A Synthetic Assessment of E-business for SMEs' in Taiwan

Jr-Jung Lyu
National Cheng Kung University
E-Mail: jlyu@mail.ncku.edu.tw

Yu-Chih Huang
Tainan University of Technology
E-Mail: t00232@mail.tut.edu.tw

Shu-Chi Li
National Cheng Kung University
E-Mail: r7895103@mail.ncku.edu.tw

ABSTRACT

The adoption and implementation of e-business by small and medium sized enterprises (SMEs) in Taiwan has become increasingly important in order to stay competitive. Due to the disparities between industries and the differing maturity levels of e-business, SMEs must apply diverse strategies and activities to deploy their e-business projects. Employing questionnaire surveys and interviews, this study demonstrates that management, process innovation, and resource infusion play a major role in the performance of Taiwanese SMEs to implement e-business, and, therefore, have the potential to promote e-business growth. Results revealed that implementation of cost reduction along with revenue increments during the midterm of the e-business project had good benefits. The factors of management, process innovation, and resource infusion were statistically significant and this implies that they have positive influences on e-business when applied in different industries.

Keywords: E-Business, Small and Medium Sized Enterprises (SMEs)

INTRODUCTION

The emergence of the Internet has augmented the speed of globalization, liberalization, and digitization in the industries around the world. The tide of Internet-usage brought a digital economic revolution, furthermore creating an unprecedented

economic shock wave to small and medium sized enterprises (SMEs). An enterprise is categorized as an SME if it has less than 200 employees or fixed capital amounting to less than NT\$ 80 millions. In Taiwan, over 97% of enterprises are SMEs, which account for around 50% of exports. Apparently, SMEs present a significant contribution to the economic development in Taiwan. However, due to limited capital resources, scarcity of informational experts, and inexperienced employees to maintain the information system, SMEs hesitated to collaborate with business partners in the aspects of information, business, logistic and cash flows. However, with the assistance from information technology (IT) service companies, SMEs began to recognize the importance of e-business and took action to gradually implement it.

Since the progress of developing e-business strategies in SMEs is influenced by the industries' characteristics and the degree of the e-business environment's maturity, various strategies are adopted to develop an e-business procedure. Managers of SMEs can therefore adjust their e-business strategies to accommodate the dynamic business environment.

This paper investigates related issues, including the level of maturity in e-business environments, and the key points and strategies of e-businesses among different industries. The benefits of e-businesses cooperating with IT service companies are explored as well. The results provide an excellent reference regarding SMEs and IT service assistance with the goal of utilizing e-business.

INFORMATION SERVICES ON SMES

According to the AMI-Partners survey (AMI-Partners, 2004), the number of SMEs in the world would increase from 77,460 thousand in 2003, to 87,000 thousand in 2008 (as shown in Table 1). The highest concentration of SMEs was in the Asia Pacific Zone (excluding Japan), 35.7% in 2003, and would rise to 37.7% in 2008, due to rapid growth in the number of SMEs in the developing Asian countries (China, India and Russia). The AMI-Partners survey also showed that the requirements of IT assistance were quite distinct in the different regions. Purchasing the IT equipments, such as computer or server, were the primary expenses of many developing Asian countries. Enterprises in North America and Western Europe made the highest priority to upgrade their computers and servers and bought new devices, such as the web phone and wireless LAN.

Nevertheless, the CIO magazine found that most companies in America had a very similar arrangement on the IT investment (as shown in Table 2). A different arrangement between SMEs and large enterprises is that SMEs strengthen e-commerce and large enterprises want to optimize supply chain. Since, IT executives are casting a wide IP network and potential return on investment for large enterprises (Horwitt, 2004).

Table 1 The Number of SMEs in the World

Region	2003		2008	
	Number of SMEs (thousand)	%	Number of SMEs (thousand)	%
Japan	1,680	2.17%	1,820	2.09%
Asia Pacific Zone (Excluding Japan)	27,660	35.71%	32,850	37.76%
Eastern Europe, Central Europe and Africa	14,190	18.32%	16,050	18.45%
Western Europe	13,480	17.40%	14,100	16.21%
Latin America	1,177	1.52%	12,630	14.52%
North America	8,680	11.21%	9,550	10.98%
Total	77,460	100%	87,000	100%

Source: AMI-Partners, 2004/7

In order to investigate the objectives and benefits of information applications, Forrester chose 540 SME companies in North America and investigated IT managers. The study found that to 'increase labor's efficiency' and to 'enhance the quality of products and the process' of production are the most valuable applications for benefit in Figure 1. However, it did not have significant benefits to 'reach new customers and keep old customers', or to 'provide new innovative products or business models' and allow 'business process re-engineering' to occur (Forrester, 2006).

The above-mentioned result also reflected that the highest expectation of SMEs was to enhance their efficiency by using IT. SMEs desired to obtain effective rewards from their IT investments.

Table 2 The Priority of Technology Investment for American Enterprises

Priority	Small-sized Enterprise	Middle-sized Enterprise	Large-sized Enterprise
1	Integrate/upgrade system and process	Integrate/upgrade system and process	Integrate/upgrade system and process
2	Ensure data security and integrate	Ensure data security and integrate	Ensure data security and integrate
3	Redesign/rationalize IT infrastructure	Redesign/rationalize IT infrastructure	Redesign/rationalize IT infrastructure
4	Manage customer relationship	Manage customer relationship	Manage customer relationship
5	Strengthen e-commerce	Strengthen e-commerce	Optimize supply chain

Source: CIO Magazine, 2004/12

Although abundant research in e-business has been conducted in the past, relatively little attention has been paid to investigating e-business implementation in Taiwan's SMEs.

As Internet applications and e-commerce functions grew vigorously, related topics such as BPR (Business Process Re-engineering), e-Marketing, CRM (Customer Relationship Management), ERP (Enterprise Resource Planning), logistics and channels became increasingly important. Therefore, McKay developed a "Stages of growth for e-business (SOGe)" model to explain the progression of e-business in the context of Australian SMEs. The SOGe model could diagnose and evaluate the current position of e-business, and provide insight and guidance on the future progression and direction of e-business (McKay, Pranato, and Marshall, 2000). The growing stages of SOGe have three important features. First, managers can assess the current stage of companies through the SOGe analysis, allowing them to identify their future symptoms. Second, they can extract the key points from similar problems in the same growing stage of organizations. Third, they can analyze the characteristics of the growing stages of SOGe and provide remedies to handle the symptoms.
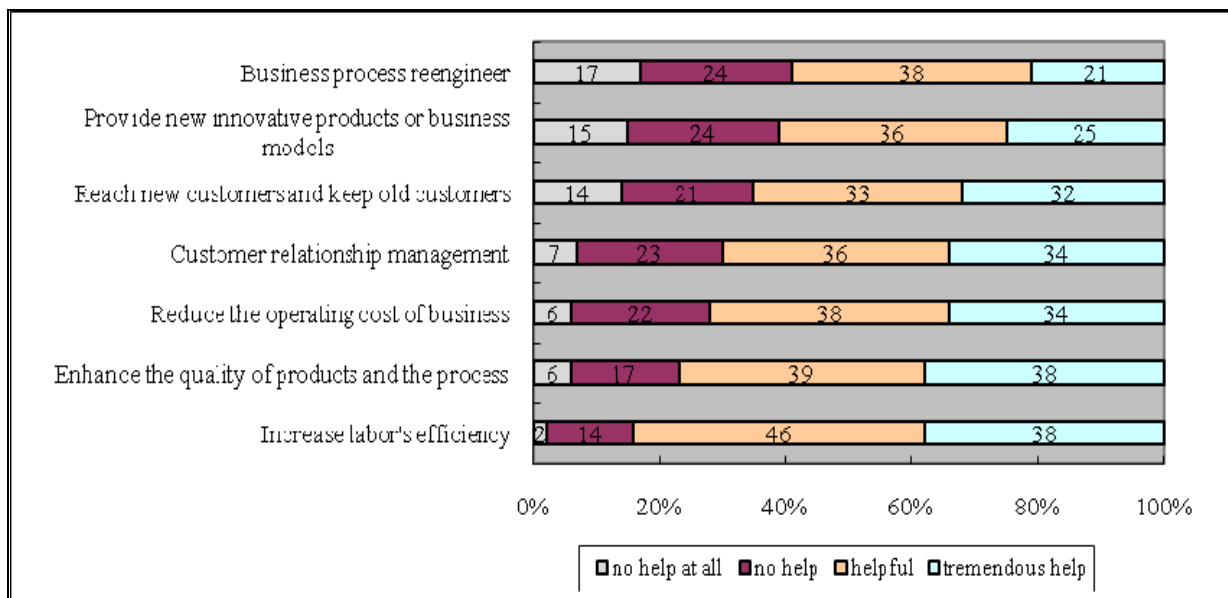
Source: Forrester, 2006
Data Collection: IMC-IDEAS-FIND

Figure 1 The Benefits of Information Applications

HYPOTHESES

This research first discussed the influences of e-business on different industries, and various scales of enterprises. Subsequently, in order to obtain the strategies and applications in 'managing and innovation', 'e-business fund', the five-point Likert-

scales questionnaire and interviews were adopted. This article also explored the relationships amid management, process innovation, and resource infusion. Figure 2 depicts the framework of the hypothesized model.

The development of SMEs e-business sector is still in the initial stages and SMEs try to figure out a general model to follow, but no suitable model has been found yet. So, when encountering the difficulty in promoting e-business, the participants will often be disappointed and frightened. The main purpose of the research was to analyze whether or not different industries and scales had any impact on the current e-business management. Meanwhile, it also explores the influences upon management, process innovation, and resource infusion of e-business. This research consists of five null hypotheses:

Hypothesis 1: Different industries have no different influences in the e-business operational model.

Hypothesis 2: Different scales of enterprises have no different influences in the e-business operational model.

Hypothesis 3: Different styles of leadership and management have no different influences in the e-business operational model.

Hypothesis 4: Processes of innovation have no influences in the e-business operational model.

Hypothesis 5: Different levels of resource infusions have no influences in the e-business operational model.

METHODS

The sample survey in this study involved both a questionnaire and interview-data collection methods. The questionnaire was written in Chinese. In Oct./Dec. 2006, questionnaires were used to survey the seven industry e-business program (200 participants). The interviews were conducted by visiting the consultant or information service provider (ISP). The visit was performed to collect the primary information for this study, using the following protocols:

1. A qualitatively structured interview questionnaire was used during a visit to collect primary data.

2. Many conversations via e-mail were processed, and receiving of secondary data from interviewees.

3. In each case the focal point of contact was the senior level IT/IS project manager, but other project team members and users were also interviewed.
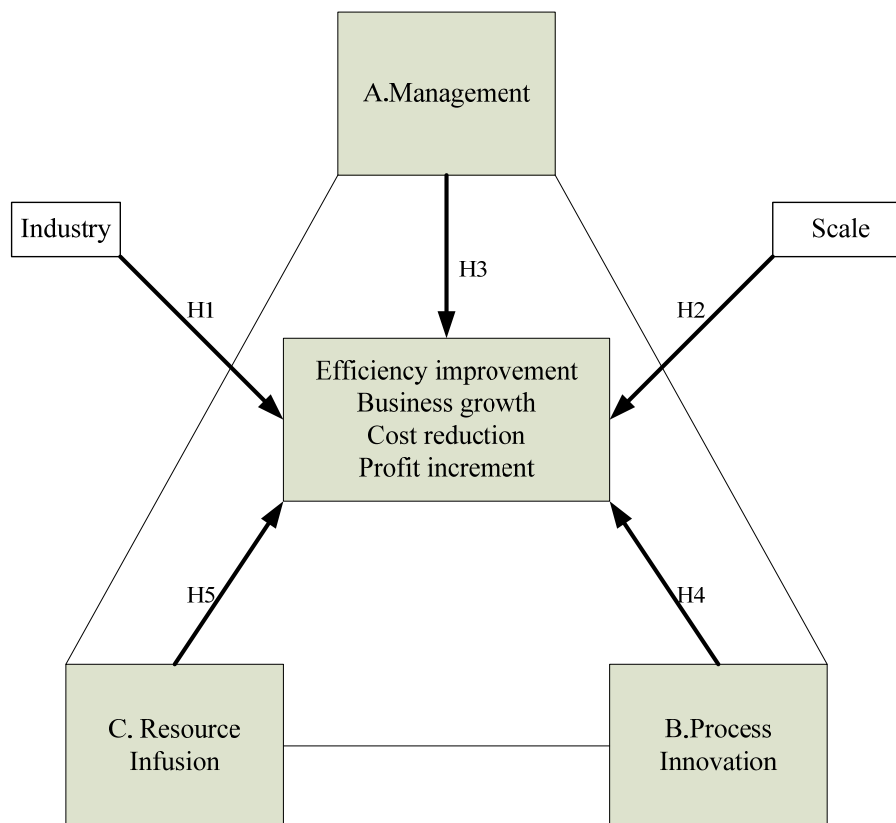
Figure 2 The Hypothesized Model

In this research, the following industries have been surveyed:

Case 1: Chain store of food industry: food industry with chain store

Case 2: Furniture industry: furniture manufacturers

Case 3: Taiwan tea industry: tea manufacturers

Case 4: Textile and clothing industry: textile and clothing manufacturers

Case 5: Mechanical equipment industry: mechanical equipment manufactures

Case 6: Printing industry: printing services

Case 7: Green electric machinery industry: electric machinery manufacturers with "green" investment and produce environment friendly products

The case study analysis (Yin, 2003) was chosen to investigate the research questions concerning the complex phenomenon of e-business implementation projects. Senior e-business project managers or owners were questioned about "the benefits and barriers arising from implementing their e-business projects onto the Internet"; "the e-business changed the management and working behaviors"; "the process innovation is efficient and businesslike", and so on.

RESULTS

During a three-month survey, 200 questionnaires were distributed and 124 valid responses were received, 62% of the net response rate.

In accordance with the type of system implementation, it can be classified into the ASP (Application Service Provider) and customization. It surveys 200 manufacturers, including 120 manufacturers of ASP and 80 manufacturers of customization. In this study, the collected data was analyzed by using SPSS 10.0.

Interview feedback also indicated the importance of environmental conditions for e-business change. For example, the capability to share information and knowledge, importance of the supply chain management, as well as the activities of change management teams were all deemed highly important, but also problematic.

Results of Hypothesis Testing

The numbers of employees is used to distinguish the scale of the enterprises. Respondents show, 0-5 employees is 40% (49); 5-20 employees is 26% (32); 20-50 employees is 22% (27); 50-200 employees is 10% (13); 200 employees or more is 2% (3).

51% of enterprises did not have an information department. Nearly 44% of enterprises had 1-5 information employees, 4% of enterprises had 6-10 information employees. Only 1% had more than 11 information employees. The results show that there is a lack of information personnel for most enterprises.

In e-business, quantity indexes involve cost reduction and revenue increments. In lowering costs, over 80% of the enterprises had good performance to reduce the related cost, as shown in Figure 3. Figure 4 shows that there is a good benefit in the revenue increments during the midterm of the e-business project implementation. E-business is expected to reduce operating costs since electronic information ends to be more accurate, timely and easily available. Another benefit of e-business could be the higher efficiency obtained in business transactions due to fast and accurate processing of information.
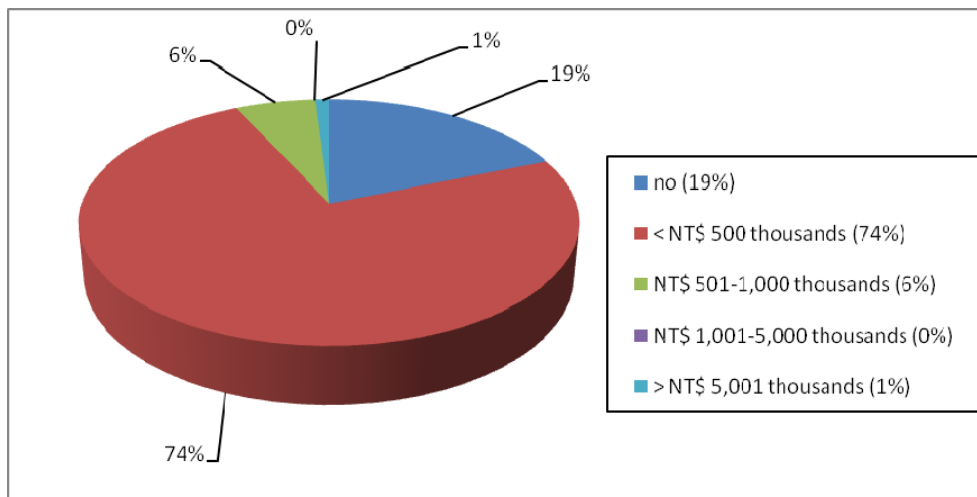
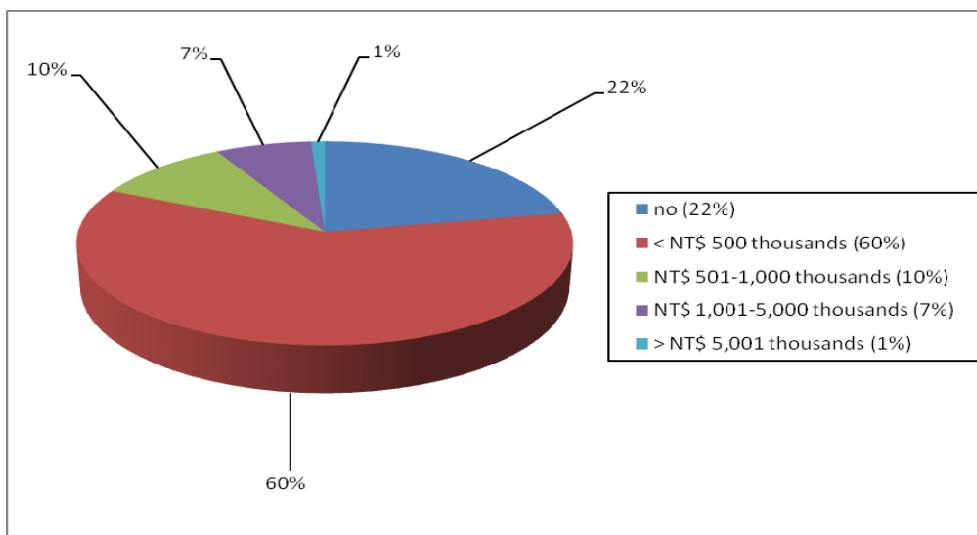Figure 3 The Performance in the Cost Reduction

Figure 4 The Performance in the Revenue Increments

This research applies analysis of variance (ANOVA) to analyze the influences among the current e-business situations and three characteristics: management, process innovation, and resource infusion.

Hypothesis 1: Different industries have no different influences in the e-business operational model.

The F value in Table 3 is 4.566, so Hypothesis 1 is rejected. The result shows that different industries have a set of specific requirements in e-business implementation. In this study, Green electric machinery industry sees itself "as competing in a very dynamic environment with ever changing technology, customer tastes, and supplier relationship" (Fan et al., 2000)

Table 3 ANOVA: industries vs e-business operational model

Effect					(thousand NT dollars)
	Sum of squares	Degrees of freedom	Mean square	F value	Significance
Between groups	2366.404	7	338.058	4.566	.000
Within groups	8588.717	116	74.041		
Total	10955.121	123			

Hypothesis 2: Different scales of enterprises have no different influences in the e-business operational model.

Table 4 shows that the scales of enterprises do not affect the enterprises' inclination to pursue efficiency and benefits of e-business implementation. Hypothesis 2 is henceforth accepted.

Table 4 ANOVA: the scales of enterprises vs e-business operational model

Effect					(thousand NT dollars)
	Sum of squares	Degrees of freedom	Mean square	F value	Significance
Between groups	424.187	4	106.047	1.198	.315
Within groups	10530.9347	119	88.495		
Total	10955.121	123			

Hypothesis 3: Different styles of leadership and management have no different influences in the e-business operational model.

Top management support is a significant factor in influencing the effectiveness of the information system functionality in an organization (Ragu-Nathan et al., 2004). In this paper, the result in Table 5 indicates that there are significant effects among styles of leadership and management for e-business. Hypothesis 3 is thus rejected. Hence, the top managers' support, and their commitment to be involved with the e-business implementation project are the critical success factors.

Table 5 ANOVA: the styles of leadership and management vs e-business operational model

Effect					(thousand NT dollars)
	Sum of squares	Degrees of freedom	Mean square	F value	Significance
Between groups	5507.699	22	250.350	4.642	.000
Within groups	10530.9347	101	53.935		
Total	10955.121	123			

Hypothesis 4: Processes of innovation have no different influences in the e-business operational model.

This hypothesis examines whether or not the operational processes of organizations, customer's and supplier's information, and the attitude of process innovators has an influence on e-business. The result in Table 6 displays that the processes of innovation have significant influences on SMEs e-business. E-business is a powerful driver of process innovation (Davenport, 1993).Furthermore, information technology plays an important role for the business objective of cost reduction, time elimination, and so forth. Thus, the processes of innovation are an important factor for SMEs e-business implementation.

Additionally, e-business has the potential to redefine the existing business activities and to re-evaluate the way in which they do business. It has capabilities in re-engineering business processes across the boundaries between suppliers and their customers.

Table 6 ANOVA: process innovation vs e-business operational model

Effect					(thousand NT dollars)
	Sum of squares	Degrees of freedom	Mean square	F value	Significance
Between groups	6477.388	15	431.826	10.415	.000
Within groups	4477.733	108	41.460		
Total	10955.121	123			

Hypothesis 5: Different levels of resource infusion have no different influences in the e-business operational model.

Table 7 ANOVA: the levels of resource infusion vs e-business operational model

Effect					(thousand NT dollars)
	Sum of squares	Degrees of freedom	Mean square	F value	Significance
Between groups	6546.869	25	261.875	5.822	.000
Within groups	4408.252	98	44.982		
Total	10955.121	123			

After analyzing the related results, 80% of enterprises attain cost reduction and revenue increment via the initial e-business activities. The ANOVA in Table 7 shows that different levels of resource infusion have a significant influence in the current e-business operational model.

A particular issue which arose is the "technology fit" to be of paramount importance in adopting an enterprise information system. In this perspective, technology is only half of the picture.

Table 8 The correlation analysis of business situations and e-business implementation

		Effect	Group A	Group B	Group C
Effect	Pearson correlation	1.000	.659**	.693**	.671**
	SIG.(2-TAILED)		.000	.000	.000
	N	124	124	124	124
Group A	Pearson correlation	.659**	1.000	.868**	.709**
	SIG.(2-TAILED)	.000		.000	.000
	N	124	124	124	124
Group B	Pearson correlation	.693**	.868**	1.000	.710**
	SIG.(2-TAILED)	.000	.000		.000
	N	124		124	124
Group C	Pearson correlation	.671**	.709**	.710**	1.000
	SIG.(2-TAILED)	.000	.000	.000	
	N	124	124	124	124

**: Correlation is significant at the 0.01 level (2-tailed)

According to the correlation analysis in Table 8, it is evident that the implementation of e-business has a positive effect on the current business situation. The correlation analysis of the current e-business management displays that three classes, group A (management), group B (process innovation), and group C (resource infusion), have positive correlations in improving efficiency, business growth, and cost reduction paired with profit increment. Their coefficient correlations are 0.659,

0.693, and 0.671 respectively, all of which are close to strong positive correlations at the significant level of 0.0001. Therefore, there is a high level of reliability in measuring respondents' perceived e-business implementation. In addition, the result also shows positive correlations among three compositions: management, process innovation, and resource infusion. Through the quantification and factor analyzations, e-business implementation shows a significant positive influence in different industries. The factors of management, resource infusion, and process management are also significant influences on the efficiency improvement of SMEs e-business implementation. Figure 5 and Table 9 present a summary of our findings.

Table 9 Summary of Findings

Hypothesis Number	Result	Explanation
H1	Rejected	Different industries have different influences in the e-business operational model.
H2	Accepted	Different scales of enterprises have no different influences in the e-business operational model.
H3	Rejected	Different styles of leadership and management have different influences in the e-business operational model.
H4	Rejected	Processes of innovation have influences in the e-business operational model.
H5	Rejected	Different levels of resource infusions have no influences in the e-business operational model.

CONCLUSIONS AND FUTURE RESEARCH

A synthetic assessment of SMEs' e-business implement is important and valuable. Each industry does not have the same operational complexity. Instead, they have different enterprise scales and various IT systems requirements in e-business implementation. Thus, each enterprise has its own unique strategies to implement e-business. This research can provide guidance to managers, researchers, educators, and government planers, etc.

To summarize, the superior benefits of cost reduction and revenue increments are present throughout the midterm of the e-business project implementation. The factors of management, process innovation, and resource infusion are imperative and provide momentous positive influences through e-business implementation in different industries.

It is believed that a more in-depth study is needed to generate a richer understanding of how the SMEs can use the e-business implementation to plan their

business processes and improve their overall performance. Furthermore, the advanced research can exploit whether industrial clustering has any effects on e-business of different industries. Therefore, if SMEs observe the trend of e-business in other enterprises, they will uncover evidence pointing to the positive effects on competitiveness and profitability originating from the e-business development, and to implement e-business within their operation as well.
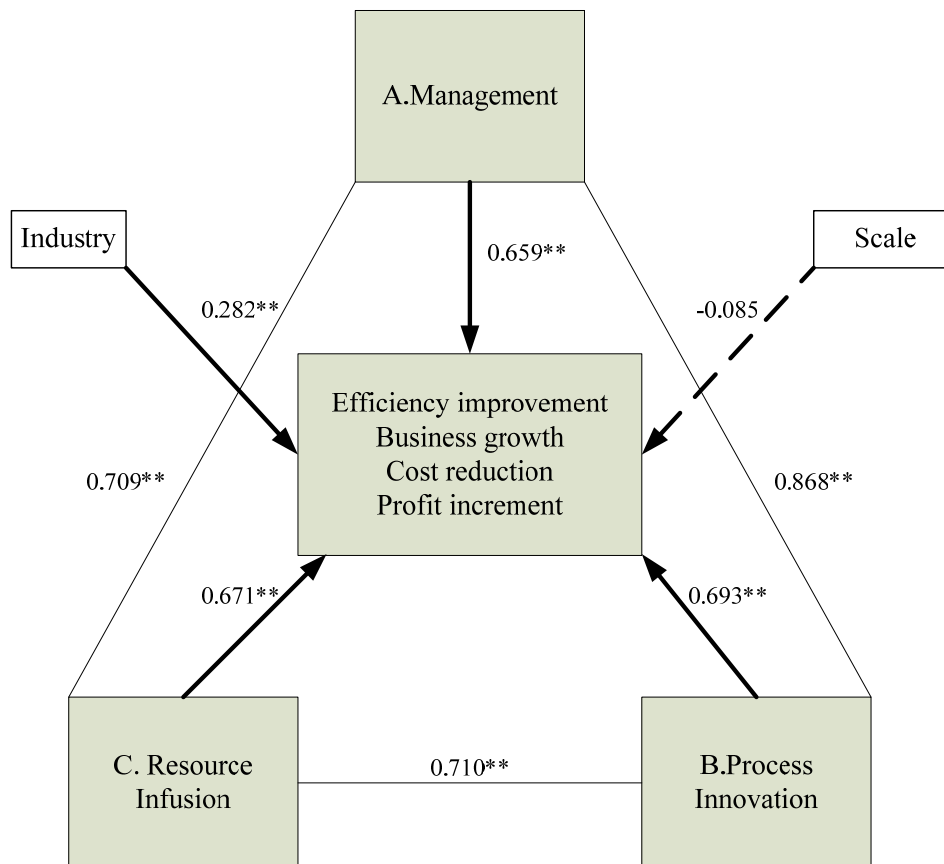

Figure 5 The Correlation Analysis and Hypothesis Testing Results

REFERENCES

Access Markets International Partners. (2004). The SMB global model. Retrieved March 16, 2007, from http://www.ami-partners.com/ami/default.aspx/

Davenport, T.H. (1993). *Process innovation: Reengineering work through information technology*. Boston, MA: Harvard Business School Press.

Fan, M., Stallaert, J., & Whinstion, A. B. (2000). The adoption and design methodologies of component-based enterprise system. *European Journal of Information Systems*, 9, 25-35.

Forrester Research. (2006). 2006 IT Spending In The SMB Sector. Retrieved March 16, 2007, from http://www.forrester.com

Horwitt, E. (2004). Dawning of the converged IP Network. *CIO Magazine,* Dec. 1, 2004. Retrieved March 16, 2007, from http://www.cio.com/

McKay, J., Pranato, A., & Marshall, P. (2000). E-business maturity: The SOG-e model. Proceedings of the 11th Australasian Conference on Information Systems (ACIS), 6-8 December, Queensland University of Technology, Brisbane, Australia.

Ragu-Nathan, B. S., Apigian, C.H., Ragu-Nathan, T.S., & Tu, Q. (2004). A path analytic study of the effect of top management support for information systems performance. *Omega*, 32, 459-471.

Yin, R. K. (2003). *Case Study Research: Design and Methods (3rd ed.)*. Thousand Oaks, CA: Sage Publications.