

Effects of Contingent Factors on Relationship between Information Technology Investment and Organizational Performance

ณัฐสัมพันธ์ เต่าพันธ์

Abstract

This study explores the development of research models which were developed in order to improve our standing of the relationship between investment in information technology and the subsequent benefit (or loss) to an organization's performance. Due to the elusive nature and contradictory findings in much of the research in this field, the proposed model was developed and tested empirically. Results of data analysis are presented and discussed. Findings suggest that IT investment has not significantly positive relationship to organizational performance. Findings also show that only human resources variable as a contingent factor is a reliable predictor of organizational performance.

Introduction

Academics have been interested in information technology (IT) evaluation since the beginning of the 1970s (Lubbe and Remenyi, 1999). Information technology has long been considered critical for effective management (King, 1978). Therefore, expenditure on IT has been growing at a rapid pace in the last decade (Anandarajan and Wen, 1999). Organizations that invested a large amount of money in IT presumed that such investments could improve their performance and increased their competitive advantage by lowering costs, enhancing

differentiation (Porter and Millar, 1985), or enhanced effectiveness and efficiency in all types of organizations (Weber and Pliskin, 1996). As the organizations have improved their ability to manage and deploy IT, researchers and practitioners are seeking to better understand the relationship between investment in IT and organizational performance (Byrd and Marshall, 1997).

Several studies have attempted to the effectiveness of an IT investment. Research focusing on information technology investment and the resulting impact on organizational performance is prevalent, yet inconclusive

* ดร. ผู้อำนวยการหลักสูตรบริหารธุรกิจมหาบัณฑิต สาขาพาณิชย์อิเล็กทรอนิกส์ บัณฑิตวิทยาลัย มหาวิทยาลัยศรีปทุม

(Kauffman and Weill, 1989). Kauffman and Weill (1989) reviewed thirteen such empirical studies and founded that many of the studies showed little evidence that IT investment created strong leverage on the value of the firm, i.e., net benefits did not appear to always exceed net costs. Results of the impact of investment in IT on an organizational Performance are showed in Table 1.

Inconsistent results of past research led Smith and McKeen (1993) to suggest the need for a better model with which to assess information technology impact on business value. Smith and McKenn (1993) suggested that the effectiveness of IT was not considered in previous studies as the critical mediating variable. They modified the fundamental research question from "What is the impact of investment in IT on an

Table 1 : Summary of The Relationship between IT Investment and Organizational Performance

Study	Sample data	Results
Cron & Sobol (1983)	138 medical wholesalers	Firms with heavy computer usage are strong or weak performers
Strassmann (1985, 1990)	38 companies	No relationship depending on strategic position
Bender (1986)	132 insurance companies	IT expense associated with high or low performers
Loveman (1988)	60 SBUs from MPIT database	The relationship is not significant
Weill (1989, 1992)	33 manufacturing firms	Performance depends on type of IT investment
Alpar & Kim(1990)	127 retail Banks	Inconclusive
Floyd& Wooldridge (1990)	Banking	Product IT has significantly positive associated with performance
Harris & Katz (1991)	40 insurance firms	Profitable firms spend more on IT and system development
Mahmood & Mann (1993)	Computerworld " Premier 100" list for 1989	Weak relationship
Hitt & Brynjoffson (1996)	Manufacturing firms	IT expenses have no relationship with profit but positive with firm output
Tam (1998)	4 NIES	IT investment was not correlated with total shareholder return
Ko & Osei-Bryson (2004)	Health care firms	The impact of IT on productivity is not uniform but is contingent on other complementary factors

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Objectives of the Study

A relationship between IT investment and organizational performance may be conditional on one or more contingent factors. The association between IT investment and organizational performance may be strong at one level of the contingent factors, but weak at another (Xiao. et al., 1997) This study explores the evolution and development of research models which were developed in order to understand the relationship between investment in information technology and the subsequent benefits (or loss) to and organization's performance. The study tries to identify contingent factors and determine the factors on which the relationship between IT investment and organizational performance is conditional.

Research Questions

The critical question of this study is whether IT investment actually has any effects on organizational performance. The underlying notion of this study is that an investment in IT is expected to yield positive performance effects. IT is a crucial part of an organizational environment. Therefore, it is important to integrate IT with any other components of organization. It may be that what determines the outcome is not how much is spent on IT, rather

how well it is utilized. Two organizations with the same amount of IT expenditure may have very different levels of performance if one organization uses IT more effectively and efficiently than the other. Therefore, it is possible that management ability confounds the relationship between IT investment.

This study sought to answer the following research questions:

1. What is the relationship between IT investment and organizational performance?
2. What firm characteristics are associated with strong positive relationship between IT investment and organizational performance?
3. Do contingent factors that effect organizational performance overwhelm the effects of IT investment levels?

Theoretical Framework

In the context of organizational impacts of IT, alternative perspectives lead to different dependent variables and suggest the use of different theoretical tools for the study of these impacts.

This study asserts that an appropriate evaluation of the relationship between IT investment and organizational performance should be based on a contingency perspective. The contingency perspective proposed in this study assumed that the degree and pattern of the impact of IT in different organizations is

conditional on factors such as the characteristics of the environment, the organization, and management. This study will use a contingency theory to integrate organizational theory findings into an information processing view of the firm. Contingency theory states that organizations should be viewed as open systems interacting with, and affected by, the surrounding environment. Contingency maintains that organizational survival or performance depends on the content of fit or alignment between organizational structures and factors such as environmental conditions, technology, and strategy (Galunic and Eisenhardt, 1994). This means that investment alone in IT cannot guarantee positive returns. Many factors have been identified as being associated with organizational performance. Organizations should also manage their portfolio of IT investments to achieve such returns. A proper fit between the complexity of task technology and the information processing activity of an organizational unit will result in high unit performance. Moreover, the impact of IT on organizational performance should be studied in a context. The impact of IT may vary from one organization to another since a particular organization operated within its own environmental context which differs from that of any other organization's. For example, it is possible to suggest that decreased centralization is more likely to be effective when an organization competes on service, but less likely to be effective when focused on a cost-minimization strategy.

Therefore, the study in this area should not focus on a single contingency. The association between IT investment and organizational performance may be strong at one level of the contingent factor(s), but weak at another. The theoretical framework for this study can be divided into three components as shown in Figure 1.

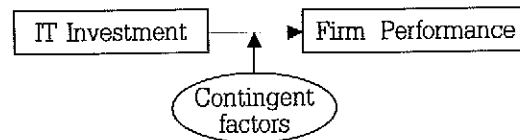


Figure 1. Theoretical Framework

The theoretical framework for this study can be seen as having three components: IT investment, organizational performance, and contingent factors. Three interrelated procedures can be involved:

1. collecting data on IT investment, firm performance, and contingent factors;
2. examining the relationship between IT investment and organizational performance, and
3. specifying the relationship between IT investment and organizational performance by reference to one or more contingent factors.

Research Model

For the purposes of this study a complete and a reduced research model will be tested. The reduced model is illustrated in Figure 2, while the complete model followed in Figure 3.

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Compared to previous research where only a direct link between IT investment and organizational performance was investigated, the proposed model introduces a chain of two mediating variables: Human resources and business resources.



Figure 2 Reduced Model

The reduced model was developed in order to allow the isolation of the mediating variables when testing the research hypotheses which are central to this study. The reduced model includes both IT investment and firm performance.

Resources of a firm can be defined as any long-lived productive capacity. Successful organizations must be able to integrate the IT resource and other resources in making strategic decision. This study will focus on human and business resources as the core dimensions underlying performance of the firm.

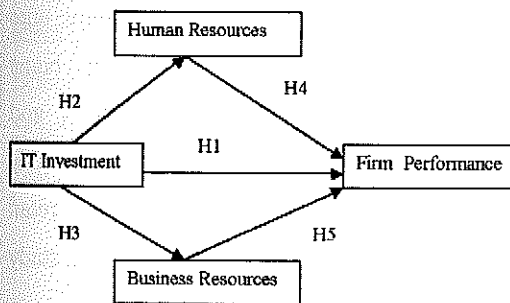


Figure 3. Complete Model

Research hypotheses

Five hypotheses are formulated as follows:

1. H1: There is a negative or no correlation between IT investment and organizational performance
2. H2: There is negative or no correlation between IT investment and human resources
3. H3: There is negative or no correlation between IT investment and business resources
4. H4: There is negative or no correlation between Human resources and organizational performance
5. H5: There is negative or no correlation between business resources and organizational performance

Operationalization and measurement of the variables

Items measuring the variables were derived from an extensive review of past research on the organizational impact of IT.

Organizational performance (OP)

Subjective performance measures have been widely used in organizational research (Dess, 1987, Lawrence and Lorsch, 1967, Powell, 1992), and are often preferred to financial statement data, since a firm may adopt varying accounting conventions in areas such as inventory valuation, depreciation, and officers' salaries (Powell and Dent-Micallef (1997). As a test of the contingent validity of the financial performance measures,

Powell and Dent-Micallef (1997) found that return on sales (ROS) correlated significantly with the subjectively derived from financial performance measures. This suggests that although the accounting and subjective measures were not identical, the accounting measures did constitute a key element of the respondents' subjective assessments. Top management officials were asked to indicate on 7-point Likert scale how his or her firm performed relative to the industry average or to other firms in the same market during the last five years.

Human resources (HR)

According to Powell and Dent-Micallef (1997), Organizational human resources consist of six dimensions: open organization, open communications, consensus, CEO commitment to IT, flexibility, and IT/strategy information. All variables were measured using 7-point Likert scale.

Business resources (BR)

According to Powell and Dent-Micallef (1997), business resources consist of six dimensions: supplier relation open organization, open communications, concensus, CEO commitment to IT, flexibility, and IT/strategy information. All variables were also measured using 7-point Likert scale.

IT investment

Determining an appropriate measure of IT investment of the firm has been one of the greatest challenges for IS researchers (Brynjolfsson,

1993; Mahmood and Mann, 1993; and Weill, 1992). Some researchers used single measures while other researchers have used multiple measures to represent total IT investments. This study adopted a scale from Weill (1989) which assessed the IT investment as a percentage of the total sales.

Data collection

In IT business value research, most studies suggested that IT measurements must be made at the firm level using measures currently used by top managers (Altinkemer et al, 1998). Because top managers possess the needed information and they are assumed to desire to know more about the effectiveness of the investment in IT. Therefore, this study gathered data from a sample of top managers. The survey method was carried out by collecting data from a sample of SMEs of retailing located in suburban and metropolitan areas. Their names were obtained from the Department of Commercial Registration, Thailand.

Retailers are divided into eight categories: building material and nurseries, department and variety stores, food stores, auto parts dealers, apparel stores, furniture and home furnishings, eating and drinking places, and miscellaneous store. The sample of this study allows for at least 30 observations per retail category. Therefore, the sample size for this study will be more than 240 retail firms.

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Table 2. Multiple performance

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Table 1. correlation Matrix

	IT investment	HR	BR	organizational performance
IT investment	-	.203*	.234*	.191
HR		-	.349*	.310*
BR			-	.138

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

Table 2. Multiple Regression Analysis (MRA) between the independent variables and organizational performance

Variable Entered/Removed			
model	Variables Entered	Variable removed	Method
1	HR	BR, IT investment	Stepwise

Model Summary					
Model	R	R ²	Adjusted R ²	F change	Sig. F Change
1	.328	.107	.094	8.070	.006**

Results

The research data were analyzed in two stages. First Pearson correlation was used for testing the hypotheses. Second, Multiple regression Analysis was used to examine the effect of all independent variables : IT investment, human resources, and business resources on an organizational performance. The results are showed in Table 2.

From the results in Table 1, IT investment has significantly positive relationship to human resources and business resources. But IT

investment shows a weak correlation to organizational performance. The results from Table 2 also show that only human resources variable is a reliable predictor of organizational performance.

Conclusions and Future Research suggestions

This study used financial performance to assess the benefits of IT. The results found that IT investment is not significantly associated with financial performance, which corroborates prior findings. On the other hand, the study found stronger performance relationships for human

resources than for IT investment. Human resources namely open organization, open communications, consensus, CEO commitment to IT, flexibility, and IT/strategy information, are the most important factor to improve organizational performance. Organizational performance is affected by a multitude of factors, the impact of IT is felt in areas not directly affecting common

measures of firm performance. Therefore, to understand the combined impact of all independent variables on firm performance, future research need to expand more contingent factors such as organizational structure, uncertainty environment, business strategies. It may lead to solutions that would solve specific managerial problems relating to IT.

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