage of organizations is in each stage. It shows that the “average“ organizations were in stages 3-4 most of the six elements, but there was a significant variation. Analysis showed that:

- Most of the six elements (except style and skills) in IT capability and the degree of satisfaction with the adoption of B2BEC were significantly correlated with each other ($p < 0.01$).
- The six elements were significantly correlated with each other ($p < 0.01$). On average, the organizations’ six elements were between stages 3 and 4. Specifically, more than half of the respondents’ strategy, structure, and super-ordinate goals elements were between stages 3 and 4.
- Structure and staff were significantly correlated with number of employees ($p < 0.01$). This indicates that larger Australian organizations had higher level of IT capability in terms of structure than their smaller counterparts.
- All six elements in IT capability and IT budget allocated by the responding organizations were significantly correlated with each other ($p < 0.01$).
- The six elements were generally correlated with both wide use of both IT investment evaluation methodology and IT benefit realization methodology ($p < 0.01$). The results suggested that there was a direct relationship between the wide use of these two methodologies and the IT capability in terms of these six elements.
- All but one of the six elements (except strategy) was significantly correlated with the implementation of both IT investment evaluation methodology and IT benefit realization methodology ($p < 0.01$). The results indicate that there was a direct relationship between the use of these two methodologies and the IT capability in terms of these six elements.

LISREL VIII was used to analyse the model. Each construct in the model was analysed separately and the fit of indicators to the construct as well as construct validity were evaluated to achieve a acceptable fit. The results of the structural equation analysis are shown in Figure 1. The model achieved a acceptable level of fit: $\chi^2(222) = 485.86, p=0.000$, RMSEA=0.083, GFI=0.804, and AGFI=0.756. The level of IT capability positively and significantly affected B2BEC effectiveness at the $\alpha=0.05$ level with a $\beta$ coefficient of 0.32 and $t$-value of 3.64. Thus, $H1$ was supported. The level of IT capability also had a significant and positive impact on B2BEC (re)source accessibility ($\beta = 0.24, t = 2.53$) and B2BEC support ($\beta = 0.51, t = 5.14$). Therefore, $H2$ and $H3$ were also supported.

**IT Evaluation Methodologies**

The results indicated a reasonably high adoption of methodologies for IT investment evaluation (67.6%) and IT benefits realization (41.5%). However, the results also showed that 15.3% had failed to adopt an IT investment evaluation methodology while 32.4% of responding organizations failed to adopt an IT benefits realization methodology. A survey conducted on large organizations in the UK by Ward et al. (1996) indicated that 40.0% and 88.0% of the organizations failed to adopt an IT investment evaluation methodology and IT benefit realization methodology, respectively. The use of IT investment evaluation methodology by the responding organizations is also higher than the findings by a recent survey on Australian SMEs where 32.3% of these organisations failed to use an evaluation methodology to measure their IT projects (Love et al., 2005). This indicates that the usage of both IT investment evaluation methodology and IT benefit realization methodology by large Australian organizations is higher than large organizations in Taiwan and the UK.

In addition, respondents indicated that IT investment evaluation methodology was widely used (selected 4 or 5 out of a five-point scale ranging from “totally disagree” to “totally agree”) in only 50.6%
of cases. However, this percentage is a lot higher than the surveys conducted in large UK organizations (36%) (Ward et al., 1996). Moreover, respondents indicated that benefits realization methodology was widely used in only 29.0% of cases. This result is consistent with findings by the two Australian SMEs studies by Jensen (2003) and Marshall and McKay (2002) where the IT benefit realization methodology was not widely used by virtually all respondents. In terms of effectiveness of those methodologies in ensuring successful information systems, respondents who had methodologies indicated that investment evaluation and benefits realization were effective (4 or 5 out of a five-point scale) in 46.1%, and 32.4% of cases, respectively.

The results of the structural equation analysis supported H4 as there was a direct positive relationship between the use of IT investment evaluation methodology and IT benefit realization methodology (β = 0.81, t = 7.87).

**Degree of Satisfaction with B2BEC**

Overall, only 37.5% of the respondents were satisfied with the use of B2BEC in their business. More than half of the respondents (56.9%) indicated that B2B electronic commerce (B2BEC) had improved the efficiency of their business. B2BEC had also helped them to establish better relationships with their suppliers and buyers (43.7%) and reduce their costs (42.5%). However, nearly half of the respondents (47.5) stated that the implementation of B2BEC had failed to enlarge their market shares.

A closer examination, using LISREL, revealed that B2BEC effectiveness and B2BEC support did not have a significant and positive impact on the use of IT investment evaluation methodology (β = 0.06, t = 0.78 and β = -0.08, t = 79, respectively) and thus, H5 and H7 were not supported. However, the analysis indicated that the path from B2BEC (re)source accessibility to IT investment evaluation methodology is positive and significant (β = 0.30, t = 3.30), suggesting that the provision of more B2BEC (re)source accessibility to Australian large organizations will lead to higher usage of IT investment evaluation methodology. Therefore, H6 was supported.

**CONCLUSION**

The survey results showed relatively high usage of IT investment evaluation and benefits realization methodologies by large Australian organizations. However, these methodologies were generally not used widely and effectively within the responding organizations. Most IT evaluations were carried out to ensure that the expected benefits/objectives were met and the quality of their IT projects were improved. In addition, the structure equation analysis revealed that there was a direct positive relationship between the use of IT investment evaluation methodology and IT benefit realization methodology.

Moreover, most respondents were not satisfied with their use of B2BEC. The results demonstrated that there was a significant positive relationship between the use of IT investment evaluation methodology and the B2BEC (re)source accessibility held by the respondents. It was also found that the level of B2BEC effectiveness and supports did not have a significant relationship with the use of IT investment evaluation methodology. Furthermore, the results indicated that higher level of IT capability can lead to higher level of B2BEC effectiveness, (re)source accessibility, and support. However, the results showed that most of the responding business organizations did not possess a high level of IT capabilities.

Finally, this study took place at a particular point in time. Further research could be conducted to capture opinions of benefits realization and investment evaluation at various phases of an IT projects life cycle. Alternatively, further analysis can be conducted to determine whether or not there are relationships
amongst the satisfaction of adopting B2BEC, the usage of IT investment evaluation methodology and IT benefit realization methodology, and the level of IT capability (e.g. if the level of IT capability can lead to more effective use of IT investment evaluation methodology and/or IT benefit realization methodology).

REFERENCES


