

THE RELATIONSHIP BETWEEN INFORMATION TECHNOLOGY, PROCESS INNOVATION AND ORGANIZATIONAL PERFORMANCE

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Abstract

The importance of information technology to current business practices has long been drawn the attention of practitioners and academicians. This research analyses the relationship between the usage of information technology adoption, process innovation, and performance at the organization. Data for the empirical investigation originates from a sample of the technology based companies in Malaysia. It was decided to focus the study on the Information, Communication, and Technology (ICT) companies located at Technology Park Malaysia designated as cyber cities under Multimedia Super Corridor (MSC). These researches are produced the following output: new findings and knowledge that benefited the researchers and managers in organizations that emphasize the strategic importance of information technology adoption, process innovation and organizational performance. The study provided empirical evidence of information technology adoption on process innovation and organizational performance. The results suggest that there is a good relationship between information technology adoption on process innovation and performance of the organization.

Keywords: Information Technology, Process Innovation, Organizational Performance

INTRODUCTION

Information technology as the formulation of technology architecture was to provide the real competitive benefits for the business organizations. To take full advantage of emerging technologies that are likely to be important to the firm one must develop a supra-architecture that is an established path for the future information technology and application into the firm's framework. The relationship between the firm and its use of information technology is developed through several layers of planning. The entrepreneurial orientations of business organizations, the extent to which they engage in adoption of information technology are associated with organizational performance. Future success for business organization lies in the premises that "planning improves performance." However, the adoption of information technology into the business environment requires a different set of techniques by business organizations to plan for future success reflected in higher organizational performance. Theoretical research suggests that effective planning forces senior managers to take a top down view to uniquely appropriate business and information technology to employ to for the business organization.

The importance of new technologies and innovations for competitiveness and growth is a truism among managers, policy makers, and researchers. However, not all new technologies and innovations lead to success. Given the manifold technological opportunities and types of innovations from which firms can potentially choose, it is desirable to know which innovative activities and technologies are most clearly associated with improved competitiveness and growth. Arguably even more important is an understanding of the factors that make the success of new technologies and innovative activities more or less likely in general. Information technology provides an opportunity for business to improve their efficiency and effectiveness, and even to gain competitive advantage (Benjamin et al., 1984; Porter & Miller, 1985; Earl, 1989; Thong & Yap, 1995). There are many reported cases in the information systems literature of the positive contribution of information technology to large businesses. With the decreasing cost and ever more powerful user-friendly microcomputers and standard software packages, today the benefits are accessible even to the smallest business.

Contemporary firms are making significant investments in information technology to align business strategies, enable innovative functional operations and provide extended enterprise networks. These firms have adopted information technology to foster changes in managing customer relationships, manufacturing, procurement, the supply chain and all other key activities (Barua & Mukhopadhyay, 2000; Agarwal & Sambamurthy 2002; Chen & Tsou, 2007) and to enhance their competitive capabilities (Sambamurthy *et al.* 2003). A number of information systems researchers have posited information technology as an important ingredient of innovation development (Corso & Paolucci 2001; Dewett & Jones 2001; Xu *et al.*, 2005). Firms implement information technology to enhance and/or enlarge the scope of their products and services. As many innovation activities involve adding new services, expanding existing ones and/or improving the service delivery process, the success of an organization hinges on how well it implements its service innovation (Berry *et al.*, 2006) to create new markets. Good innovation practices help enhance a firm's competitive advantage (Bharadwaj *et al.*, 1993; Afuah 1998;). However, there is little theoretical work on the development of nomological relationships among information technology, service innovation and competitive advantage. Systematic empirical investigations of these relationships are also scarce and no dominant pattern has emerged (Preissl, 1999). To address these gaps and advance understanding of information technology adoption and specific service innovation practices, explored information technology adoption as a coordination mechanism (Galbraith 1973; Dedrick *et al.*, 2003), which has led to changes in innovation-related activities.

This study is to examine whether information technology significantly impacts the core strategies and organization of companies to the extent that it should be considered as the primary means of initiating innovation or development. The study is looks at ICT Companies located at Technology Park Malaysia from small to large scale and explores the effective applications of technology and how they are changing markets and industries. The study also points out the developing challenges for companies in utilizing the technology.

The general research questions for this study are to seek the relationship between the information technology, process innovation, and performance at the organizational level. This study is motivated and guided by the following research questions:

- a. Is there a relationship between information technology adoption and process innovation?
- b. Is there a relationship between information technology adoption and information technology performance?

The broad objective of this study is to analyse the relationship between the information technology, process innovation, and performance at the organizational level. This research will have the following specific objectives:

- a. To investigate the relationship between information technology adoption and process innovation.
- b. To investigate the relationship between information technology adoption and information technology performance.

Information Technology

Swanson (1994); Chen & Tsou (2007) suggested that information systems innovation among organizations can be categorized into three distinct types: innovations that occur within the information systems function (Type I), at the individual user or work group level (Type II) and at the organizational level (Type III). Consistent with the perspective of Type III innovations, we discuss and analyze information technology adoption at the organizational level and conceptualize information technology adoption based on four elements in Scott Morton's (1995) MIT90 model. The terms of the four elements are slightly modified as information technology infrastructure, strategic alignment, organizational structure and individual learning, without losing the original meanings. Another element in the MIT90 model, management process, is considered separately and discussed specifically with regard to service innovation, to investigate its relationship to the other elements.

Process Innovation

Process innovation refers to the introduction of a new production method that includes a novel way of handling a commodity commercially (Schumpeter 1934) and can be applied to the entire value chain process, including manufacturing, data processing, distribution and service (Zaltman *et al.*, 1973). Adopting information technology may have positive impacts on internal operational processes as well as external cross-enterprise processes that integrate other organizational and supply chain processes (Joglekar & Yassine, 2002).

The adoption of information technology enhances a company's response to customer demands with shorter delivery times (Jackson, 1990) and enables customers to monitor their deliveries (Tinnilä & Vepsäläinen, 1995). Externally, companies can not only improve delivery speed and progress visibility, but also take advantage of information technology in designing or modifying new service processes (Avlonitis et al., 2001), such as using Web or mobile services for customer information inquiry and consultation, enriching multi-channel purchasing features and enhancing after-sale services. Internally, information technology may enhance service development capabilities and administration efficiency to shorten product design time, reduce the number of prototypes that must be built, cut costs, improve quality (Karagozoglu & Brown, 1993) and foster better collaboration, communication and coordination among project members (Ozer, 2000).

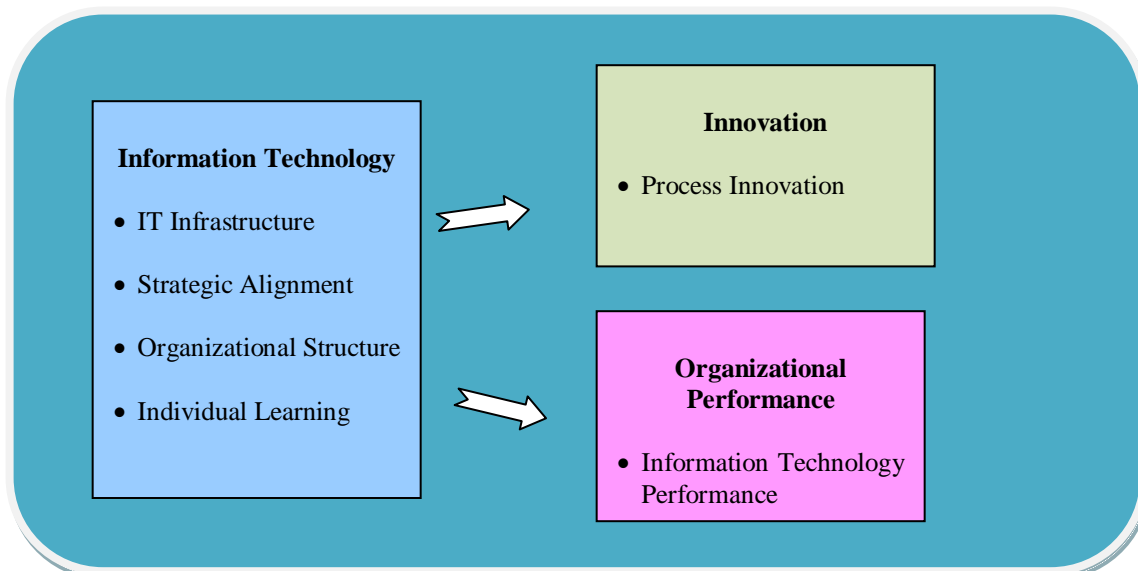
Information Technology Performance

Despite the enormous directed to advanced information technologies during recent years, demonstrating the effects of such investments on organizational performance has proven to be extremely complex. Over the years, several research studies have responded to this challenge by investing the impact of information technology on financial performance (Julio, 2008) by adopting diverse conceptual, theoretical, analytical approaches; and by employing various methodologies at multiple level of analysis. But empirical studies that have examined information technology payoffs have generally reported conflicting and inconclusive findings. More recent firm-level studies are optimistic with respect to the contribution of information technology to productivity. To the extent that new data have become available and new methodologies have been used, empirical studies have found that information technology generate improvements in productivity and economic growth.

METHODS

Chan & Tsou (2009) suggested that information technology adoption can be categorized into four distinct types; information technology infrastructure, strategic alignment, organizational structure, and individual learning. Categories of innovation are process innovation. Innovation is commonly defined as the initiation, adoption and implementation of ideas or activity that are new to the adopting organization (Fichman, 2001). To create new market, firms must implement specific innovation practices to develop scalar business models, manage customer experience, monitor employee performance and provide managerial process innovation (Atuahene-Gima, 1996; Berry et. al., 2006). The performance implications can vary across different types of innovation, depending on firm internal and market specific factors (Koellinger, 2008). Performance in this research in measured in terms of information technology performance. The research framework proposed was developed after an analysis of the literature. The framework leads to the development of hypotheses. Figure 1 depicts the proposed research model that will be used in the study. Upon completing the exploratory study involving the interviews, the model is expected to be refined and finalized prior to conducting the survey.

Figure 1: Theoretical Framework



Source: Adapted from Chen & Tsou (2007)

The main emphasis in the literature is on the discussion of information technology adoption and its relationship with process innovation and organizational performance. Based on Rogers's (1983) innovation diffusion theory, implementation represents the infusion stage in the process of innovation diffusion (Cooper & Zmud 1990). Therefore, once it has adopted and adapted a technology, a firm begins to use it in a comprehensive and integrated manner to support organizational work and innovative practices. Figure 1 presents the research framework of the present study. It shows the relationships that are hypothesized to exist among information technology adoption, process innovation and information technology performance.

The proposed hypotheses for this study are as follows:

Hypothesis 1:

Information technology adoption is positively related to process innovation.

Hypothesis 2:

Information technology adoption is positively related to information technology performance.

Sampling Design

This study was conducted with a sample of the technology based companies in Malaysia. It was decided to focus the study on the Information, Communication, and Technology (ICT) companies located at Technology Park Malaysia designated as cyber cities under Multimedia Super Corridor (MSC). In this research, data was collected using the questionnaire method to employees randomly distributed. The self administered and structured questionnaire was distributed to 50 employees responded to the questionnaires. The respondents would fill up the questionnaire and returned to the researcher on a stipulated time frame. This sample selection was also felt appropriate since a range of different sectors would be involved and the quality of data supplied by these organisations was also felt likely to be more accurate than that attainable. It was felt that employees in such organisations would therefore be well placed to express an opinion in respect of the value of such data. It is clear that the selection of this organisation as the basis of research could make it to generalize the results.

Instrument Design

The structured questionnaire was based on academic- and practitioner-oriented literature and interviews. The data were secured by means of a four-page, self-administered questionnaire as part of a wider examination of the information technology adoption, service innovation practices and competitive advantage in the financial industry. Following the suggestions of Churchill (1979), existing scales were adopted, modified and extended. The scale of measurement is Likert scale except for the respondent’s profile and usage level section which are categorical type. The response to all the items on the questionnaire was captured on a five-point Likert scale (1=Strongly Disagree, 2=Disagree, 3=Neither Disagree Nor Agree,4=Agree and 5=Strongly Agree).

RESULTS

The Pearson Coefficient of Correlation was computed to investigate the relationship between information technology adoption, process innovation and information technology performance. This section discussed the analysis of information technology (IT) based on the mean scores of the dimensions; information technology infrastructure (ITI), strategic alignment (SA), organizational structure (OS) and individual learning (IL). Dimension of innovation measured by mean score process innovation (PCI). Organizational performance also based on the mean score of dimension information technology performance (ITP).

Table 1: Correlation on Information Technology Adoption and Process Innovation

Variables	ITA	PCI
Information Technology Adoption (IT)	1	
Process Innovation (PCI)	0.608**	1

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

Hypothesis 1 predicted that there is a positive relationship between information technology adoption and process innovation. As shown in Table 1, the correlation between information technology adoption and process innovation is 0.608. The strong correlation value obtained shows that information technology adoption is positively related to process innovation.

Therefore, information technology adoption should be designed to lead to process innovation. Specifically, organization that high in process innovation depends on information technology adoption. The data is further supported by Table 2. The value shows that all dimensions of information technology adoption have positive correlations value with process innovation. This provides evidence that there is a significant relationship between information technology adoption and process innovation. Thus hypothesis 1 is accepted.

Table 2: Correlation on Information Technology Adoption (All Dimensions) and Process Innovation

Variables	ITI	SA	OS	IL	PCI
Information Technology Infrastructure (ITI)	1				
Strategic Alignment (SA)	0.508**	1			
Organizational Structure (OS)	0.416**	0.496**	1		
Individual Learning (IL)	0.372**	0.431**	0.396**	1	
Process Innovation (PCI)	0.461**	0.640**	0.429**	0.308**	1

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

Hypothesis 2 is predicted that there is a positive relationship between information technology adoption and information technology performance. As shown in Table 3, the correlation between is 0.610. The positive correlation value obtained shows that information technology adoption is positively related to information technology performance. This seems to suggest that information technology adoption is contributing factors to high information technology performance which fit well with the organization orientation.

Table 3: Correlation on Information Technology Adoption and Information Technology Performance

Variables	ITA	ITP
Information Technology Adoption (ITA)	1	
Information Technology Performance (ITP)	0.610**	1

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

The data is further supported by Table 4. The value shows that all dimensions of information technology adoption have positive correlations value with information technology performance. This provides evidence that there is a significant relationship between information technology adoption and information technology performance. Thus hypothesis 2 is accepted.

Table 4: Correlation on Information Technology Adoption (All Dimensions) and Information Technology Performance

Variables	ITI	SA	OS	IL	ITP
Information Technology Infrastructure (ITI)	1				
Strategic Alignment (SA)	0.508**	1			
Organizational Structure (OS)	0.416**	0.496**	1		
Individual Learning (IL)	0.372**	0.431**	0.396**	1	
Information Technology Performance (ITP)	0.475**	0.460**	0.585**	0.346*	1

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

* Correlation is significant at the 0.05 level (2-tailed)

DISCUSSION AND CONCLUSION

Implementing new information technology applications to enable a competitive edge has become a core and important strategy in most contemporary corporations. Prior studies have suggested that information technology plays a fundamental role in a firm's ability to enhance business performance through innovations in products, channels and customer segments (Sambamurthy et. al., 2003).

This study developed a research framework and empirically investigated the effect of information technology adoption on organizational performance through innovation practices. This research highlighted two innovation practices in the form of process innovation and product innovation. The implementation of these innovation activities requires the coordination of related and complementary resources across the firm's business units. Building on previous research, this study conceptualized information technology as a major coordination mechanism.

Based on the MIT90 model (Scott Morton, 1995), information technology adoption construct to conceptualize the relationship among information technology infrastructure, strategic alignment, management processes, organizational structure and individual learning and to explain how such mechanisms can sustain and enhance innovation practices in selected organizations. This research model and the associated hypotheses add detail to the prevailing understanding of critical linkages between information technology adoption and organizational performance. With all hypotheses supported, the empirical results provide strong overall validation and point to the important role of information technology adoption that coordinates four elements to improve the implementation of innovation practices.

There are two key messages arising from the empirical analysis:

1. Information technology adoption is currently important enablers of innovation.
2. Information technology adoption is positively associated with organizational performance.

Future research should consider information technology adoption from a different perspective, to investigate how using information technology applications in workflow and project management, communication and coordination and knowledge management would affect innovation practices and performance in different service design stages. Also, a cross-industry comparison study of information technology adoption for innovation practices to examine whether there are different influences for different industries or service sectors would also greatly contribute to the field. In addition, researchers should examine the nature of organization designs, governance structures and managerial skills that will foster such innovation practices and facilitate the development of product and strategic processes innovation described in this model.

The conceptual framework and the empirical results presented in this article provide some new insights on the relation between technology, innovation, and firm performance. It is argued here argued that the adoption of new technologies that were invented and produced elsewhere could enable process or product innovations in the adopting firm. In addition, it is also argued that innovation is mediating the effect of information technology adoption on performance. The empirical results of this study showed that innovative firms are more likely to grow, and necessarily more likely to be profitable. To put it bluntly, what a firm innovates is more important than how it innovates, but most important is that it innovates at all.

Exploration of the role of information technology adoption on firm innovation and performance are important agent of change is the use of information technology by businesses and consumers. While this study has taken a more general view of information technology and innovation, a key area that will increasingly affect organizational performance in the future is the created opportunities to reach new levels of coordination and collaboration, but at the same time has created a global business environment characterized by more intense competition. Furthermore, as connectivity rises and decision systems mature, it is clear that information technology will increasingly play a key role in firm innovation and performance. A firm's innovative capabilities are interrelated and strongly influenced by information technology adoption.

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