

# An Investigation into Business-to-Business Electronic Commerce Organizations

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*The issue of information technology (IT) investment evaluation in B2BEC (business-to-business electronic commerce) has generated a lot of interest and discussion among academics and researchers. This research was undertaken to investigate the relationships between the level of IT maturity, the use of IT investment evaluation (IEM) and benefits realization (BRM) methodologies, and the degree of satisfaction with the adoption of B2BEC in Taiwanese B2BEC organizations. The results indicated that the level of IT maturity was a strong predictor of the use of evaluation methodologies while the use of evaluation methodologies had a significant impact on the degree of satisfaction with the adoption of B2BEC. It was also found that evaluation methodologies had played a mediating role between the level of IT maturity and the degree of satisfaction with the adoption of B2BEC. Managerial implications and future research directions are also provided.*

*ACM Classifications: H.0. (Information Systems – General), K.6. (Computing Milieux – Management of Computing and Information Systems)*

## INTRODUCTION

Each year, organizations around the world are investing a huge amount of money in information technology (IT). Global IT spending, as forecast by Global Insight, is likely to increase to over US\$3.2 trillion in 2007 (WITSA, 2004). Taiwan, ranked seventh worldwide in terms of effective utilization of IT in 2005/2006 (WEF, 2006), had a total IT spending of US\$6.6 billion in 2001, up

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from US\$2.7 billion in 1993 (MAIT, 2002). The leadership of the electronic manufacturing industry in Taiwan, for example, has actively embraced B2BEC (business-to-business electronic commerce) technology, including recently the use of enterprise resource planning (ERP) software (Foster *et al.*, 2000). In particular, B2BEC spending in Taiwan has reached US\$22.5 billion in 2004 and will increase by 17.6% annually between 2004 and 2008 (Chen, 2004). B2BEC refers to the use of electronic commerce systems and practices between organizations (Standing and Lin, 2007). In other words, B2BEC deals with Internet-based commercial activities between two or more different organizations (Lin and Huang, 2007b). For example, a factory that manufactures a certain electronic component would sell it to another electronic company for assembly, rather than directly to consumers.

However, senior managers have found it increasingly difficult to justify rising expenditures in IT (Hu and Quan, 2005; Willcocks and Lester, 1997). Despite the fact that the ability to harness the potential of IT to gain competitive advantages has been a critical issue for organizations around the world (WEF, 2006), organizations have great difficulties in finding reliable ways to ensure that expected benefits from IT investments are actually realized (Dhillon, 2005). Indeed, 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). Despite large investments in IT over many years, it has been difficult to determine whether or not there is a positive relationship between IT investments and the desired organizational outcomes (Lin *et al.*, 2006; Love *et al.*, 2005; Sugumaran and Arogyaswamy, 2004).

Some researchers e.g. Hitt and Brynjolfsson (1996) and Zhu (2004) take the position that the confusion over the realization of the desired IT outcomes is due to, among other things, lack of use of IT evaluation and benefits realization processes and/or methodologies as well as ineffective or inappropriate use of these methodologies. According to Ward and Daniel (2006) and Zhu (2004), many senior executives still do not understand the importance of the use of IT investment evaluation methodology (IEM) and IT benefits realization methodology (BRM). IEM is more about selecting the IT investments that at the outset seem to offer the greatest benefits and these investments are evaluated throughout the project life cycle at regular intervals (Lin and Pervan, 2003) whereas BRM helps organizations to focus constantly on the expected IT benefits and to ensure that IT investments remain aligned with business goals as well as to make strategic adjustments in resources and manage required changes (Dhillon, 2005; Lin and Huang, 2007a).

In recent years, there is some evidence that organizations with higher levels of IT maturity are more likely to carry out evaluation on their IT investments than those with lower levels of IT maturity (Hackbarth and Kettinger, 2004). Organization's IT maturity relates to an organization's ability to effectively utilize its IT (Galliers and Sutherland, 1991) and adopt business management processes (e.g. IEM or BRM). It is about the balance between the IT being adopted, and the capabilities as well as business management processes used to master and utilize IT within the organization (Auer and Reponen, 1997). It is also about the result of a history of IT performance evaluation and modifications which can lead to improved business management processes as organizations mature (Jiang *et al.*, 2003). In other words, the level of IT maturity may affect the adoption of IEM and BRM which can be used as the tools to evaluate IT investments and realize benefits from IT investments (Galliers and Sutherland, 1991; Lin, Lin, and Tsao, 2005; Lin, Pervan, and McDermid, 2005). According to Kohli and Sherer (2002), the adoption of business management processes such as IEM and BRM can significantly affect the perceived performance of the IT investments, and thus is likely to impact on the degree of satisfaction with the adoption of the new investments (e.g. B2BEC systems).

Therefore, the main objective of this research is to investigate the relationships between the level of IT maturity, the use of evaluation methodologies (IEM and BRM), and the degree of satisfaction with the adoption of B2BEC in Taiwanese B2BEC organizations. In the next section, relevant literature regarding IT maturity and IT investment evaluation and benefits realization is briefly discussed. Following that, three hypotheses are proposed and the research approach used is described. The main section of the paper then discusses the research findings. Research and managerial implications are also presented.

## RELEVANT LITERATURE

### IT Investment Evaluation and Benefits Realization

IT investment evaluation and benefits management efforts regularly run into difficulties. A survey by Seddon *et al* (2002) indicated identifying and measuring benefits as the most difficult issue in evaluating IT. Another survey by PriceWaterhouseCoopers (2003) found that organizations achieved expected benefits between 25% and 75% of the time. Similarly, in their research study, Ezingard *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.

The problem of evaluation has become more complex as the nature of IT investments and the benefits they can deliver have changed rapidly. The less precisely bounded environment of B2BEC technology adds more complexity to the IT evaluation problem as this type of investment is physically distributed between suppliers and vendors, making the evaluation process even more difficult (Kleist, 2003; Lin, Huang, and Tseng, 2007). As a result, formal evaluation processes such as IEM and BRM are necessary to ensure that an organization realized the planned benefits (Tallon *et al*, 2000). However, the use of IEM alone is insufficient in terms of ensuring that the benefits identified and expected by organizations are realized and delivered (Dhillon, 2005; Lin, Pervan, and McDermid, 2007; Standing *et al*, 2006). This is because IT alone does not create benefits, but it is the management process (e.g. BRM) that uses IT to create benefits (Kohli and Sherer, 2002; Lin, Huang, and Lin, 2007). The use of BRM enables organizations to ensure that desired business changes have been clearly defined, and they are measurable and deliverable (Ward and Daniel, 2006).

### Level of IT Maturity and Use of IEM/BRM

Various stages of growth models have been proposed to describe the evolution of organizational information systems e.g. Hirschheim *et al* (1988) and Nolan (1979). Despite some criticism of these models, they provide an insightful organizing framework for thinking about IT change in organizations (Galliers and Sutherland, 1991). These models were developed to determine the effectiveness of an organization in aligning IT with its business goals and processes as well as in achieving its desired IT outcomes. In addition, these maturity models extend organizations' abilities to evaluate and track impacts of IT investments within their organizations (Schuh and Leviton, 2006).

Nolan's (1979) stages of growth model, one of the earliest IT maturity models, is the most well-known model but has attracted criticisms over the years. The revised stages of growth model by Galliers and Sutherland (1991) is meant to overcome some of the limitations by introducing a means of bringing together a range of key elements associated with the operation and management of an organization generally. The revised model of Galliers and Sutherland (1991) can be represented as six stages, each with its particular set of conditions associated with the seven "S" elements which have provided a rich set of conditions upon which an organization can analyze and measure its IT

maturity. The seven elements are strategy, structure, systems, staff, style, skills, and superordinate goals. However, three of the elements (strategy, systems, and staff) were not included in the analysis because they were found not to be good measures of IT maturity for the Taiwanese organizations. The six stages of the revised model are: ad hoc, starting the foundations, centralized dictatorship, democratic dialectic and cooperation, entrepreneurial opportunity, and integrated harmonious relationships. The revised model assesses the organization's capability and readiness to obtain business benefits from IT directly to its level of IT maturity and the results provide crucial information about the organization's ability to effectively utilize IT in order to achieve competitive advantage and business goals.

### Degree of Satisfaction with the Adoption of B2BEC

The degree of satisfaction with the adoption of B2BEC refers to the perception of organizations that the B2BEC systems effectively meet their business demands and expectations (Subramaniam and Shaw, 2002). It is the result of a comparison between organizational expectation of the B2BEC adoption and the perceived performance and capability of the system (Armstrong *et al*, 2005; Castro-Lacouture and Skibniewski, 2005). For example, inappropriate implementation of B2BEC has the potential to cause worsening relationships with suppliers and buyers and can lead to lower organizational satisfaction with the adoption of the system. On the other hand, there is also some evidence that evaluation of IT investments such as B2BEC can lead to better perceived organizational outcomes (Tallon *et al*, 2000). Enhancement of corporate image and development of new business as a result of successful adopting B2BEC are some of the ways in which organizational satisfaction can be improved.

### CONCEPTUAL MODEL AND HYPOTHESES

The organizational perspective views the performance of an organization as depending heavily on the contribution of its existing IT infrastructures which are capable of supporting business management processes to achieve the desired organizational outcome (Banker *et al*, 1998). According to this view, organizations wishing to achieve the desired organizational outcomes (i.e. B2BEC adoption satisfaction) need to closely align their IT infrastructures (i.e. the level of IT maturity) with business management processes (i.e. the use of IEM and BRM) (Byrd *et al*, 2006). In other words, in order for organizations to achieve the desired level of B2BEC adoption satisfaction from IT investments in B2BEC, senior managers have to ensure a clear linkage between business goals, the level of IT maturity, and the use of IT evaluation methodologies (Chan *et al*, 1997). Therefore, this research seeks to test the following three hypotheses:

**H1:** The level of IT maturity is positively related to use of IEM and BRM by organizations.

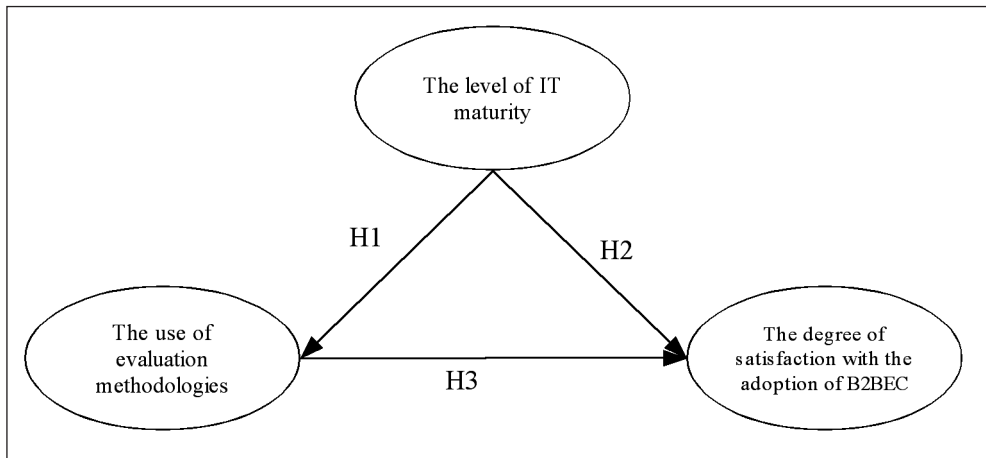
**H2:** The level of IT maturity is positively related to the degree of satisfaction with the adoption of B2BEC by organizations.

**H3:** The use of IEM and BRM by organizations is positively related to the degree of satisfaction with the adoption of B2BEC.

These hypotheses can be represented by the following model in Figure 1.

### RESEARCH METHOD AND DESIGN

This survey targeted Taiwanese organizations involved in B2BEC activities. Prior to determining the sample size for the survey, a pilot survey of IT managers/CIOs of 10 B2BEC organizations was conducted. The response rate for this pilot study was 100% and comments about the questionnaire were all positive. Therefore, the questionnaire was only altered slightly for the main survey.



**Figure 1: Conceptual model: The relationships between the level of IT maturity, the use of evaluation methodologies, and B2BEC adoption satisfaction**

For the main survey, 275 Taiwanese organizations were randomly selected from the top 5000 Taiwanese organizations (which were involved in B2BEC activities) listed by a semi-governmental organization, the Institute for Information Industry (III, 2004). The questionnaire, accompanied by a covering letter to explain briefly the purpose and aim of the survey and a reply-paid return envelope was hand-delivered to the IT managers/CIOs of 275 Taiwanese organizations involved in B2BEC activities (III, 2004). Two follow-up mailings or phone calls were carried out to increase the response rate. A total of 106 questionnaires were returned, giving an overall response rate of 38.5%. Late returns were compared with other responses received earlier in order to check for non-response bias. No significant differences were detected between the two samples.

### Measurement

The survey was conducted to examine the relationships between the level of IT maturity, use of IEM/BRM, and the degree of satisfaction with the adoption of B2BEC in Taiwanese organizations. Respondents were asked to indicate their agreement on a 5-point scale (1 for strongly disagree and 5 for strongly agree) with statements concerning three main constructs: (1) the level of IT maturity; (2) the use of IEM and BRM; and (3) the degree of satisfaction with the adoption of B2BEC. In the absence of objective data on these constructs, the perceptions of IT managers and CIOs were used. Although there has been some debate about the legitimacy of perceptual measures as a proxy for objective measures of IT outcomes (e.g. B2BEC adoption satisfaction), research has succeeded in alleviating some of the concerns by showing that perceptual measures of organizational outcomes have strong positive relationship with more traditional objective measures (Boynton *et al*, 1994; Grover *et al*, 1998).

Prior to analysis, data were screened for possible response sets, outliers, and missing or out-of-range values. One questionnaire containing several missing values was discarded, giving a total of 105 questionnaires for analysis. Next, missing values were estimated with the EM-algorithm in the missing value analysis (MVA) module in SPSS 11 ( $p=0.812$ ) (Arbuckle, 1996). The reliability analysis (alpha) was conducted on these three main constructs. Cronbach's alpha and measurements for all constructs are provided in Table 1 with all above 0.70 indicating an acceptable reliability for

	S.D.	V1	V2	V3	Alpha <sup>a</sup>	CR <sup>b</sup>
V1 Level of IT maturity	1.08	<i>0.50<sup>c</sup></i>			0.76	0.80
V2 IT investment evaluation and benefits realization methodologies	2.82	0.484**	<i>0.50<sup>c</sup></i>		0.89	0.75
V3 Degree of satisfaction with adoption of B2BEC	3.30	0.300**	0.291**	<i>0.50<sup>c</sup></i>	0.89	0.80

\*p< .05; \*\*p< .01; \*\*\*p< .001

<sup>a</sup> Internal Consistency Reliability Cronbach’s coefficient alpha.

<sup>b</sup> Composite Reliability (Fornell and Larcker, 1981).

<sup>c</sup> The diagonal (in italics) shows the average variance extracted (Fornell and Larcker, 1981) for each construct.

**Table 1: Correlation Matrix for Variables**

the measures (Nunnally, 1978). Table 1 presents the descriptive statistics and Pearson correlation for the variables used in this study. There was no evidence of multicollinearity in the data as the coefficients were all under 0.50.

The *level of IT maturity* scale was based on Galliers and Sutherland’s Revised Stages of Growth Model (Galliers and Sutherland, 1991). The scale was revised into a four-item measurement and the alpha value for this scale was 0.76, indicating acceptable values of internal consistency (Nunnally, 1978). This scale measured the IT maturity of an organization in terms of its stage of growth for each of the four elements – structure, style, skills and super-ordinate goals. The other three elements (strategy, systems, and staff) had very low Cronbach’s alphas and were, therefore, deleted from the analysis.

The *IT investment evaluation methodology (IEM) and IT benefits realization methodology (BRM)* scale was adapted from Ward *et al* (1996). The scale measured the use of IT investment evaluation methodology and IT benefits realization methodology by organizations seeking to adopt B2BEC. The scale has three items and the alpha values for the scale was 0.89. The IEM and BRM scale measured the wide use of these methodologies and the evaluation process that links IT projects with business objectives.

The *degree of satisfaction with the adoption of B2BEC* scale was derived from Tsao *et al* (2004). The scale has four items and the alpha value for this scale was 0.89. The scale measured the benefits obtained through the adoption of B2BEC. According to Tsao *et al* (2004), adoption of B2BEC, for example, can help the organizations to enhance better corporate image, establish better relationship with suppliers, and develop new business opportunities.

## Data Analysis

All measures were analyzed for reliability and validity in accordance with the guidelines set out by Anderson and Gerbing (1988) and Jöreskog and Sörbom (1993). The reliability of these constructs was evaluated using Cronbach’s coefficient alpha ( $\alpha$ ) and their  $\alpha$  values were all above 0.7, indicating a reliable measurement instrument (Nunnally, 1978). In addition, three types of validity were assessed to validate our measurement model: content validity, convergent validity, and discriminant validity. Content validity was established by ensuring consistency between the measurement items and the extant literature. This was done by interviewing IT managers and pilot-testing the instrument before sending out the main survey. Churchill (1979) has suggested that convergent and discriminant validities should be examined for construct validity. Therefore, we



assessed convergent validity by examining composite reliability (CR) and average variance extracted (AVE) from the three constructs (Hair *et al*, 1998).

CR is calculated by squaring the sum of loadings, then dividing it by the sum of squared loadings, plus the sum of the measurement error whereas the AVE measures the variance captured by the indicators relative to measurement error. Our CR values of the three constructs were between 0.75 and 0.80 and all are above the suggested minimum of 0.70 (Hair *et al*, 1998). Their AVE values were all 0.50 and these values provided further evidence of convergent validity (Fornell and Larcker, 1981) (please refer to Table 1). These AVE values could also be used to assess discriminant validity (Fornell and Larcker, 1981) which was evident in the results of this study as AVE values for three constructs were higher than the largest squared pairwise correlation between three constructs (0.23) (Espinoza, 1999).

The other way to evaluate construct validity is to examine the pattern and structure coefficients in determining whether constructs in measurement models are empirically distinguishable (Chin, 1998). The factor loadings of each measurement item should be consistent across subgroups and load higher on the construct of interest than on any other constructs (Chin, 1998). Results presented in Table 2 demonstrate adequate discriminant and convergent validity.

Both SPSS 11 and Amos 5 were used to analyze the survey data. SPSS was used initially to obtain some descriptive data and SEM (Structural Equation Modeling) using Amos 5 was then applied to estimate direct and indirect effects for the model (Figure 1). SEM is a multivariate technique that examines a series of dependence relationships simultaneously (Arbuckle, 1996). A two-step SEM approach was followed to first evaluate the quality of the measurement items and then estimated the structural model (Hulland *et al*, 1996). All variables within the model were

Construct	Item Name	Items Description	V1	V2	V3
V1 IT Maturity	Mat1	Structure	<b>0.692</b>	0.416	0.132
V1 IT Maturity	Mat2	Style	<b>0.587</b>	0.353	0.112
V1 IT Maturity	Mat3	Skills	<b>0.729</b>	0.438	0.140
V1 IT Maturity	Mat4	Superordinate goals	<b>0.677</b>	0.407	0.129
V2 Evaluation Methodologies	Evaluat1	Process linkage between IT projects and business objectives	0.413	<b>0.687</b>	0.219
V2 Evaluation Methodologies	Evaluat2	Effective use of IT investment evaluation methodology	0.580	<b>0.965</b>	0.307
V2 Evaluation Methodologies	Evaluat3	Effective use of IT benefits realization methodology	0.551	<b>0.917</b>	0.292
V3 Satisfaction	Sat1	Overall satisfaction with B2EC usage	0.158	0.263	<b>0.826</b>
V3 Satisfaction	Sat2	Enhancement of corporate image	0.159	0.264	<b>0.830</b>
V3 Satisfaction	Sat3	Establishment of stronger linkage with suppliers/buyers	0.174	0.290	<b>0.910</b>
V3 Satisfaction	Sat4	Development of new business opportunities	0.136	0.227	<b>0.713</b>

Table 2: Measurement item loadings

regarded as separate reflective measures. The model (Figure 1) was run as a structural model. It was found that the direct path between “the level of IT maturity” and “degree of satisfaction with the adoption of B2BEC” (H2) was weak and not significant and so was removed from the model. The revised model (Figure 2) had achieved a good fit of the data and the resulting fit indexes indicated that the measurement model fitted the data well:  $\chi^2 = 40.99$  (42 degrees of freedom),  $p = 0.52$ , root mean square error of approximation (RMSEA) = 0.00, Goodness-of-Fit Index (GFI) = 0.93 and Adjusted Goodness-of-Fit Index (AGFI) = 0.89.

The value of (Chi-square/degree of freedom) is less than 3 (Chin, 1998) and the GFI is above 0.90 (GFI=0.93) (Hair *et al*, 1998). In addition, the RMSEA value is less than 0.05, implying good model fit (Sharma, 1996). Moreover, the ranges of all factor loadings and the measurement errors were acceptable and significant at  $\alpha = 0.01$ , which provided evidence of convergent validity.

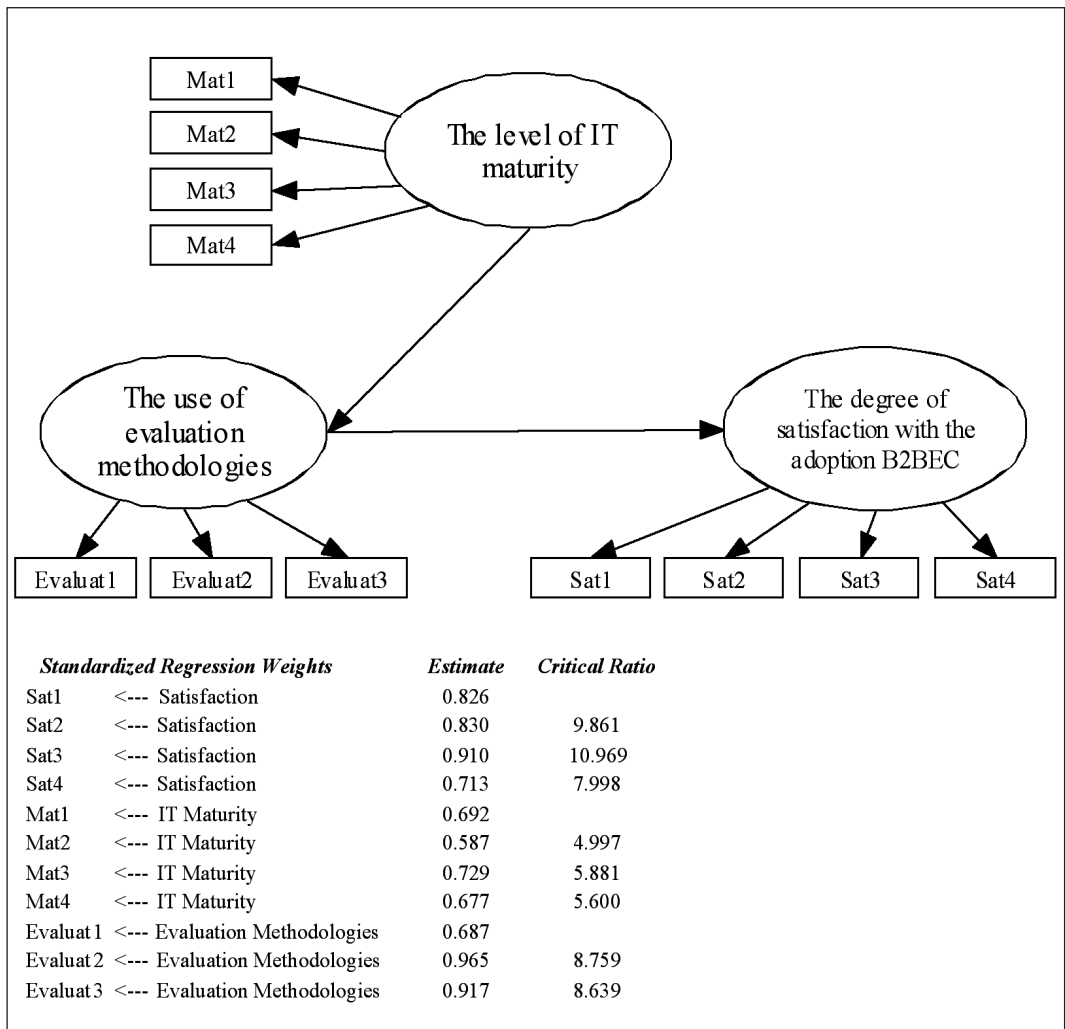


Figure 2: Final model of IT evaluation



**RESULTS AND DISCUSSION**

**Background Information**

Most of the information presented in this section was based on descriptive statistics, but some comparisons between groups were made using one-way ANOVA tests and correlation statistics. Table 3 provides background information collected from the responding organizations for the postal survey.

Most responding organizations involved in B2BEC were from manufacturing (54.7%), retail and services (24.5%) and IC designs and semi-conductor (9.5%) industries. The figures here are not surprising given that B2BEC is more widely diffused in the manufacturing sector than other sectors

<b>Range</b>	<b>Percent (%)</b>	<b>Standard Deviation</b>
<b>(a) Industry sectors</b>		N/A
Manufacturing	54.7	
Retails and Services	24.5	
IC Designs and Semi-Conductor	9.5	
Information Technology Services	3.8	
Optics and Electronics	1.9	
Financial Services	1.9	
Transportation	1.9	
Other	1.8	
<b>Total</b>	<b>100</b>	
<b>(b) Net revenue (US\$m)</b>		1.467
<1 (=1)	42.5	
1-10 (=2)	10.0	
11-100 (=3)	17.5	
101-500 (=4)	20.0	
501 and above (=5)	10.0	
<b>Total</b>	<b>100</b>	
<b>(c) Spending on B2BEC (US\$m)</b>		0.700
<0.01 (=1)	64.0	
0.02-0.49 (=2)	20.0	
0.50-0.99 (=3)	12.0	
1 and above (=4)	4.0	
<b>Total</b>	<b>100</b>	
<b>(d) Total number of employees</b>		1.461
<49 (=1)	29.3	
50-249 (=2)	25.2	
250-999 (=3)	17.2	
1000-4999 (=4)	12.1	
5000 and above (=5)	16.2	
<b>Total</b>	<b>100</b>	

**Table 3: Background information of the responding organizations**

in Taiwan (Chen, 2003). In addition, the responding organizations were almost evenly divided between multinational and national. Half of the responding organizations had less than US\$10 million in net revenue and 250 employees. Only 1% of responding organizations had spent more than US\$1 million on B2BEC. Moreover, the responding organizations were mostly flat (68.3%) and centralized (58.3%), and almost evenly divided between divisional/functional and cross-functional structure. The ANOVA revealed that net revenue did not significantly vary with firm size in terms of employee numbers, but significant differences were found between net revenue and the spending on B2BEC ( $p < 0.00$ ). This indicates that organizations with larger revenue generally can afford to spend more on B2BEC.

Respondents were asked about the usage of formal IT investment evaluation (IEM) and benefits realization (BRM) methodologies for various IT activities and revealed a reasonably high adoption of methodologies for IT investment evaluation (52.8%) and IT benefits realization (52.8%).

The ANOVA revealed that organizations tend to adopt either both methodologies or none at all. However, 47.2% of responding organizations failed to adopt an IT investment evaluation methodology or an IT benefits realization methodology. Therefore, overall, their use was found to be commonplace but by no means universal. In particular, the level of usage of IT investment evaluation methodology and IT benefits realization methodology by respondents were significantly correlated (0.849).

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 only 31.2%, and 29.2% of cases, respectively. The level of effective use of IT investment evaluation methodology was significantly correlated with the effective use of IT benefits realization methodology (0.885).

Overall, the IT investment evaluation and benefits realization methodologies were not effective in ensuring successful information systems. Moreover, the usage of these methodologies was not significantly correlated with the size of the organizations in terms of both the net revenue and employee size. The results from this study and other similar studies are summarized in Table 4. The result is interesting when compared with other studies carried out in Australia and the UK. The table shows that while the usage of IEM by Taiwanese organizations is lower than organizations in Australia and the UK, the usage of BRM is quite high among the responding organizations in Taiwan. In addition, Taiwanese organizations are more likely than UK and Australian organizations to prepare benefits delivery plans and hold formal processes to ensure that lessons are learned and benefits are identified and realized after IT implementation. However, it should be noted that the UK studies are from the early-mid 1990s and further UK research is needed to update their conclusions and validate these comparisons.

### Discussion of the Model

As anticipated, the level of IT maturity was positively related to the use of evaluation methodologies ( $\beta = 0.60$ ,  $p < 0.01$ ). This suggests that the level of IT maturity had a significant impact on the effective use of IT investment evaluation and benefits realization methodologies. In addition, the level of IT maturity can also affect the organization's ability to implement a formal evaluation process to link IT projects and organizational business objectives. This provides full support for **H1**.

**H2**, which predicted that organization's the level of IT maturity could affect the degree of satisfaction with the adoption of B2BEC, was not supported. The relationship was not significant and it appeared that without adopting other business management processes (e.g. use of evaluation

methodologies) the level of IT maturity alone could not significantly affect the B2BEC adoption satisfaction within the responding organizations.

On the other hand, B2BEC adoption satisfaction was positively influenced by the use of evaluation methodologies ( $\beta = 0.32, p < 0.01$ ). This shows that the effective adoption of IT investment evaluation and benefits realization methodologies and a formal evaluation process to ensure the linkage between IT projects and organizational business objectives could have significant impact on the degree of satisfaction with the adoption of B2BEC. Thus, **H3** was supported.

The level of IT maturity was a strong predictor of the use of evaluation methodologies while the use of evaluation methodologies had a significant impact on the degree of satisfaction with the adoption of B2BEC. It was also found that there was no direct relationship between the level of IT maturity and the degree of satisfaction with the adoption of B2BEC. This confirms that the use of IT investment evaluation and benefits realization methodologies had played a mediating role between the level of IT maturity and the degree of satisfaction with the adoption of B2BEC. The level of IT maturity could only directly impact on organization's ability or capability to effectively utilize IT evaluation processes but not on the degree of satisfaction with the adoption of B2BEC.

Questionnaire Items	This Study	Love <i>et al</i> (2005)	Lin and Pervan (2003)	Ward <i>et al</i> (1996)	Willcocks (1992)
	Taiwanese Organizations	Australian SMEs	Large Australian Organizations	Large UK Organizations	UK Organizations
Usage of:					
• IT investment evaluation methodology (IEM)	52.8%	67.7%	65.7%	60%	>50%
• IT benefits realization methodology (BRM)	52.8%	–	32.8%	12%	–
Effective use of:					
• IEM	31.2%	–	–	–	–
• BRM	29.2%	–	–	–	–
Current process was able to identify relevant benefits	46.2%	–	50.0%	78.0%	–
Overstated the benefits in order to get approval	47.7%	–	26.2%	47%	–
Prepared a benefits delivery plan	60.4%	45%	43.0%	27%	–
Had a formal process to ensure that lessons were learned	65.1%	20.8%	52.3%	29%	44.0%
Had a formal process to identify and realize any further benefits after implementation	61.3%	–	18.2%	19%	–

Table 4: Summary of findings from this study and other similar studies

## CONCLUSIONS AND IMPLICATIONS

The results from this survey on Taiwanese B2BEC organizations show relatively high usage of IT investment evaluation and benefits realization methodologies. However, these methodologies were generally not used effectively within the responding organizations when compared with organizations from other countries such as UK and Australia (Table 4). The SEM results have also shown that the level of IT maturity had significant impact on the use of evaluation methodologies while the use of evaluation methodologies had a positive relationship with the degree of satisfaction with the adoption of B2BEC. However, it was also found that the level of IT maturity had no significant relationship with the degree of satisfaction with the adoption of B2BEC. This had revealed that the use of IT evaluation methodologies had a mediating role between the level of IT maturity and B2BEC adoption satisfaction.

The findings have some implications for senior managers. The IT investment evaluation and benefits realization methodologies have a direct bearing on the B2BEC adoption satisfaction since understanding and measuring the IT investments in B2BEC has a positive impact on the degree of satisfaction since stakeholders realize the value being delivered by their B2BEC systems. Therefore, it is necessary for senior managers to ensure that these evaluation processes are fully understood and properly carried out. Alternatively, if organizations are not in a position to properly carry out these evaluation processes, more should be done to improve the level of IT maturity. Higher levels of IT maturity will enhance organizations' ability and willingness to undertake evaluation processes which will, in turn have a direct positive impact on B2BEC adoption satisfaction. In light of the recent interest in IT investments in B2BEC, it is critical for senior IT managers to exercise greater control and authority over their B2BEC investments and ensure that the required levels of IT maturity and IT evaluation methodologies are appropriate in order to improve their organizational B2BEC adoption satisfaction which will have a great impact on organizational performance and outcomes.

Based on our findings we also recommend that organizations should focus on making IT evaluation processes an integral part of their business management strategy. They should conduct an assessment of the IT available so that features and benefits can be readily identified and matched with the strategic vision of the organization. This can be done, for example, by developing an IT Strategic Impact Grid (Nolan and McFarlan, 2005) to identify how much it relies on IT for operations and competitive edge through B2BEC providing new value-added services and products, and then locate them as defensive or offensive IT users and hence determine appropriate strategic modes for improving their levels of IT maturity and the use of evaluation methodologies. Using this, organizations can further refine their evaluation plans or processes and determine if sufficient B2BEC adoption satisfaction and expected organizational outcomes exist (Ash and Burn, 2003; Nolan and McFarlan, 2005). Therefore, in order to achieve the desired organizational outcomes, organizations can adapt the appropriate organizational culture that is supportive of adopting IT infrastructures and other business management processes (Hackbarth and Kettinger, 2004).

Finally, some limitations in this research also need to be acknowledged. The views expressed in the survey responses are of a single individual from the responding organization and perhaps those interested in the research topic may be more likely to complete and return the questionnaire. Those replying may be more likely to carry out evaluation and be satisfied with their evaluation processes than the average non-respondent. Moreover, our study took place at a particular point in time. Further research could also be conducted to capture opinions of respondents on benefits realization and investment evaluation at various phases of an IT projects life cycle and also in terms of other critical success factors for IT investment evaluation. Alternatively, our study could be replicated in

a few years' time to examine how IT benefit realization and investment evaluation have changed and are being managed in light of new emerging e-commerce technologies.

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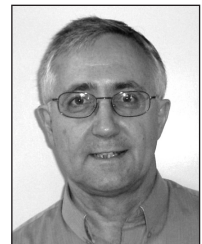
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