Antecedents of E-Business Adoption Level in the Manufacturing Sector

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Abstrak

Objektif kajian ini ialah untuk menganalisa kaitan antara pengemudi-pengemudi utama dan aras penguasaan E-dagang dalam sektor perkilangan di Malaysia. Kajian ini merujuk kepada model "Technological Inovation" yang dihasilkan oleh Tornatzky dan Fleischer (1990, petikan dari Cata, 2003). Kemajuan teknologi, struktur organisasi dan keadaan persekitaran adalah pembolehubah tidak bersandar, manakala aras penguasan E-dagang adalah pembolehubah bersandar. Jaminan keselamatan, insfrastruktur IT dan kemahiran teknik adalah berunsurkan keadaan kemajuan teknologi dalam kajian ini. Keadaan struktur organisasi terdiri daripada unsur-unsur sokongan dari pihak pengurusan atasan, perancangan yang strategik untuk E-dagang, pendokong organisasi dan peningkatan pengetahuan di kalangan kakitangan. Keadaan persekitaran merangkumi tekanan daripada pelanggan, tekanan daripada pesaing dan penyelaras. Ini adalah kajian yang deskriptif. Sejumlah 350 set kertas soalselidek telah diagihkan kepada peserta melalui pos dan media elektronik. Berdasarkan keputusan analisa, hanya lima pembolehubah menunjukkan kaitan dengan aras penguasaan E-dagang. Mereka adalah berkemahiran teknikal, sokongan pengurusan atasan, tahap pengetahuan, pelan yang strategik untuk E-dagang dan tekanan daripada pesaing. Kesan yang menonjol menpengaruhi aras penguasaan E-dagang adalah daripada berkemahiran teknik dan sokongan dari pengurusan atasan. Penemuan dalam kajian ini akan meningkatkan pemahaman terhadap faktor-faktor pengemudi utama yang mempengaruhi pembuat keputusan untuk meningkatkan penguasan E-dagang. Dalam hal ini, pihak pengurusan dapat memastikan mereka menggunakan sumber secara berkesan samada menguasai sistem E-dagang atau menaiktarafkan sistem E-dagang mereka. Di samping sektor perkilangan, hasil kajian ini

dapat dijadikan bimbingan asas kepada organisasi apabila mereka berhasrat untuk menguasai aras sistem E-dagang yang diingini.

ABSTRACT

The objective of this study is to analyze the relationship between key drivers and E-business adoption level in the manufacturing sector in Malaysia. This study was based on the Technological Innovation Model, which was developed by Tornatzky & Fleischer (1990, cited from Cata, 2003). Technological, organizational and environmental context are the main independent variables, while E-business adoption level is the dependent variable. Security, IT infrastructure and technical expertise are elements of the technological context in this study. Organizational context consists of top management support, strategic planning for E-business, organizational support and knowledge level of staff. Environmental context include customer pressure, competitor pressure, and regulatory. This is a descriptive study. A total of 350 sets of questionnaires were distributed to respondents via postal mail and electronic mail. From the discriminant analysis result, only five variables showed relationship with E-business adoption level. They are technical expertise, top management support, knowledge level, strategic plan for E-business and competitor pressure. The strongest significant effects on E-business adoption level are technical expertise and top management support. The findings of this study will let us understand the key driving factors that motivate decision makers on the adoption level of E-business. Under this condition, the management will ensure that they allocate their resources effectively either to adopt the E-business system or to upgrade their E-business system. Besides the manufacturing sector, the results of this research can also provide a guide for the organization to adopt at a desired level of E-business.

Chapter 1

INTRODUCTION

1.1 Background

In today's digital world, distance and time becomes not the barrier for a company to conduct its business. The Internet is accessible 24 hours a day, 7 days a week anywhere in the world. This directly creates the radical competition among the firms. E-business will be an alternative tool for a firm to sustain the competitive advantage in this digital arena.

E-business takes part into many form of Internet domain. There is business to business (B2B), business to customer (B2C), customer to business (C2B), business to government (B2G), government to business (G2B) etc. (Kotler, 2003). The Malaysian government actively promotes e-business to local companies. At the same time, the Malaysian government is also actively involved in the business. This is to show that our government is very seriously looking at this area. For example, the Income Tax department has started to enable the receipt of document of income tax payer through the Internet.

Besides Malaysia, others countries are also very actively promoting e-business. For example, the Indian government since late 1980s allowed companies, which adopted the e-business, to file their annual returns through floppies (Lal, 2002). The New Zealand government came up a vision on e-business in that they wanted to be world class in embracing Electronics-Commerce for competitive advantage (McColeand & Ramsey, 2005). These are only two simple examples to show that many countries do aggressively encourage companies to participate in e-business.

However, many companies have failed in e-business (Gale & Abraham, 2005). Turban et al. (2000, cited in Phan, 2002) mention that e-business is the hottest and most dangerous business model nowadays. Different companies might have different intention on different E-business adoption level. Some might have the intention to go for higher level of E-business adoption level, while some firms might like to adopt the E-business at lower level. Giant companies like Intel realize the importance and power of e-business, so Intel would like to go for higher level of E-business adoption level. Intel introduced E-Business Program in 1998 because they want to show to their customers that they are serious in the e-business system. A lot of manpower and investment have already been pumped into this program (Phan, 2002). Another giant company, like Microsoft, is afraid that it will be obsolescent by those competitors, unknown or unborn, who will use better e-business model (Phan, 2002). But some firms, especially SME firms, might intend to adopt the E-business at initial level.

In order to make sure companies able to successfully adopt at their desired level of the E-business system, the study on the key driver becomes very important. The companies, especially SMEs, should be able to optimize their resources based on the key drivers in order to implement the e-business successfully.

1.2   Problem Statement

E-business brings a number of benefits to the firms. Wagner et al. (2003) mentioned that the adoption of E-business would enable to improve customer service, in terms of communication speed and efficiency. This directly improves customer satisfaction. McCole and Ramsey (2005) found that E-business adoption enable the firms to effectively advertise their firms, build brand image, increases sales and cost saving.

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Other researchers, like Cata (2003) and Tan (2001, cited from Croom 2005) also obtained similar benefits of E-business adoption.

Although E-business system brings a number of benefits, the decision makers of the organization have difficulty in evaluating the level of E-business adoption. The result is that the firms do not initiate the E-business system easily and smoothly. A number of factors influence the decision of organization in the adoption level of E-business. Examples, Ung (2000) found that online competition, customer relationship management and value chain management significantly affecting the E-commerce initiative. This study will look into the key drivers that motivate the decision maker in the adoption level of E-business from technology context, organizational context and environmental context.

Previous discussions on e-business adoption are more focused on Western Countries. In the Malaysia context, some researchers look at difference sectors. For example Lim (2000) looked at the service sector only, while Ung (2000) studied this topic on general organization as a whole. Lim (2003) studied E-readiness on the SME sector, which includes manufacturing, service and agriculture, but the study concentrated more on technology and organization context.

This study will include the external environmental factors, like customer pressure, competitor pressure etc., as study elements. At the same time, the scope of manufacturing sector in this study is not only confined to SMEs but also to multinational companies. This will provide clearer information on the key drivers of e-business adoption level in manufacturing firms. Therefore, this study intends to extend the literature in Manufacturing Sector context by examining the key drivers of e-business adoption level.

For the practitioners, this study will provide the better understanding of key drivers on E-business adoption level. Those who intend to participate at different levels of e-business system should be able to optimize their resource base on key drivers in order to make sure the system can be smoothly implemented.

1.3   Research Objective

The objectives of this research study are:

1. To study the adoption level of E-business system in the manufacturing organization; and

2. To examine the relationship among key drivers with E-business adoption level.

By understanding the above relationships, managers would be able to identify the key drivers for e-business adoption level and to optimize the resources in their organization.

1.4   Research Question:

This research will examine following issues:

1. What is the adoption level of E-business system in the manufacturing organization?

2. What is the relationship between key drivers with E-business adoption level?

1.5   Significance of the study

This research study is expected to provide guidance to the managers when they intend to adopt e-business system at their desired level. Organization decision to adopt the

level of E-business is motivated by the key drivers. By identifying the key drivers on e-business adoption level, managers would be able to optimize the resources in their organization. At the same time, this guidance will make sure that the e-business system is smoothly implemented.

Although this study concentrates on the manufacturing sector, the key drivers of e-business adoption level is still applicable to other sectors, especially trading company and food industry, as basic guideline. Therefore, this study is able to contribute not only to the manufacturing sector, but also to other similar sectors.

This research study is also able to extend the literature in the Manufacturing sector. This study includes internal and external factors of the firms, so it would be able to provide better coverage information and picture of key drivers of e-business adoption level to researchers.

1.6   Scope of the Study

The key drivers of E-business adoption level will be looking into internal and external factors of an organization. For the internal factors, the organization context (like top management support, organization support, employee knowledge level, etc) and technology context (like IT technical expertise, network security, IT infrastructure etc) will be the scope of the study. While for the external factors, this study will look at the environmental context (like customer pressure, competitor pressure and regulations).

The firms will either adopt or not adopt the e-business system will be one of the target study. For those who adopted e-business system, their adoption level (from very basic level to very complicated level) will be the target study items and key drives which will lead to e-business adoption will also another study target.

The survey will be conducted on the organizational level by posing different types of questions. The target respondents on this survey will be those who are dealing with external parties, like supplier, customer, external transportations agents etc, on data exchange, business information exchange, maintenance of business relationship, and business transaction through e-business system.

1.7   Definition of Key Terms

Those key terms will be defined in this section. This will provide better understanding on parameter used in this study.

1.7.1   E-business

There are a number of definitions for e-business. Laudon and Laudon (2005) define E-business as the use of the Internet and Digital Technology to execute all the business processes in an enterprise. So, E-business includes e-commerce as well as processes for the internal management of the firm and for coordination with suppliers and other business partners. While Croom (2005) define E-business as the use of system and open communication channels for information exchange, commercial transaction and knowledge sharing between organizations.

However, for the purpose of this study, E-business is defined as the use of the Internet technology to share business information, maintain business relationship, and / or conduct business transactions (Rauseo, 2001). In simple words, E-business can be said to be the use of Internet technology, examples e-mail, Internet, World Wide Web, or extranets, to communicate and/or conduct transaction with stakeholders and trading partners.

1.7.2 E-business adoption level

E-business adoption level can be categorised as offline mode, online mode, and e-business using shared or individual portal (Lal, 2002; Lal, 2005). Different researchers might define it in different ways.

However, for the purpose of this study, definition from Lin and Lee (2005) will be adopted. Lin and Lee (2005) divided the e-business adoption level into 5 levels, and they are:

1)   Initiative level – The organization has established its own e-mail system and web site, but this web site only provides basic information of the firm

2)   Propagation level - The organization has established a web site with an intranet, and the web site features information on executing internet business tasks.

3)   Networking level - The organization has established B2B e-commerce and B2C e-commerce systems that link company employees, suppliers and customers and facilitate online transactions

4)   Business Integration level – The organization has integrated ERP, SCM, and EPR systems that include advanced features such as business strategy support

5)   Business Transformation level – The business strategy of the organization has been transformed by e-business adoption. The strategy is characterized by cross-enterprise involvement, with a focus on establishing partnerships and developing new business opportunities.

1.7.3   Security

According to McConnell (2001), information security concern about the trust of the processing and storage of networked information. The information should be secure from unauthorized access or virus attacks, etc. Naedele and Rist (cited from Chen et al., 2005) mentioned that security for information transfer and stored is of utmost importance. There are a number of technologies to secure the data, like firewall, SSL (Secure Socket Layer), encryption, and digital signature. (Chen et al., 2005)

1.7.4   IT Infrastructure

IT infrastructure defines as a platform technology (hardware and software), network and telecommunication technologies, key data and core data processing application (Duncan, 1995, Armstrong & Sambamurthy, 1999, cited from Cata). This technology platform enables e-business to be established. (Zhu & Kraemer, 2005).

1.7.5   Technical Expertise

Technical expertise refers to staff that have capability and knowledge on handling IT task relating to E-business. The staff have expertise in hardware, software, network connectivity, web based programming and web-based application (Chen, 2003).

1.7.6   Previous Network Experience

Previous network experience refers to staff that have previous knowledge and skill on networking. The knowledge and skill of the staff are useful and applicable on E-business related tasks.

1.7.7 Top Management Support

Top management support refers to those who are able to affect the decision to apply a new technology in an organization. Their support on E-business will ensure the success of a project by allocating the necessary time and resource and adopting positive approaches to the new technology (Au, 2000).

1.7.8 Training Available

According to Sazri (2000, cited from Tee, 2005), technical training is a type of training that tends to be specific to a job or agency. So, the training available in this study refers to the quality of education available to technology adopters or users (Lin & Lee, 2005). This technical training is related to E-Business system. This is to develop the required skill and knowledge for the related staff to operate the E-business system.

1.7.9 Knowledge Level

Laudon and Laudon (2005) mentions that knowledge is a concept, experience, and insight that provides a framework for creating, evaluating and using information. Knowledge level refers to the familiarity of staff, especially the non- IT members, with a technology (Lin & Lee, 2005). The technology is an essence of E-business activities.

1.7.10 Organization support.

Organization support refers to organization structures, cultures and a psychological positive organization climate (Ein-Dor & Segev, 1978, cited from Cata, 2003) towards new technology

1.7.11 Strategic Plan for E-Business

"Strategy" is defined as the determination of the basic long-term goals and objectives of an enterprise and the adoption of courses of action and the allocation of resources necessary for carrying out these goals (Chandler, 1962 cited in Apigian, 2003)". So, strategic plan for E-Business refer to the allocation of resources for a course of action, which aligns with new technology, for those long-term goals and objectives of the firms.

1.7.12 Customer Pressure

Customer pressure refers to customers forcing the organization to change and innovate in novel ways for value creation (Cata, 2003). Customer pressure pushes the organization to adopt the latest technology available, especially E-business related technology (Cata, 2003)

1.7.13 Competitor Pressure

Competitive pressure defines as the degree of pressure that the company feels from competitions within the industry (Zhu & Kraemer, 2005), and most importantly from its main competitors (Cata, 2004). Competition exists among the firms to adopt the new technology, especially E-business related technology.

1.7.14 Regulation

Regulation refers to government regulation, jurisdiction and activities that protect e-business transactions, regulating the Internet to make it a trustworthy business

platform (Zhu & Kraemer 2005), or control and impediment on new technology adoption (Cata, 2003).

1.8   Organization of the Study

This study is divided into five chapters. Chapter 1 will introduce the research topic, followed by explaining the problem statement, research objective, research question, significant of study and key term explanation. In Chapter 2, the literature review on independent and dependent variables will be presented. Chapter 3 will focus on methodology of research, theoretical framework and hypothesis. The result of analysis and interpretation of the data will be discussed in Chapter 4. Finally, Chapter 5 will explain the findings, implications, recommendations, limitations of the study and the suggestions for future research.

Chapter 2

Literature Review

2.1   Introduction

Although E-business concept has been discussed for more than 10 years, the adoption level of E-business in Public Listed Companies in Malaysia, including some manufacturing firms, are still at the initial stage (Adham & Ahmad, 2005). Most of them just provided the basic information of their companies in the E-business system. Saw (2000) studied the website adoption in Manufacturing line in Malaysia found that 51% of them have website, but the utility are low. It is coherent with Adham and Ahmad. On contrary to others, Ung's (2000) found that E-commerce system in companies located in the Free Trade Zone Penang lagged only behind American companies but at par with European and East Asia companies. So, the actual E-business adoption level for manufacturing sector in Malaysia is still doubtful.

If our manufacturing firms are still at the initial stage of E-business adoption level, then the firms might not able to fully enjoy the benefits of E-business. The power of E-business system gets attention from many researchers and practitioners. Some researchers from developed countries, like the USA, have already started to discuss dynamic E-business system - that is the next generation of E-business system (Chen et al., 2005). So, the study of key drivers of E-business adoption level in manufacturing factory will be very important. These key drivers will able to motivate the decision maker of firms to adopt the level of E-business, with the hope that firms would be able to enjoy the benefits of E-business.

This study does not only look at the technology and organizational context, which was done by Lim (2003), but also to look at the environmental context. Saw

(2000) also looked at the environmental context. While environmental factor acts in a moderator role, this study sets the environmental factor as an independent role. This study is based on the Technology Innovation Model (Tornatzky & Fleisher, 1990, cited in Cata, 2003) to identify the key drivers of new technology (E-business system) in manufacturing firms. This model had been used by many researchers, like Thong (1999, cited in Cata, 2003) and Prekumar and Ramamurthy (1995, cited in Cata, 2003), in different technologies (Cata, 2003). Recent research also adopts this innovation theory, like Lin and Lee (2005), Zhu and Kraemer (2005) and Harrisson and Waite (2005) in their E-business adoption.

This theory will analyze the new technology from three difference aspects; namely the Technology context, Organization context and Environmental context. Please refer Figure 2.1. This model analyzes the situation from internal and external factors of the organization in order to provide better coverage information about success or failure of new technology adoption. With this better coverage of information, manufacturing firms will be able to speed up their adoption and also increase the adoption level in order to enjoy the benefits of E-business.
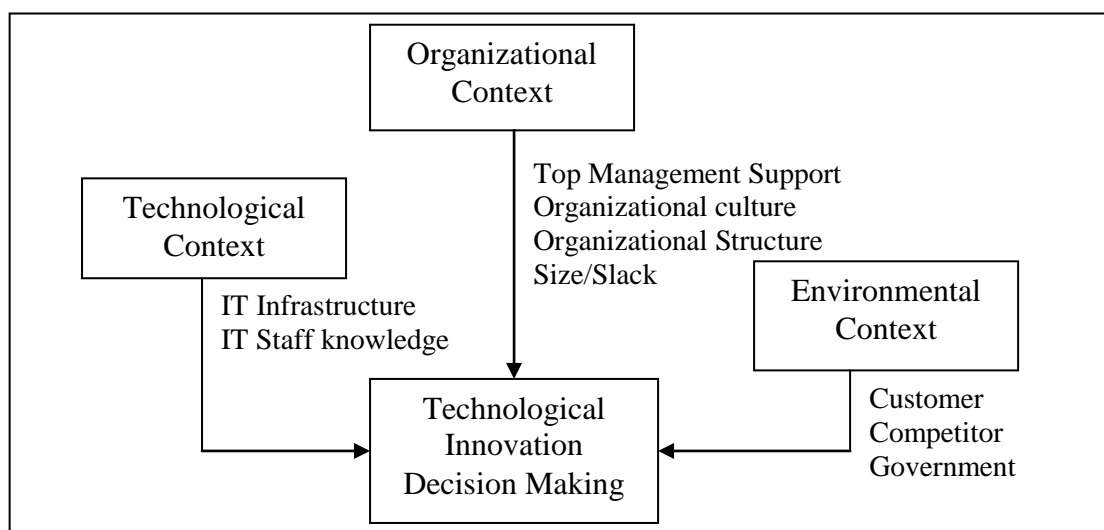

Figure 2.1 Context of Technological Innovation
(Tornatzky & Fleischer, 1990 cited from Cata, 2003)

2.2   E-Business Adoption

Lin and Lee (2005) studied the E-business adoption level in Taiwan by analyzing the impact of knowledge management and organization. Their study also adopted the innovation theory. McCole and Ramsey (2005) study showed that the majority of E-business systems adopted by companies in New Zealand are at Primitive level; for example the web sites are simply to advertise and promote the company name. They did not integrate with the internal system.

Ung (2000), Saw (2000), Lim (2003), and Adham and Ahmad (2005) also did a study on E-business or a part of E-Business adoption system in Malaysia. Their definitions of E-business adoption are different from this study. Most of the study set the business transaction at the highest level of E-business adoption level. However, this study looks at E-business adoption level from the very basic level (e-mail utilization) to business transformation level. Business transaction is considered as the middle stage in the entire E-business adoption level.

2.3   Technological Context

According to the Technology Innovation Model (Tornatzky & Fleisher, 1990, cited in Cata, 2003), technology is one of the critical aspects of new technology adoption. In line with this model, the study of E-business adoption level will also look at this technology context. This study will pay special attention on security factor, IT infrastructure factor, IT staff's technical expertise factor, and previous network experience. Therefore, the technology is an important parameter in this study.

2.3.1 Security

Most people have the impression that security is a very important factor in the virtual world. This perception is true from the consumer stand point. Research from Rotondaro (2002) confirmed this perception. His findings mentioned that access and safety play a major role in the purchasing process. So and Sculli (2002) conducted a similar study in Hong Kong found that customers view security as an important element.

However, in the organization context, the important level of security might be different. Lim (2003) in his study found that information security has no significant relationship with E-business adoption level. Her result is consistent with Cata (2003) but their results differ from most of other researchers, like Phan (2002), Min and Galle (2002). When Intel introduced the E-business system, the best security protection scheme is one of the key success factors (Phan, 2002). Wagner et al. (2003) also mentioned that security is one of the impediments of E-business strategy in his research. So, the importance of security factor in E-business system becomes a doubt, especially in the Malaysia context. Therefore, this factor becomes an important factor in this study.

2.3.2 IT Infrastructure

Brorson (1998, cited Wagner et al. 2003) highlighted that IT infrastructure was the pre-requisite to adopt e-business. Hardware, software, and system are the key elements of IT infrastructure. Lal (2002 & 2005) also found that IT infrastructure, either internal firm or government provider, was pre-requisite for the E-business adoption in Indian firms.

The alignment of new IT system and existing IT system are also another important factor. Misalignment of new technology and traditional IT infrastructure cause the users to struggle (Ricknell, 1998, cited Wagner et al. 2003) and finally became another barrier of E-business adoption. Selection of right digital infrastructure is one of the key success factors for E-business (Mougayar, 1998, and Raisch, 2001, cited from Phan, 2002).

Infrastructure was found to have significant contribution to the website adoption in Manufacturing Firm in Malaysia (Saw, 2000). This parameter was verified again by Lim (2003) in that IT infrastructure has significant impact on E-business adoption with SME in Malaysia. Therefore, the IT infrastructure is an important parameter for the study of E-business adoption level.

2.3.3 Technical Expertise

Technical expertise in this study refers to IT staff's technical capability. Doukidis et al. (1994) found that staff involvement in IT development and IT training had direct significant effect on IT adoption. However, the study from Lim (2003) did not show any significant relationship between expertise in IT and E-business adoption.

Therefore the role of technical expertise in E-business adoption in manufacturing sector is still in doubt. This study is intended to find out the relationship between technical expertise and E-business adoption level in the manufacturing sector.

2.3.4 Previous Network Experience

Pennings and Harianto (1992a, b cited in Cata, 2003) found that accumulated experience with technology and inter-firm networking had significant impact on new

technology adoption. A rich networking experience will increase the confidence level of the firms with networking, (Pennings & Hariano, 1992a,b, cited in Cata, 2003), which would lead them to E-business adoption. Fink (1998, cited in Lim , 2003) also listed out that IT experience was one of the important factors for the successful adoption of information technology in Small and Medium Enterprises. However, these finding were different from Cata (2003), who did not find any relationship between previous network experiences with E-Business adoption in the insurance sector. Due to these discrepancies, the previous network experience factor is included in this study.

2.4   Organization Context

In the organization context, this study will concentrate on five important elements. They are top management support, training availability, knowledge level, organization support and strategic plan for E-business.

2.4.1   Top Management Support

In 1996, Javvenpaa and Ives (cited from Cata, 2003) found that the role of top management was not significant in early introduction of Internet technology. When the management staff fully understood the power of Internet-based technology, they would lead the firms to new direction or era (Gale & Abraham, 2005). So, top management support on new technology was one of the critical factors of E-business adoption.

Lim (2003) discovered that top management commitment and support had significant impact of E-business adoption. Harrisson and Waite (2005) also concluded the same result on the importance of top management support, especially on the

influence of key personnel. Therefore, top management support is one of the critical factors in the study of E-business adoption level.

2.4.2   Training Available

E-business training to the employees led to higher levels of e-business adoption system in Information System sector in Taiwan (Lin & Lee, 2005). Mougayar (1998, cited in Phan, 2002) and Raisch (2001, cited in Phan, 2002) also mentioned that necessary education and training to employees, management staff and customers would led to success in E-business implementation. Training will increase the knowledge level and experience of staff on new technology. Therefore training that are available is an important factor for this study.

2.4.3   Knowledge Level

Adequate technical and e-business knowledge was a basic requirement for a firm to adopt the E-business system (Lin & Lee, 2005). Knowledge integration became an important factor for strategic competitiveness in a modern firm (Johannessen et al., 1999, cited in Lin & Lee, 2002).

Wagner et al. (2003) had highlighted that with poor knowledge and lower level of training will become a barrier to the implementation of E-business. However, McCole and Ramsey (2005) found that there was no significant difference on staff capability on adopter and non-adopter firms on E-commerce in professional service firm. Therefore, this study will look into the relationship between knowledge level and E-business adoption level in manufacturing firms.

2.4.4 Organization Support

When there is good support for IT investment and encouraging organizational climate, the creativity would be promoted or fostered (Cooper, 2000, cited by Cata, 2003). The organizational climate refers to organizational culture, resources and rewards. Chatman and Jehn (1994) study showed that companies that are characterized as innovative in their organizational culture are more willing to implement innovative and new technology in their organization. Cata (2003) study showed that organization support has significant impact on E-business adoption. Therefore, organizational support is an important study parameter for this E-business adoption level study.

2.4.5 Strategic Plan for E-Business

Since around 1994 only the use of Internet for business application had been started (Moschovitz et al. 1999, cited by Apigian, 2003). Therefore the literature of Internet strategy was not quite up to the level of other type of strategy (Gesyken et al. 2002, cited by Apigian, 2003).

The firms could easily adopt the Internet-based-technology, but the performance could not be improved without effective strategy formulation (Power, 2005). Porter (2001) mentioned that by integrating the Internet with overall strategy would bring the firm to a powerful competitive advantage force. In order to achieve operation-based competitiveness in E-commerce, Silveira (2003) suggested that the linking between business strategy and E-commerce was very important. Apigian (2003) also found that Internet strategy was influenced from the functional level of an organization, like marketing or operation, had significant impact on Internet success.

Besides that, Mougayar (1998, cited in Phan, 2002) and Raisch (2001, cited in Phan, 2002) mentioned that one of the key success factors of E-business

implementation was the development of new web-centric marketing strategy. In 2003, Cata (2003) had the same result on the importance of strategic planning for E-business towards E-business adoption. Therefore, the strategic plan for E-business will be a very important element for the study of key drivers of E-business adoption level.

2.5   Environmental Context

Information Week and Business Week conducted a survey on 375 senior business and IT executives; the results showed that more than 70% of the respondents had been trusted into business decision making process and 61% indicated that E-business forced them to lead business-process reengineering (E-Business Evolution, 2000, cited by Dammanpour, 2001). The external factors forced the company to move into E-business world.

Ung (2000) analyzed the moderating effect of environmental factor on E-commerce initiation, but his result showed that this environmental factor did not have that effect. He considered organization setting as the environmental factor. In this study, the environmental factor is set as independent variable towards E-business. This study categorized customer pressure, competitor pressure and government regulation as environmental context.

2.5.1   Customer Pressure

Ung (2000) study showed that customer relationship management had significant effect on E-commerce initiative for companies in the Free Trade Zone Penang. Cata (2003) conducted the research on E-business adoption in the insurance sector also detected the same relationship. Customer satisfaction and retention was found to be a

critical success factor for E-business adoption (Dubelaar et al., 2005). Therefore customer pressure is an important driver for the study of E-business adoption level in the manufacturing sector.

2.5.2 Competitor Pressure

Wu (2001) conducted a research on the corporate sector in the U.S found that competitor orientation did not significantly affect the overall intention of E-business adoption. This finding contradicted with the research done by Ung (2000) in Malaysia and Cata (2003) in the U.S. Ung (2000) found that on-line competition had significant effect on e-commerce initiative. Cata (2003) also found similar effect. The effect of competitor pressure on E-business adoption becomes inconsistent.

Recent research from Zhu and Kraemer (2005) found that competitor pressure was the most important factor among the factors in E-business adoption. McCole and Ramsey (2005) found that "competitor have one" is one of the top five reasons why New Zealand firms adopt the E-business. Therefore, this factor is an important study factor in E-business adoption level in the Malaysia context.

2.5.3 Regulation

Damanpour (2001) highlighted that domestic regulation issue related to E-commerce need to be reviewed because there was varying degree of domestic regulations in WTO countries.

Cata (2003) found that there are direct relationship between regulation and E-business adoption. Zhu and Kraemer (2005) found that regulation support is one of antecedents of E-business adoption. Their study highlighted that this regulatory factor differed between developed country and developing countries. The regulation effect

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tended to be a greater force in developing countries because of information asymmetry and immature institutional structure. Therefore the role of regulations in the study of E-business adoption level is important.

2.6   Theoretical Framework

Based on the literature reviewed, this research study proposes the theoretical framework as shown in Figure 2.2. The E-business adoption level is the only dependent variable for investigation.

Based on the Technology Innovation Model, the independent parameter can be categorized into three main factors namely, technology context, organizational context and environmental context. Technology context consist of security, IT infrastructure, technical expertise and previous network experience. Organization context consist of top management support, training available, knowledge level, organizational support and strategic planning for E-business. Customer pressure, competitor pressure and regulations are the main element for Environmental context.

2.7   Hypothesis Development

This study mainly would like to analyze the key drivers of E-business adoption level in the manufacturing sector in Malaysia. The hypothesis development will be divided into three sub-sections on the relationship between those key drivers to E-business adoption level. The relationship between technology context and E-business adoption level will be discussed in first section, followed by the relationship between organizational context and E-business adoption level. The final section will explain on the relationship between environmental context and E-business adoption level.
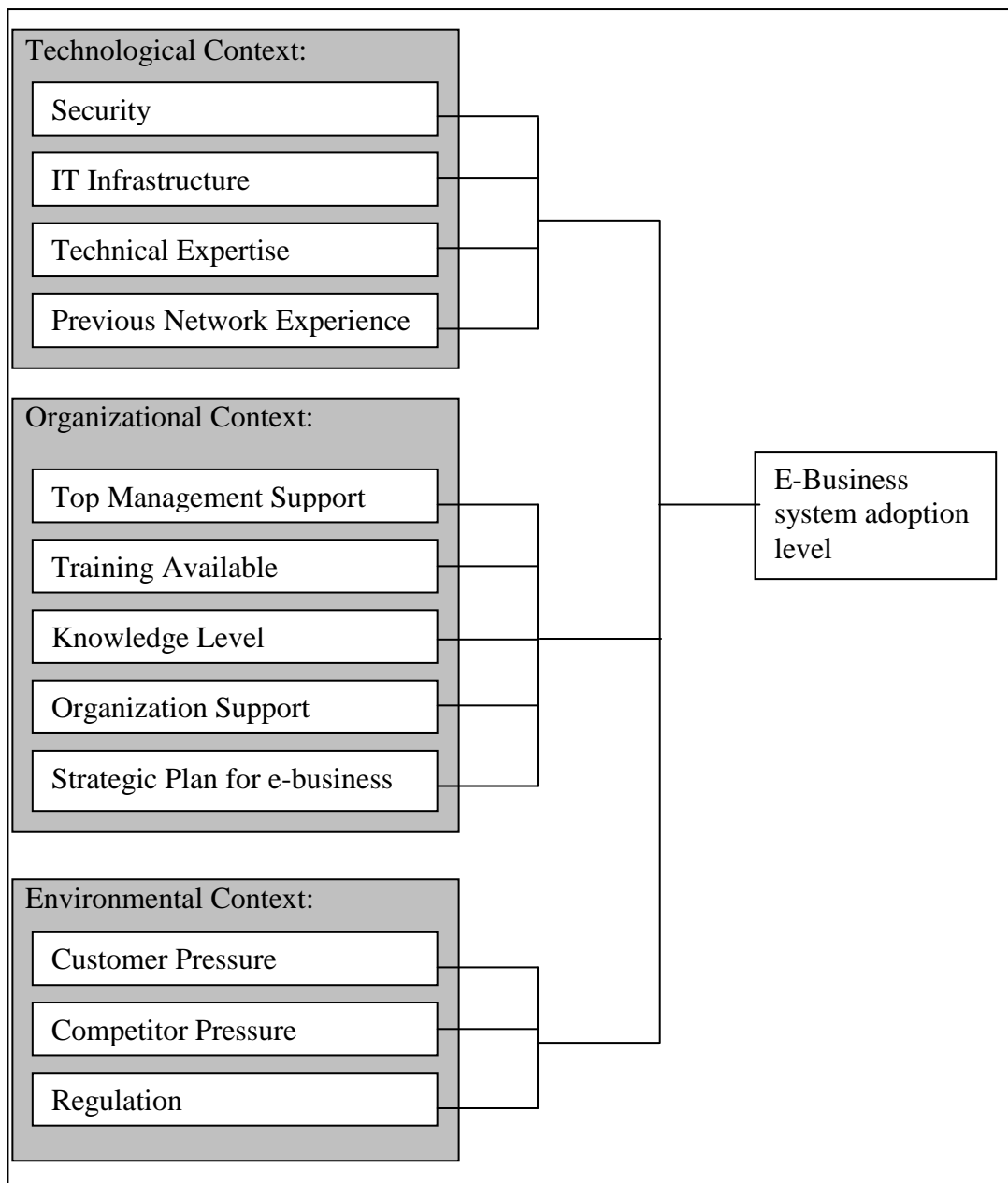
Figure 2.2 Research Framework

2.7.1 The Relationship between Technology Context and E-business adoption level.

In this study, technology context consist of security, IT infrastructure, technical expertise and previous network experience. IT infrastructure is the pre-requisite of E-business implementation (Lal, 2002; Lal 2005). Without these tools, it is impossible

for the firms to start to be involved in this new technology. Security of the E-business system will provide the confidence to management and users. If the system is not secure enough and cannot provide the confidence to all parties, nobody will use it. As shown by studies done by Sulaiman and Jani (2001), the main barrier for E-commerce implementation is the security issue.

The E-business system can be developed by either in-house or outsourced. It needs capable IT staff to operate. The technical expertise and previous network experience of IT staff will make the E-business more flexible, reliable, secure and also give the confidence to the management to involve in this E-business era. Therefore, this study posits the following hypotheses:

H1: Technology factor will be related to E-business adoption level

H1a: Security will be related to E-business adoption level

H1b: IT Infrastructure will be related to E-business adoption level

H1c: Technical Expertise will be related to E-business adoption level

H1d: Previous network experience will be related to E-business adoption level

2.7.2 The Relationship between Organizational Context and E-business adoption level

Based on previous literature review, the main element for organizational context are top management support, training available, knowledge level, organizational support and strategic plan for E-business.

Human capital is the most valuable asset for a firm. Kwon and Zmud (1987, cited in Lim, 2003) highlighted a fact that in order to successfully implement the IS, sufficient technical skill is one of the important elements. The high level of E-