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## **E- Commerce Technology Adoption:**

### **A Malaysian Grocery SME Retail Sector Study**

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## ABSTRACT

Electronic commerce (EC) has substantial potential to foster the growth of small and medium-sized enterprises (SMEs) in developed and developing countries alike. However, EC adoption by SMEs in developing countries has faced many challenges that have not been adequately addressed due to the complex nature of EC adoption in such countries. The aim of this study is to systematically examine the influence of organizational, industry, national readiness and environmental pressure on the adoption of diverse EC technologies by SMEs in developing countries. A quantitative survey was conducted with retail SMEs within the Malaysian grocery sector to validate the proposed multi-level model. Findings indicate significant influence of environmental pressure on the adoption of various EC technologies. Organizational and national readiness have different influences across diverse EC technologies, while the influence of industry readiness is shown to be insignificant. This study extends the current understanding of the influence of micro-, meso- and macro-level factors and has important implications for researchers, practitioners, and policy makers.

**Keywords:** Electronic commerce, adoption, readiness levels, environmental pressure, grocery retailers, SMEs, multi-level model, Malaysia

## 1. INTRODUCTION

Small and medium-sized enterprises (SMEs) typically offer significant contributions to the national economy, particularly in developing countries (Kotelnikov, 2007). Even though SMEs provide a strong stimulus to the national economy, they generally suffer from a lack of nationwide geographical presence and an inability to extend their services 24 hours a day and 7 days a week. The adoption of EC technologies alleviate these conditions and enable SMEs to access larger markets without expanding their physical presence (Quaddus and Hofmeyer, 2007). EC technologies have a strong appeal to SME retailers as EC can make geographic locations, distances and time irrelevant (Premkumar and Roberts, 1999). Due to the impacts of EC technologies on SMEs, EC technologies have become important entities of consideration within business and entrepreneurship literature (Peltier et al., 2012). However, SMEs in developing countries are slow to adopt EC technologies into their business processes (Alam, 2009; Hussain and Noor, 2005). This slowness is due to the unfavorable social, economic, technological and political conditions that prevail in many developing countries (Esselar and Miller, 2002).

Although a steady stream of EC studies for developing nations is slowly emerging (Hussain and Noor, 2005), the existing literature of EC studies focuses largely on developed nations. Moreover, much of the current literature typically has a wider focus on general EC technology adoption across industry sectors. Few studies therefore exist concerning the adoption of EC technologies in a particular industry sector such as the grocery retail sector. In fact, because of the large number of products carried and the low profit margin, the grocery retail sector is generally known to pioneer the adoption of innovative technologies to enhance efficiency (Al-Sudairy and Tang, 2000; Reardon and Hopkins, 2006) and therefore provides an appropriate and useful context to examine EC technology adoption. Furthermore, this sector plays an important role in the economies of developing nations like Malaysia. Systematic efforts are thus needed to determine how SMEs

within this particular sector are responding to the call of EC adoption to improve their efficiency, productivity and overall performance.

Additionally, much of the existing literature on SMEs' adoption of EC technologies seeks to explain EC adoption behavior from the perspective of technology adoption, using popular theoretical frameworks such as the Theory of Reasoned Action (Ajzen and Fishbein, 1975), the Theory of Planned Behavior (Ajzen, 1985), the Technology Acceptance Model (Davis, 1989) and Diffusion of Innovation (DoI) (Rogers, 1995). This is because EC technologies are considered to be novel innovations facilitating the growth of SMEs (Grandon et al., 2011). Innovations are also viewed as a key driving factor for corporate success (Cardozo et al., 1993). However, for a typical SME, successfully introducing innovations is a complex task as it has limited resources and expertise (Avermaete et al., 2003). By selecting various constructs from the related technology adoption theories, EC scholars have developed different research models that resulted in contradictory outcomes (Tan et al., 2009). Furthermore, most existing studies assess the effect of a number of factors related to technology and/or organization on the adoption (Alam et al., 2011; Hussain and Noor, 2005; Cloete and Courtney, 2002). Few studies assess factors related to the national environment (Feghali et al., 2009; Wong, 2003; Zhu et al., 2003; Zhu and Thatcher, 2010) but without simultaneously considering technological and organizational factors. Additionally, those studies which assess some aspects of environmental influences (Molla and Licker, 2005; Zhu and Thatcher, 2010) have not specifically considered the industry the focal organization is part of, and environmental pressure. In fact, organizations do not exist in isolation but in an environment that leads to the inclusion of the industry and national readiness levels (Boyer-Wright and Kottemann, 2009; Damsgaard and Lyytinen, 1998; Gregor and Johnston, 2000; Kurnia and Johnston, 2003; Zhu and Thatcher, 2010). Therefore, the influence from three institutional levels (organization, industry and country) and environmental pressure need to be considered simultaneously in one study to develop a more comprehensive understanding of the EC adoption phenomenon.

Motivated by the knowledge gaps, this study aims to assess the influence of factors related to organizational, industry and national readiness to adopt EC technologies as well as environmental pressure on the adoption of diverse EC technologies that facilitate Business-to-Business (B2B) activities in the retail SME sector. An integrative approach is applied by combining constructs from the DOI and National Institutional Perspective (NIP) theory. NIP suggests the prevalence of entrepreneurial activities associated with specific dimensions of a country's institutional environments (Spencer and Gomez, 2004). As SMEs represent a part of an industry sector within a country (Damanpour, 1991), there are important influences from the industry and the country levels on their adoption decision regarding EC technologies (Feghali et al., 2009; Zhu and Thatcher, 2010) which should be considered alongside organizational factors influencing the adoption. Government policy, legal framework, physical infrastructures, economic condition and human capacity are examples of possible influences at industry and country levels (Boyer-Wright and Kottemann, 2009; Feghali et al., 2009; Molla and Licker, 2005; Zhu and Thatcher, 2010). The integrated model developed in this study is then empirically evaluated within the Malaysian retailing context employing a quantitative survey study.

Utilizing the responses from 125 Malaysian retail SMEs, a set of factors is identified which helps differentiate between adopters and non-adopter of six specific types of EC technologies. The survey analysis indicates that factors related to the three levels of readiness influence the adoption, as does environmental pressure, but the influence of industry readiness is not found to be significant. In fact, the most salient factor influencing the adoption of EC technologies is environmental pressure which is internally and externally driven.

The remainder of this paper is organized as follows. Section 2 presents the background literature and lays out the theoretical foundation of this research. Section 3 reports on the development of the research framework guiding this study. Section 4 outlines the research methodology. Section 5 presents the empirical findings of this study. Section 6 discusses these

findings in light of the existing literature. Finally, Section 7 concludes the paper, highlights the implications of the findings, acknowledges some limitations and identifies future research directions.

## 2. BACKGROUND LITERATURE

### 2.1. E-commerce and SMEs

Diverse definitions of e-commerce (EC) exist in the literature (Holsapple and Singh, 2000). As EC is understood differently by individuals, researchers have used the term EC according to the scope of their research. This study adopts an EC definition provided by Turban et al. (2008) because it is simple, yet comprehensive. According to Turban et al. (2008; p. 4), EC refers “to the process of buying, selling, or exchanging products, services and information via computer networks, including the Internet”. When successfully adopted, EC can provide organizations with enormous opportunities for improving many key business activities such as trading relationships, exchanging information, co-ordinating logistics and communications via global or regional supply chains (Humphrey et al., 2003). Popular EC technologies, particularly those supporting B2B exchange, include Internet, e-mail, Electronic Data Interchange (EDI), Electronic Funds Transfer (EFT) and bar codes (Gunasekaran et al., 2002).

Recognizing the enormous potential benefits that EC technologies can bring to organizations, many scholars have paid considerable attention to the study of EC adoption by SMEs. Such EC adoption has been investigated within the contexts of both developing and developed nations. A high level summary of the literature on EC adoption by SMEs across various countries (with a focus on developing countries) is provided in Table 1. Although the list of studies included in Table 1 is not exhaustive, it is adequate to gain some insights into studies assessing the phenomenon of EC adoption in developing countries. Specifically, there are two important observations: a) with a few exceptions (Chen 2003; Kim, 2006), most focus on EC adoption across multiple industry segments and b) many studies have applied Technology Acceptance Model (TAM) and Diffusion of Innovation (DOI) theory as the primary theoretical lens to study the EC adoption phenomenon, with

limited attention being given to constructs derived from other theoretical frameworks (e.g., environmental pressure and industry characteristics).

### **Table 1 here**

Researchers use the significance of EC for the Malaysian SME context has been recognized by a few scholars as well. For example, Hussain and Noor (2005) studied 107 manufacturing SMEs. By drawing on the DOI theory (Rogers, 1995), they found that relative advantage, complexity and observability influence the SMEs' use of e-commerce. They have, however, used only a single perceptual item to measure EC adoption. In another study, Tan et al. (2009) apply an integrated model by combining constructs from DOI (Rogers, 1995) with security and costs associated with EC technologies. Using a survey and a sample population drawn from SMEs of the southern region of Malaysia, the importance of relative advantage, complexity and security on SMEs' adoption of EC is reported. Finally, Alam (2009) investigates Internet adoption by Malaysian SMEs and finds that perceived benefits, cost, and organizational culture influence Internet adoption. Although the findings of these studies are useful, the current level of EC technologies within the grocery SME retailers sector in Malaysia and the influence from the environment are still not clear. Moreover, like most EC studies conducted in other countries, these studies also examine EC adoption phenomenon primarily from the DOI and/or TAM perspectives.

A small stream of studies has investigated national factors that may influence the adoption of EC in different countries. For example, Gibbs and Kraemer (2004) suggest that the scope of EC adoption across ten different countries is influenced by national factors such as government policy and EC legislation. Likewise, in another study, Boyer-Wright and Kottemann (2009) examine the relationship between national factors and level of e-business activities. Using data from the World Bank and UNESCO, they found that ICT laws, higher education, and a nation's innovation capability affect its level of e-business activities. Recently, Zhu and Thatcher (2010) employ the National Information Ecology perspective to examine how the influence of the external environment affects

EC adoption for major global economies. These authors report that at the infant stage of EC, supportive government policies, effective legal environment and compatible socio-cultural infrastructure were powerful facilitators of EC adoption.

In summary, there is still a lack of research which simultaneously considers factors related to the readiness at organizational, industry and national levels as well as the influence arising from environmental pressure. As these factors tend to influence each other, assessing the influence of these factors on EC in a single study has the potential to offer a more holistic view of the EC adoption phenomenon. This in turn would permit researchers to draw important implications for research, practice and policy formulation regarding the adoption of EC solutions and strategies.

## 2.2. Underlying Theories

The DOI appears to be the dominant theoretical lens used by scholars to explain EC adoption for SME context across many countries. Nevertheless, there is a need to consider alternative theoretical frameworks because adoption of EC technologies by SMEs is multi-faceted in nature (Peltier et al., 2012). Hence, the use of a technology adoption lens (such as DOI and TAM) alone is inadequate to fully understand such a complex phenomenon. Moreover, the application of TAM is arguably inappropriate in studies examining organizational adoption as it focuses on technology adoption by an individual. Applying TAM at an organizational level requires a meticulous study design to capture the organization-wide perception. An understanding of the business managers' perceptions, organizational conditions, and external environment is required to better appreciate the complex interactions of diverse factors affecting the EC adoption phenomenon. Therefore, both the DOI and National Institutional Perspective (NIP) are deployed in this study to comprehensively assess the EC adoption phenomenon. A brief introduction of key theories which are used in the development of the proposed framework (discussed in Section 3) is provided below.

### 2.2.1. Diffusion of Innovations (DOI)

The diffusion of innovation (DOI) theory that Rogers (1995) proposes to explain the adoption and diffusion of technological and organizational innovations and to predict organizational outcomes (Oliveira and Martins, 2011). Researchers apply DoI theory in studies of EC adoption (Al-Qirim, 2007; Grandon and Pearson, 2004; Tan et al., 2009). Rogers (1995; p. 5) defines diffusion of innovation as “the process by which an innovation is communicated through channels over time among the members of a social system”. The diffusion of innovation contains four elements; innovation, communication channels, time and social system. An innovation is defined as “an idea, practice, or object that is perceived as new by an individual or other unit of adoption” (Rogers, 1995; p 12). Innovations are not necessarily beneficial and desirable to potential adopters. Furthermore, they can be desirable for an adopter in one situation, but not to others in different situations. Therefore, adopting an innovation such as EC involves some risks and the degree of risk differs from one potential adopter to another.

Five key characteristics of innovations which affect their adoption are relative advantage, complexity, compatibility, trialability and observability. The perceptions of high relative advantage, compatibility, trialability, and observability as well as the perception of less complexity have positive impacts on the adoption of a new innovation. Innovations that require major changes in the behavior of the potential adopters create more challenges for adoption than those requiring minor changes, because of the greater risks and uncertainty involved. Communication channels used within the social system to share information about the innovations and the time required to pass the information also affect the adoption decision. Finally, the social structure including how work and power is distributed, interconnectivity, communication structure and the established behavior patterns (norms) of members within a social system as well as the existence of opinion leaders and change agents influence adoption.

### 2.2.2. National Institutional Perspective (NIP) theory

Previous research on technology adoption including EC in the developing countries (DC) context has applied the NIP theory (Shih et al., 2005; Spencer and Gomez, 2004; Zhu and Thatcher, 2010). NIP suggests the prevalence of entrepreneurial activities associated with specific dimensions of countries' institutional environments (Spencer and Gomez, 2004). Specifically, a country's institutional environment comprises relatively stable rules, social norms, and cognitive structures that guide, constrain, and liberate domestic economic activity. The institutional environment sets the framework for market transactions by defining the alternative courses of action open to firms, dictating the risks and payoffs for different activities, and specifying the conditions under which firms hold legitimacy (Spencer and Gomez, 2004). Furthermore, the institutional environment of a country has been found to affect the adoption of EC in a number of studies (Feghali and Sahyoun, 2009; Gibbs and Kraemer, 2004; Zhu and Thatcher, 2010).

NIP incorporates two aspects: regulatory institutions (RI) and cognitive institutions (CI). The RI dimension of the institutional profile consists of laws, regulations and government policies, which promote certain behaviors and restrict others. Laws and regulations can specify the responsibilities of business owners, assign property rights, and reduce the risks involved in starting a new business and adopting technological innovation, which lead to industry structures and standards for the industry level. In contrast, the CI dimension of the institutional profile reflects the knowledge and skills possessed by people in a country as well as the frameworks they use to categorize and evaluate information, which in turn affects their capacity to innovate and adopt new technologies. The prevalence of skills, such as the ability of people to identify relevant information and appropriately manage the risk inherent in running a business, should relate to an entrepreneurial climate. The existence of business training programs, the distribution of information relevant to new business owners, and the availability of assistance with market research and other business development activities contribute to the cognitive environment and can help build the entrepreneurial

skill set of a society (Spencer and Gomez, 2004). Both dimensions of NIP are relevant to this study for explaining the influence of government policy, legal environment, infrastructure and human capacity for innovation on the adoption of EC in Malaysia. This is because several studies (Boyer-Wright and Kottemann, 2009; Feghali and Sahyoun, 2009; Zhu and Thatcher, 2010) report how a number of factors at a national level have influenced EC adoption, but due to the nature of SMEs and time restrictions for the proprietors of SMEs in Malaysia, fewer results are obtained to provide further understanding or development of a national perspective. Therefore, fewer combined national level frameworks exist. This study offers a major contribution in this area.

### 3. PROPOSED FRAMEWORK AND HYPOTHESES

Building upon the Diffusion of Innovation (DOI) and National Institutional Perspective (NIP) theories and based on a synthesis of previous studies, this study proposes a multi-level framework to understand the adoption of diverse EC technologies by SMEs in developing countries, as shown in Figure 1. Key EC technologies which are considered include e-mail, internet, intranet, extranet, EDI, EFT, and barcodes/scanners. The framework consists of a combination of three levels of readiness and environmental pressure. To ensure a manageable research scope, only five factors are included. These factors are arguably most important and relevant to the adoption of EC technologies within the context of developing countries. Each of the readiness levels, factors considered and hypotheses are discussed below.

**Figure 1 here**

#### 3.1 Organizational Readiness Level

The first level considered in the proposed framework is the *Organizational Readiness (OR) level*. When considering EC innovation adoption, a major driving factor for adoption is

organizational readiness (Ghobakhloo et al., 2011). Some studies have considered organizational readiness in terms of the availability of financial and technological resources within SMEs, while others relate organizational readiness to factors such as organizational culture (Seyal et al., 2004), management support (Tsao et al., 2004), firm size (Kuan and Chau, 2001), compatibility between EC and organizational norms, values and cultures (Ghobakhloo et al., 2011; Teo and Ranganathan, 2004), perceived benefits of EC (Jeon et al., 2006; Kannabiran and Dharmalingam, 2012; Scupola, 2003) and employees' knowledge of IT (Scupola, 2003).

In this study, organizational readiness is defined in terms of *Perceived Benefits* (PB) and *Perceived Organization Resources and Governance* (PORaG). To consider EC adoption, SME owners/managers need to be convinced that the benefits of EC adoption are relevant for the current business environment and these benefits can outweigh costs and risks (Kim and Pae, 2007). The notion of PB is a distinguishing characteristic of DoI (Rogers, 1995) and has been consistently found to be related to EC adoption for SME context as indicated in Table 1. In addition, those owners/managers need to be sure that their organizations have adequate resources, including relevant capability to govern and manage EC adoption and use. These two factors are arguably the most fundamental at the organizational level and encompass many other organizational factors reported in the literature. Each of them and the related hypothesis are further discussed below.

### **3.1.1. Perceived Benefits (PB).**

EC is still viewed to be an innovation for many SMEs (Alam et al., 2011). Perceived benefit is defined as a set of anticipated advantages that innovation can provide to adopting organizations (Seyal et al., 2004). In this research, PB is used to succinctly describe how a particular technology is perceived to be beneficial to an organization, which has a broader connotation compared to the term relative advantage (RA) used in the DOI theory. The term also takes into account the

costs/risks/threats, opportunities and compatibility of innovation with the existing needs, culture, process and infrastructure since they affect the PB.

Research on EDI adoption and implementation has identified the importance of perceived benefits of the technology on adoption. For example, Iacovou et al. (1995) find a positive relationship between PB and the adoption of EDI. Looi (2005) finds that relative advantage influences EC adoption in Brunei. Organizations are likely to perceive the benefits of EC technologies if the potential of the technology to improve their business process is clear, risks are manageable and compatibility with their current business needs, process and culture is maintained.

**Hypothesis 1: The higher SMEs perceive benefits of EC technologies to be, the more likely that they will adopt these technologies**

### 3.1.2. Perceived Organization Resources and Governance (PORaG).

This factor consists of two concepts; perceived organization resources and perceived organization governance. Although previous studies on EC adoption have separated the two concepts in their studies (Molla and Licker, 2005), the proposed framework combines them because a broader stream of literature on enterprise governance and IT governance often relates the concept of organization governance to the control and management of resources (Lufthansa, 2004; Reynolds, 2010). By combining these two inter-related concepts, the number of factors in the framework becomes more manageable.

The term ‘perceived organization resources’ refers to a firm’s perceptions of the availability of resources including technological, financial/business and human resources (Molla and Licker, 2005). For SMEs, organizational resources provide opportunities for business process improvement through technology adoption and business growth (Ciabuschi et al., 2012). A number of studies have shown that organizational, financial and technological resources determine the adoption of EC technologies (Kuan and Chau, 2001; Tan et al., 2007; Tsao et al., 2004; Zhu and Kraemer, 2005).

Technological resources are related to the availability of IT infrastructure and IT usage sophistication in organizations. They could facilitate or hinder adoption of a new technology and hence affect the adoption decision (Chau and Jim, 2002; Lawson et al., 2003). Business or financial resources refer to the availability of capital to adopt and develop EC technologies and to carry out EC-related activities within the company or with trading partners. Finally, human resources are concerned with the availability of a skilled and knowledgeable workforce who can innovate and develop EC initiatives to support and improve the current business operations (Kurnia, 2008; Molla and Licker, 2005; Zhu and Kraemer, 2005).

As part of assessing organizational readiness, this study also considers organization governance. Molla and Licker (2005) in their study of organizational readiness when adopting EC technologies analyse the role of “governance” in EC diffusion. Organization governance encompasses a strategic, tactical, and operational model that defines the way organizations structure themselves to establish objectives, allocate resources, and form decisions (Molla and Licker, 2005). Other EC research has also indicated that organization governance is important for predicting EC adoption in various developing countries (Tan et al., 2007). For example, a study by Teo and Ranganathan (2004) on Singapore businesses finds that 54.4% of EC adopters have a formal plan and a task force dedicated to deploying EC. Similarly, Tan et al. (2004) find that organization governance is significant in predicting EC technologies adoption in China.

**Hypothesis 2: The higher SMEs perceive organization resource availability and governance to be, the more likely that they will adopt EC technologies.**

### 3.2. Industry Readiness Level

Unlike larger organizations, SMEs have less power and influence within the industry and broader environment, and are often engaged in EC technology adoption because of perceived coercion by large trading partners (Kurnia and Johnston, 2003; Mak and Johnston, 1998; Poon,

2000). Therefore, the second readiness level considered in this study is *Industry Readiness (IR)*. This level signifies industry readiness in fostering EC technologies adoption (Damsgaard and Lyytinen, 1998). The level deals with interactions between adopting organizations and external institutions, their mutual dependencies and power relationships, which are generally concerned with the industry structure (Damsgaard and Lyytinen, 1998). Furthermore, EC adoption requires compatibility in goals and interests among trading partners and willingness to collaborate, since EC technologies supporting business-to-business transactions are inter-organizational in nature (Kurnia and Johnston, 2003). Having established industry standards is therefore useful in helping organizations align goals and in providing a framework to facilitate collaboration.

Thus, important characteristics at this level include supporting industry structures, availability of industry-wide standards for Electronic Data Interchange (EDI) and other business processes, the presence of co-ordinating bodies, and the level of trust among industry players (Gregor and Johnston, 2001, Kurnia and Johnston, 2003). The Regulatory Institutions perspective drawn from the NIP theory supports the relevance of the influence of co-ordinating bodies and industry wide standards. The importance of this level cannot be underestimated because it is attached to and holds both the macro/national and micro/organizational levels. However, the impact of IR on EC adoption by SMEs has largely been overlooked in the current literature on EC adoption by SMEs, and therefore is examined in this study. It is assessed through the *Perceived Industry Structure and Standards (PISaS)* construct, as elaborated below.

### **3.2.1. Perceived Industry Structure and Standards (PISaS)**

The concept of PISaS consists of two closely related concepts; industry structure and industry standards. Firstly, perceived industry structure refers to *the extent to which management perceives that the industry structure supports the adoption of EC technologies*. Some industries may have an unfavorable industry structure that is not conducive to the adoption of EC technologies. Ali and

Kurnia (2011) for example, identify that organizations within the Bahraini grocery industry are highly competitive due to overlapping roles and the existence of a handful small players who have strong power and influence within the industry. Therefore, although organizations have adequate resources to adopt EC and are trading electronically with overseas trading partners, they prefer to maintain the status quo when dealing with local players.

Secondly, perceived industry standards refer to *management's perception of the availability of standards and co-ordinating bodies that facilitate the adoption of EC technologies*. This is also important for readiness at the industry level because successful EC adoption requires various sectors and segments of the industry to work systematically through coordinating bodies in order to resolve their concerns and project their demands (Crowston and Myers, 2004). The existence of co-ordinating bodies provides a platform where issues can be discussed and resolved collaboratively (Gregor and Johnston, 2000). Industry bodies may also support the development of portals and required databases (e.g. RosettaNet and Transora) to facilitate a standard mechanism for exchanging business documents between trading partners. Therefore, both aspects comprising the *PISaS* concept are important factors related to industrial readiness, which influence the adoption of EC technologies by SMEs.

**Hypothesis 3: The higher SMEs perceive the industry structure compatibility and standards availability to be, the more likely that they will adopt EC technologies.**

### 3.3. National Readiness Level

The third level considered is the *National Readiness (NR)*. There have been a relatively limited number of EC adoption studies which consider the NR level. Based on these, there are indications that NR is the major inhibitor to EC adoption (Kshetri and Dholakia, 2002; Tigre, 2003). This assertion is supported by the fact that many developing countries lack adequate technological, social, cultural, legal, logistical and financial infrastructures to effectively adopt and implement EC

technologies (Dalberg, 2011). This viewpoint considers the national environment conditions as an organization's major determinants of EC adoption. A handful of earlier studies on EC adoption by SMEs have independently explored a number of variables related to NR. These include regulatory environment and support (Zhu et al., 2003), support from technology vendors (Al-Qirim, 2007; Doolin et al., 2003), degrees of support from the government (Jeon et al., 2006) and national infrastructure (Huy and Filiatrault, 2006). However, limited research has investigated such factors in the context of developing countries (Seyal et al., 2004; Jeon et al., 2006). This study assesses national readiness through the *Perceived Supporting Services (PSS)* construct, explained below.

### 3.3.1. Perceived Supporting Services (PSS).

PSS refers to *management's perception regarding the availability of services in a country that support the adoption of EC technologies*. It includes the availability of appropriate technology infrastructure, skilled human resources to develop and maintain EC applications, software/hardware vendors, regulatory environment and support as well as IT and logistics infrastructures, which are pertinent factors determining the adoption of EC technologies by SMEs (Doolin et al., 2003; Srinivasan et al., 2002). The presence of large multinational IT companies such as, Compaq and Microsoft can also spur the uptake of EC by providing reliable products, fostering knowledge in the indigenous ICT community and enriching them with technical expertise. Furthermore, a large pool of trained human resources in the field of ICT acts as the propellant for more EC activity. Easy and affordable access to skilful individuals will incite EC uptake especially among SMEs. Finally, the maturity of the legal and regulatory frameworks governing EC activities is expected to influence the adoption propensity.

**Hypothesis 4: The higher SMEs perceive the supporting services availability within the country to be, the more likely that they will adopt EC technologies.**

### 3.4. Perceived Environmental Pressure (PEP)

Finally, *Environmental Pressure (EP)* is also considered in this study. Environmental pressure refers to the influence from the internal and external environment that compels SMEs to adopt EC technologies. Environmental pressure can occur from a customer, supplier, government demands, market pressure, or changes in external environments (Qu et al., 2011). When addressing innovation diffusion and entrepreneurial activities environmental factors have been viewed as important and often exert pressure on organizations to adopt particular technological innovation (Al-Qirim, 2007; Grandon and Pearson, 2004; Qu et al., 2011). Unequal distribution of dependency exists between SMEs and their large influential business partners, creating the perception among SMEs of pressure from those partners, triggering EC adoption decisions among the SME community. For example, Iacovou et al (1995) and Bengtsson et al. (2007) identify the importance of external pressure by large trading partners on the adoption of EC technologies by small organizations.

Furthermore, an organization may adopt certain technologies to gain similar advantages afforded to an increasing number of organizations within the same industry which have already implemented innovative technologies (Ghobakhloo et al., 2011; Looi, 2005; Zhu and Kraemer, 2005). Kuan and Chau (2001) also note that a driving force for SMEs to adopt EC technologies emanates from government policies. For example, within the Malaysian shipping industry, EDI usage is high because shippers and forwarders are obliged to transact with the Customs Department electronically for duty payments and import/export declarations (Ang et al., 2003). Finally, passion for business excellence is another environmental pressure linked to readiness and propagation of EC technologies adoption (Zhu and Kraemer, 2005).

**Hypothesis 5: The higher SMEs perceive the environmental pressure, the more likely that they will adopt EC technologies.**

## 4. RESEARCH STUDY METHODOLOGY

### 4.1 Research Context

The target population for this study is small and medium-sized retailers within the Malaysian grocery sector. This sector is selected because of its important contribution to the economy of the country and the fact that it is a leader in technology adoption (Al-Sudairy and Tang, 2000; Wrigley and Low, 2010). Selection of SMEs is based on personal contacts or association with the local Malaysian university where one of the academic team members was based. Business owners or managers/CEOs are selected to complete the survey as they can provide an organization-wide view. Research has also found that SMEs are defined diversely, each according to the context of interest (Senderovitz, 2009). Since the context of this study is Malaysia, an SME in Malaysia is defined as an enterprise with fewer than 50 full-time employees or annual sales turnover not exceeding RM5 million (SME Association of South Johor, 2012). In 2012 there were approximately one million SMEs in Malaysia (Wong, 2012).

Malaysia is chosen as the study context because it shares a number of common characteristics with other developing countries, particularly those within the Asia Pacific region. Malaysia represents a developing country (DC) with a rapidly emerging economy that is well-managed as measured by current account surpluses, low inflation and stable currency, stock markets and interest rates (Shilling, 2014). According to a report published by the National Bank of Malaysia, Malaysia's GDP grew 5.1% in 2013 (The Star Online, 2014). In 2011, SMEs contributed significantly to economic activities in Malaysia, employing 59% of its workforce and contributing 32.5% of gross domestic product (The Star Online, 2013). Malaysia aims to increase SMEs' contribution to employment from 59% of the workforce to 61% and to enhance their export contribution from 19% to 25%. The contribution is very high particularly for the retail grocery sector (Wrigley and Low, 2010).

Furthermore, Malaysia has a supportive environment for technology adoption by SMEs. For example, to encourage SMEs to adopt Information and Communications Technologies (ICT), the Malaysian government offers loans with minimum interest rates over five years (SME Association of South Johor, 2012). Moreover, a particular ICT of current importance in Malaysia which may affect EC adoption is broadband. The Malaysian government is supporting the uptake of broadband by business and individuals by forming agreements with local Internet Service Providers (ISPs) (Kotelnikov, 2007). Again, this situation is similar to several developing countries, particularly within the Asia Pacific region (Kartiwi and MacGregor, 2007; Kurnia, 2008; Lertwongastien and Wongpinunwatana, 2003; Tan et al., 2007).

#### 4.2 Unit of Analysis and Questionnaire Description

As this research emphasizes Malaysia's small and medium grocery retailers, the unit of analysis is the individual participating retailer. A majority of the items included in the survey questionnaire are adapted from previous studies, such as Rogers (1995) and Molla and Licker (2005) to fit the context of this study. In order to ensure the content validity of the scale used, it is advisable to adapt the items for each construct from prior research (Luarn and Lin, 2005). In this research, 24 survey items for five constructs in the questionnaire are derived from prior empirical studies and modified to fit the context of this research as shown in Table 2.

Prior to administering the survey questionnaire, a pilot test was conducted with eight individuals from academia and the SME sector. Participants for the pilot are selected on the basis of knowledge, expertise and understanding of the SME sector in Malaysia and represented the sample frame. This led to the identification of a few ambiguities and a revision of the interview protocol and questionnaire.

The final questionnaire contains closed-ended questions. Section A emphasizes the demographics of an SME in terms of the size and type of SME; independent or chain, numbers of

employees, and educational attainment. Section B contains items based on the theoretical constructs and consisted of a Likert-scale of 1 (strongly disagree) to 5 (strongly agree). These items measure the five factors influencing the adoption of EC technologies. Section C determines the use of EC technologies by the participating organizations. Section D examines the impact of EC. This study reports only that part of the survey analysis focusing on EC technology adoption determinants.

**Table 2 here**

### 4.3 Data Collection

A purposive sampling method was used to enable the team to identify small and medium-sized grocery retailers who displayed the typical, normal, and average adoption of EC behavior. This method allowed us to reach the target population faster than a random sample population would have. A list of SMEs was obtained from the website of the Small and Medium Industries Development Corporation (SMIDEC) of Malaysia ([www.smidec.gov.my](http://www.smidec.gov.my)). Based on the list, information on SMEs located in local vicinities of Kuala Lumpur was acquired. Concurrently, online and offline searches for SME retailers in Malaysia were made and several local, personal contacts from the academic team's network were established by telephone or word of mouth.

Replies from targeted retail proprietors following the telephone conversations indicated willingness to participate and resulted in an academic team member and a research assistant from Kuala Lumpur arranging personal visits to the participants' premises for four purposes: 1) to personally explain the study's purpose; 2) to provide a hard copy of the survey; 3) to gain familiarity with the SME and its owner; 4) to build trust between researcher and academic. A pre-paid envelope was also provided to the participating retailers.

Overall, 300 surveys were administered, with 180 returned surveys, resulting in a 60% response rate. The high response rate is attributed to the personal approach adopted. Following a data cleansing process involving elimination of incomplete and missing values, a total of 125 complete

and usable surveys eventually emerged. This constitutes an approximate 42% response rate which is still considered satisfactory. SPSS software was used to analyze the survey data.

Non-response is a potential source of bias in survey studies that needs to be addressed (Fowler, 1993). The potential bias is evaluated by comparing responses between early and late respondents. This approach is also used by e-commerce scholars such as Teo et al. (2009) and Grandon and Pearson (2004). Early respondents are those who completed the questionnaire within the initial three weeks, while late respondents are those who completed after the specified period. About 72% of the responses are from early respondents. Demographic data are utilized for this purpose: number of employees, type of company and ownership of company. The results of the chi-square tests indicate no significant differences between the early and late respondent groups, suggesting the absence of non-response bias.

## 5. EMPIRICAL FINDINGS

In terms of the nature of business, 96% of SMEs indicate local entrepreneurship, 91.9% independent retailing and 8.1% are part of a chain. On the matter of adoption, a variation within six specific EC technologies accepted by these SMEs. Table 3 summarizes the number and proportion of adopters and non-adopters of each EC technology. E-mail is adopted by most SMEs (22.4%). In terms of non-adopters, the highest percentage is evident for extranet (91.9%), with the least percentage for barcodes (71.2%).

### Table 3 here

Data analysis involves three steps. Initially, Cronbach's Alpha is used to evaluate the reliability of each construct included in the framework. For the second step, validity of the constructs is established using factor analysis. Finally, in the third step, a logistic regression technique is used to

assess the impact of five independent factors on the adoption of each EC technology considered in this study. This technique is chosen for two reasons; a) the dependent variable (adopters versus non-adopters) is dichotomous, therefore, only two possible values of 0 or 1, and b) the need for fewer assumptions than discriminant analysis (Pallant, 2007). Each step is described below.

Table 4 shows the outcomes of reliability analysis of the constructs included in the framework. One item from the perceived benefit (PB) construct is removed due to its low item-total correlation. Overall, the alpha values range between the values of 0.789 to 0.933. Reliability of all the constructs is considered satisfactory as the values were above the acceptable value of 0.7 (Nunnally, 1978). In general, the greater the value of Cronbach's alpha the more reliability is demonstrated (Garson, 2008).

#### **Table 4 here**

To assess construct validity, convergent and discriminant validities are used. Convergent validity refers to the degree to which concepts that would be related theoretically are interrelated in reality. Conversely, discriminant validity refers to the degree to which concepts that should not be related theoretically are not interrelated in reality. Convergent and discriminate validities (Table 5) are evaluated by performing a multi-trait, multi-method factor analysis as suggested by Campbell and Fiske (1959). Convergent validity is confirmed when the items load strongly (loading > 0.50) on their associated factors. Discriminate validity is established when each item loads stronger on its associated factor than on any other factors. The overall items achieved loadings of >0.50 on their associated factors and loaded stronger on their associated factors than on other factors.

#### **Table 5 here**

In Figure 1 the proposed framework incorporates five independent predictor factors. To rule out the existence of a multi-collinearity problem, both the Pearson correlation and Variance Inflation Factor (VIF) are calculated. The term 'multi-collinearity' refers to a high degree of correlation among several independent variables (Hair et al., 1998). It occurs more commonly when a large

number of independent variables are incorporated in a regression model because some of them can measure the same concept. The results of the Pearson correlation matrix are shown in Table 6, which indicates that the highest squared correlation among the five independent variables was 0.508.

**Table 6 here**

The results of the VIF analysis are shown in Table 7. The overall VIF values are less than 5 and the squared correlation among the independent factors (in Table 6) are less than 0.8 (Hair et al., 1998), which indicates the absence of a multi-collinearity problem. Therefore, no evidence of a multi-collinearity problem is detected.

**Table 7 here**

For the third step of data analysis, a logistic regression analysis technique is applied and the results are indicated in Table 8. These results identify both significant and insignificant factors. The results further reveal that there is a goodness-of-fit statistic for all the different logistic-regression tests; thereby suggesting that the logistic regression model is satisfactorily significant in discriminating between the adopters and non-adopters of EC technologies in the sample. Next, the accuracy or discriminating power of the logistic regression test is determined (Table 8). Accuracy varied between 83.9% and 94%, with a near perfect result for extranet and EDI, the more classic versions of EC technologies.

**Table 8 here**

Drawing on the results shown in Table 8, a high level summary of findings is provided in Table 9 indicating: a) a significant positive or negative influence of factors, and b) an insignificant influence of some factors. These two tables demonstrate that PISaS is the only factor that has no significant influence on the adoption of any EC technologies. In contrast, PEP has a positive significant influence on the adoption of all six types of EC technologies. The remaining three factors have significant influences on at least two EC technologies.

## 6. DISCUSSION

This section discusses the influence of each construct in greater depth. The first construct is PB, which surprisingly is not found to significantly affect most of EC technologies. What is more surprising is that PB negatively affected the adoption of two specific EC technologies: e-mail and internet. This finding is consistent with Seyal and Abd-Rahman (2007). However, this finding is contrary to Al-Qirim's (2007) finding where PB is associated with extranet adoption by small businesses in New Zealand. What these contradictory results do offer as a lesson is that when adopting EC technologies the influence of a specific construct (in this case, PB) at the organizational level is likely to be diverse. The findings on the negative impact of PB are possibly attributed to the demographic characteristics of the SME owners / managers in Malaysia. This is because previous research on owners/managers of ethnic minority businesses (EMBs) in the UK find that ICT such as the Internet and e-mail are used much less than their white British counterparts (Foley and Ram 2002). A further study by Allison et al. (2004) suggests that awareness of ICT benefits may be known, but due to greater barriers to adoption, resistance to the adoption of novel technologies was evident and led to a negative reaction to innovation. Building on these observations reported in the existing literature, resistance among Malaysia's small and medium-sized grocery retailers towards novel EC technologies may exist arguably because the barriers appear to be greater than the benefits. This attitude leads to the formation of negative perceptions, which outweigh the positive impressions about the impact of EC technologies. The retailers may also have expected more benefits at the beginning, but the actual benefits experienced can be lower than their initial expectations. This observation implies that in general there is a lack of understanding within the surveyed SMEs about the benefits that can be obtained from EC technologies. This issue calls for more effort by the industry and government to increase the level of understanding of EC benefits among SMEs so that they can develop more realistic expectations.

This study further reveals that participating SMEs that have adopted EC technologies may be organizationally ready and compliant with the environmental pressure, but they ignore the influence of potential benefits in adopting e-mail and Internet. In other words, the SME adopters could be regarded among the first SMEs that adopted e-mail and the Internet without paying much attention to the potential benefits of these technologies. The benefits at the adoption stage are not always easily perceived by the SMEs as most managers of SMEs in developing countries are not sure about the direct and indirect benefits that can be derived from EC. This issue is perhaps due to the lack of adequate skills or knowledge about the affordances of technology. An interesting observation obtained during the field visits to SMEs and informal discussions with the participating retailers indicates that many SME employees do not have access to e-mail and the Internet at home, which could be a likely reason for these technologies to be used by employees for non-work related purposes in work settings. This misuse of e-mail in turn may result in negative benefit perceptions about the adopted e-mail and Internet. This particular aspect represents a unique contribution as it explains why PB is not always perceived to have a positive impact on EC adoption.

While non-adopter SMEs may have perceived the benefits of adopting e-mail and the Internet, they are not organizationally prepared and do not perceive any external pressure to adopt these technologies. Therefore, the adoption decision is delayed until they improve their organizational readiness and experience a pressure to adopt. On the other hand, perceived benefits are found to be an insignificant factor in determining intranet, extranet, EDI, EFT and barcode adoption for both SME adopters and non-adopters. Many of these EC technologies are more complex than simple e-mail and the Internet. The participating SMEs are less concerned about the benefits as external driving forces (as findings in Table 9 indicate) may take precedence in their decision to adopt these technologies. This finding is consistent with Seyal and Abd-Rahman (2003; 2007) who also find that relative advantage to be an insignificant contributor to EC adoption in developing countries, but

contrasted with the study by Al-Qirim (2007) that finds relative advantage associates with extranet adoption.

The second construct (at the OR level), PORaG, was statistically significant and displayed positive results for e-mail, internet and barcodes. This finding is consistent with previous studies that revealed perceived organizational readiness is positively associated with adoption of EC technologies (Doolin et al., 2003; Grandon and Pearson, 2004; Tsao et al., 2004; Zhu et al., 2003). The finding suggests that the non-adopters may not have the necessary resources, infrastructure and procedures to adopt EC. However, PORaG has an insignificant influence on the adoption of intranet, extranet, EDI and EFT. This result suggests that the participating retailers are not prepared to adopt these EC technologies irrespective of their PORaG. These EC technologies may be considered unnecessary for supporting their business activities and information exchange within and beyond their organizations.

PISaS is the only factor that is not found to significantly affect any EC technology. This finding is particularly consistent with the previous observation regarding the lack of interest among participating SMEs in EDI and EFT, which typically require industry support. A plausible explanation for this insignificant influence could be attributed to the lack of awareness of the participating SME owners and managers about the industry structure and the availability of EC technology standards within Malaysia's grocery sector. Most of the SMEs participating appear to have a limited understanding of EC technologies, little exposure to the technology and standard development within the industry, as well as limited awareness of the EC capability of their larger trading partners and the nature of business relationships within the industry. Most SME managers seem not to be interested in the role of the industry co-ordinating bodies or do not perceive a need to have interactions with those bodies when contemplating EC adoption. As a result, PISaS is found not to be a significant determinant for EC adoption. This is supported by findings from a UK study suggesting that business support and awareness of policy initiatives within SME ethnic minority owner/managers can lead to the ICT not being adopted (Beckinsale et al., 2010).

Interestingly, PSS is found to negatively influence the adoption of e-mail, the internet and barcodes. This suggests that the adopters of e-mail, the internet and barcodes in this study have lower perceptions of the availability of supporting services. This finding is in agreement with the views of Bennett and Robson (1999) and Mole (2002) who argue that smaller organizations display reluctance towards seeking support. Interestingly, PSS is found to be an insignificant factor in the adoption of the intranet, extranet, EDI, and EFT, which are arguably more complex than e-mail, the internet and barcodes. A possible explanation for this finding is that perhaps the participating retailers do not have adequate understanding of these technologies and the importance of supporting services for the adoption, which is consistent with the observations regarding the influence of PISaS.

PEP is the only factor that is found to be important for all six EC technologies. This implies that the greater the environmental pressure perceived by small retailers, the greater the likelihood of their adopting EC technologies. Thus, small retailers who have not yet adopted EC technologies perceive low external pressure from the environment. The results support the view that external pressure (trading partners) leads to EC adoption (Iacovou et al., 1995). Environmental pressure can emerge as a factor driving adoption for innovative technologies due to SME owners/managers keeping abreast with what their competitors are doing, keeping up-to-date with the environment where technological changes are viewed to be important for companies, and determining ways of meeting the current and future needs of customers. Also included in this view is that competitors' activities influence new product adoption (Laforet, 2008). The results are thus consistent with earlier studies on the effect of environmental pressure in other developing countries (Grandon and Pearson, 2004; Huy and Filiatrault, 2006; Scupola, 2003), but contradict some studies (Kuan and Chau, 2001; Thong, 1999). Once again, this study shows that the impact of a particular adoption factor can be diverse in both developed and developing countries.

In summary, the results indicate that PB, PORaG, PS and PEP have varying influences on the adoption of different EC technologies. For example, PORaG influences the adoption of e-mail, the

Internet and barcode, but it is insignificant in affecting the adoption of intranet, extranet, EDI and EFT. This means that there are certain factors that influence SMEs' adoption of a specific EC technology, which highlights the importance of these determinants to this specific technology. In the case of e-mail, the Internet and barcode, the decision to adopt these three technologies is mainly based on internal and external factors, particularly the organization's resources, governance of SMEs and environmental pressure. In the case of intranet, extranet, EDI and EFT, the decision to adopt these technologies is largely dependent upon environmental pressure. Likewise, perceived benefits are found to be significant in determining the adoption of e-mail and the Internet only. This factor is insignificant in determining the adoption of intranet, extranet, EDI, EFT and barcode. Thus, to encourage adoption of a particular EC technology, it is important to understand what factors are relevant in order to devise a more appropriate strategy for the specific context.

The survey results also suggest that EC adoption in Malaysia's grocery retail sector is primarily influenced by environmental pressure, followed by national and organizational readiness levels. These levels have also been considered important in other EC adoption studies for DC context (Pare et al., 2009; Qu et al., 2011). When understanding EC within DC context, Molla and Licker (2005) suggest that readiness levels and the environment are important factors of consideration. Using the example of the Malaysia's grocery retail sector and the SME owner/manager's perspective, this study finds that the environmental pressure together with two specific readiness levels (i.e. national and organizational) do impact EC technologies adoption, which supports the views of Molla and Licker (2005).

## 7. CONCLUSION AND STUDY IMPLICATIONS

This study provides an integrated view on EC adoption for the Malaysian grocery SME context by considering various e-readiness factors affecting three different levels, namely organization, industry and national. Previous studies of EC adoption by SMEs typically explore these various factors independently. This study explores the impact of industry readiness on EC adoption

by SMEs which has been largely overlooked in the EC literature. The study also demonstrates the importance of the context, particularly the specific EC technologies being investigated, in understanding factors that affect the adoption process. By considering a number of widely known factors that influence SMEs' adoption of technology in general and EC in particular, this study shows that these well-known factors have different influences on the adoption of different EC technologies. This finding offers a contribution to the EC literature.

This study has enhanced the existing EC research by considering factors at three different levels and applying it to the Malaysian grocery SME context. As indicated earlier, the use of a multi-level framework is still minimal in EC adoption research for the DC context. The study findings suggest that the factors related to organizational readiness, national readiness and environmental pressure do influence EC adoption in a developing country such as Malaysia. Therefore, applying a multi-level EC adoption framework developed for a DC context can provide richer insights than those studies which use only a single theoretical lens (such as technology adoption) at a single level (e.g. organizational). This study also explores the impact of Industry Readiness on EC adoption by SMEs which, while not found to be significant, has largely been overlooked in the current EC literature.

The findings of this study bear several implications for further EC research. For academic research, this study sets an example of an application of multilevel EC adoption research for a DC context, which is not commonly reported in the existing literature. EC scholars can benefit from the use of the framework used in this study to evaluate EC adoption phenomenon in other DC contexts. Another implication is for the Malaysian SME context. Studies on EC adoption for Malaysia's grocery retail sector are rare. This study is thus a pioneering attempt in this regard. Therefore, studies are needed to inform and grow awareness of the SMEs from an organizational perspective. The insignificant influence of the construct PISaS suggests that both adopters and non-adopters of EC have equal perceptions regarding the impact of these factors on the adoption of EC technologies by

SMEs in Malaysia. This implies that for Malaysian SMEs, barriers to entry in the form of standards and structure may be minimal, hence encouraging more Malaysian SMEs to adopt EC.

For policymakers, identification of factors with a policy aspect could lead to an increase in adoption of EC technologies by SMEs. For instance, industry standards have been viewed not to have any influence on EC technologies adoption, as indicated in this study. Policymakers could take steps to increase awareness of industry standards and structures amongst SMEs, thereby providing uniformity and quality within the sector. Policymakers should also provide SMEs with human, financial and technological resources to facilitate the adoption of EC technologies. If an SME is considering adoption of e-mail or the Internet, focus could be placed on raising awareness of the potential benefits of these technologies, building internal organizational readiness and issuing policies and procedures for adopting the technology. This also implies that the owner/manager of an SME needs to know and understand the potential benefits of EC technologies by learning from the experiences of other adopting SMEs, and access better education programs provided by industry-affiliated organizations or government.

Overall, this study highlights the need for more collaboration between industry partners and government to encourage SMEs to adopt EC technologies by increasing their understanding of the benefits arising from these technologies. It is also important to raise awareness of why business partners exert pressure on SMEs for EC adoption and the benefits (as perceived by the influential trading partners) that such adoption can bring to supply chains. In addition, industry partners and government need to help SMEs build and maintain their internal organizational resources, structures and governance to fit well with EC technologies. National policies and strategies need to be established or reactivated in order to influence the behavior and attitudes of SMEs towards the adoption of various EC technologies.

Despite the study contributions, there are some limitations which future studies should address. First, the small sample size constraints the ability to generalize the results beyond the

grocery industry for Malaysia. Hence, future studies should attempt to include a large number of SMEs. To add greater depth and richness, future studies involve multiple case studies which could highlight potential interactional effects among the three levels of factors included in the framework. Second, focusing only on Malaysia as the study context affects the applicability of the study findings across developing countries. As Malaysia has been used as one exemplar DC of South East Asia, similar research in other South East Asian countries (e.g. Bangladesh) would be useful. Such a study would provide a unique aspect to EC adoption research. The research would also facilitate comparisons between South East Asian countries' SMEs and the presentation of opinions and views regarding the influences of the factors. Additionally, although this study predicts the influence of readiness factors from organizational, industry and national levels on EC technology adoption, it is difficult to infer a causal relationship between them due to the small sample size. Therefore future studies should explore causal relationships between the readiness factors.

Finally, additional factors may influence EC adoption in developing countries that were not explicitly included. In particular, attributes of technology such as complexity, compatibility and risks have been captured only as part of the perceived benefits. Nor has trust between trading partners been considered. Future studies assessing the influence of these factors would therefore complement and enrich the findings of this study.

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## Tables and Figures

**Table 1: Examples of empirical studies on EC adoption for SME context: A summary**

Illustrative literature sources	Country	Underlying theories and key factors studied	Key findings on factors affecting EC adoption
Quaddus and Hofmeyer (2007)	Australia	TAM, organisational characteristics	
Seyal and Abd-Rahman (2003)	Brunei	TAM, environmental factors	
Looi (2005)	Brunei	Diffusion of Innovation, general IS adoption literature	Competitive pressure, IT knowledge, relative advantage, security and government support
Olatokun and Kebonye (2010)	Botswana	Broader EC adoption literature	Security, high costs, lack of technical manpower, slow internet speed
Grandon and Pearson (2004)	Chile	TAM, DOI, organizational readiness	Organizational readiness, external pressure, perceived ease of use, perceived usefulness

Tarafdar and Vaidya (2006)	India	No specific theory, broad literature on IS adoption	Management support, organization culture, organisation structure (centralisation/decentralisation)
Tan et al. (2009)	Malaysia	DOI, EC security and EC costs	
Al-Qirim (2007)	New Zealand	DOI, organizational and environmental factors	
Olatokun and Bankole (2011)	Nigeria	Broad EC adoption literature. A model is developed in somewhat TOE format	Perceived benefits, nature of business, size of organization, owners' EC awareness
Seyal et al. (2004)	Pakistan	TOE, Culture theory (Hofstede, 1997), motivation theory (Vallerand 1997) and DOI (Rogers, )	organizational culture, government support, perceived benefits, task variety
Teo and Ranganathan (2004)	Singapore	No specific theory	Industry type, organization type, Level of annual IT investment, B2B champion, management support,
Cloete et al. (2002)	South	TAM	

	Africa		
Molla and Licker (2005)	South Africa	TOE	EC awareness, management commitment, governance, human resources, business resources, technology resources, government support, market forces, supporting industries
Kim (2006)	South Korea	TOE	Management support, security, ease of use, belief of inter-firm benefits, B2B mindset
Jeon et al. (2006)	South Korea	DOI and environmental pressure	
Chen (2003)	Taiwan		pressure
Lertwongstaien and Wongpinunwatana (2003)	Thailand	TOE, broader IT innovation literature	Organization size, management support, existence of an IT department, compatibility, competitive pressure, perceived benefits
Li et al. (2011)	USA	DOI, TAM, competitive pressure	

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**Table 2: The Constructs and survey items of this research study**

Constructs	References	Survey items
I. Perceived Benefits	Gibbs and Kraemer, 2004; Seyal et al., 2004; Iacovou et al., 1995; Looi, 2005	<ol style="list-style-type: none"> <li>1. Our organization is aware of the opportunities and threats enabled by e-commerce.</li> <li>2. Our organization understands the potential benefits of e-commerce to our business.</li> <li>3. Our organization perceives that e-commerce is compatible with culture, values, needs and work practices of our organization</li> </ol>
II. Perceived Organization Resources and Governance (PORaG)	Molla and Loker, 2005; Ciabuschi et al., 2012; Tsao et al., 2004; Tan et al., 2007; Kuan and Chau, 2001; Zhu and Kraemer, 2005; Chau and Jim, 2002 and Lawson et al., 2003; Kurnia, 2008	<ol style="list-style-type: none"> <li>1. Our organization has the required expertise and skills for supporting e-commerce.</li> <li>2. Our organization has the financial resources to adopt ecommerce.</li> <li>3. Our organization has the technical resources to adopt ecommerce.</li> <li>4. Our organization has a flexible technical infrastructure that can easily incorporate ecommerce technology.</li> <li>5. Our organization has champions for ecommerce initiatives.</li> <li>6. Our organization has clearly defined roles, responsibilities and accountability within each ecommerce initiative.</li> </ol>
III. Perceived Industry Structure and	Crowston and Myers, 2004; Gregor and	<ol style="list-style-type: none"> <li>1. Our ecommerce applications are interconnected and compatible with our trading partners.</li> </ol>

Standards (PISaS)	Johnston, 2000; Kurnia and Johnston, 2003; Ali and Kurnia, 2011	<ol style="list-style-type: none"> <li>2. Our trading partners collaborate with us and share important data and information.</li> <li>3. Our industry has standards for ecommerce and electronic data transfer.</li> <li>4. Our industry has co-ordinating bodies where ecommerce issues are raised, discussed and resolved.</li> <li>5. Our industry has online databases and portals to facilitate the growth of ecommerce.</li> </ol>
IV. Perceived Supporting Services (PSS)	Srinivasan et al., 2002, Doolin et al., 2003; Kuan and Chau, 2000	<ol style="list-style-type: none"> <li>1. The logistics and transport infrastructure is reliable and efficient to support ecommerce.</li> <li>2. The legal environment is conducive to conduct ecommerce and has effective laws to protect consumer privacy and combat cyber crime.</li> <li>3. There are adequate skilled labour and software/hardware vendors to support ecommerce initiatives.</li> </ol>
V. Perceived Environmental Pressure	Qu et al., 2011; Qu et al., 2011; Kuan and Chau, 2001; Kuan and Chau, 2001; Looi, 2005; Zhu and Kraemer, 2005; Ghobakhloo et al., 2011; Ang et al., 2003	<ol style="list-style-type: none"> <li>1. Our industry is pressuring us to adopt ecommerce.</li> <li>2. Our government is pressuring us to adopt ecommerce.</li> <li>3. Our customers are pressuring us to adopt ecommerce.</li> <li>4. Our suppliers are pressuring us to adopt ecommerce.</li> <li>5. Our organization is forced to adopt ecommerce due to competitive pressure.</li> <li>6. Our organization is forced to adopt ecommerce due to serious decline in business performance (profits/revenue/market share).</li> </ol>

7. Our organization is proactive and motivated to business excellence and is adopting ecommerce in order to set pioneering trends.

**Table 3. Summary of adopters and non-adopters of EC technologies**

EC Technologies	Valid Survey Responses	Adopters N (%)	Non-Adopters N (%)
E-mail	125	28 (22.4%)	97 (77.6%)
Internet	124	28 (22.6%)	96 (77.4%)
Intranet	124	13 (10.5%)	111 (89.5%)
Extranet	124	10 (8.1%)	114 (91.9%)
EDI	124	12 (9.7%)	112 (90.3%)
EFT	124	17 (13.7%)	107 (86.3%)
Barcode	125	36 (28.8%)	89 (71.2%)

**Table 4. Results of construct reliability assessment**

Factor	No of items	Valid No.	Mean	Std. deviation	Cronbach's alpha
Perceived Benefits (PB)	3	124	2.988	0.957	0.822

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Perceived Organization Resources and governance (PORaG)	6	122	1.866	0.901	0.912
Perceived Industry Structure and Standards (PISaS)		123	1.920	0.663	0.813
Perceived Supporting Services (PSS)	3	121	2.639	0.841	0.789
Perceived Environmental Pressure (PES)	7	125	1.355	0.507	0.933

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**Table 5. Results of factor analysis**

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Perceived Benefits (PB)	Perceived Organization	Perceived Industry Structure and	Perceived Supporting	Perceived Environmental
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	Resources and Governance (PORaG)	Standards (PISaS)	Services (PSS)	Pressure (PES)
PB1	0.762			
PB2	0.782			
POR1	0.809			
POR2	0.804			
POR3	0.892			
POR4	0.871			
POR5	0.813			
POR6	0.545			
PIS1		0.508		
PIS2		0.624		
PIS3		0.812		
PIS4		0.745		
PIS5		0.723		
PSS1			0.729	
PSS2			0.747	
PSS3			0.813	
PEP1				0.837
PEP2				0.756
PEP3				0.879
PEP4				0.875
PEP5				0.856

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PEP6	0.724
PEP7	0.835

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**Table 6. Correlation matrix of the research variables**

Factors	1	2	3	
Perceived Benefits (PB)	1			
Perceived Organization Resources and Governance (PORaG)	.498	1		
Perceived Industry Structure and Standards (PISaS)	.405	.508	1	
Perceived Supporting Services (PSS)	.311	.448	.417	
Perceived Environmental Pressure (PES)	.323	.338	.474	.247

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**Table 7. VIF for the independent variables**

Independent Factors	Regressed on Factor				
	Perceived	Perceived	Perceived	Perceived	Perceived

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	Benefits	Organizational Resources and Governance (PORaG)	Industry Structure and Standards (PISaS)	Supporting Services (PSS)	Environmental Pressure (PEP)
Perceived Benefits (PB)		1.067	1.213	1.134	1.088
Perceived Organizational Resources and Governance (PORaG)	1.300		1.341	1.311	1.275
Perceived Industry Structure and Standards (PISaS)	1.182	1.131		1.130	1.198
Perceived Supporting Services (PSS)	1.183	1.097	1.209		1.127
Perceived Environmental Pressure (PEP)	1.203	1.131	1.358	1.195	

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**Table 8. Predictors of EC technology adoption for Malaysian small retailers**

Variables	B	S.E.	Wald	df	Sig.	Exp (B)	95.0% C.I. for EXP(B)		Model accuracy (%)	Nagel kerke R	Chi- square	df	Sig.
							Lower	Upper					
<b>E-mail</b>										88.1	.63	9.720	.000
Perceived benefits	-1.20	.52	5.296		0.021*	.301	0.108	.837					
Perceived organization resources and governance	2.19	0.61	12.998		0.000**	8.965	2.721	29.540					
Perceived supporting services	-1.50	0.67	5.054		0.025*	0.223	0.060	0.825					
Perceived environmental pressure	2.65	0.70	14.366		0.000**	14.18 9	3.600	55.928					
<b>Internet</b>										88.9	0.66	63.289	0.00 0
Perceived benefits	-0.96	0.48	3.964		0.046*	0.385	0.150	0.985					
Organization resources and governance	2.62	0.67	15.115		0.000**	13.76 5	3.670	51.624					

**Supporting**

services	-1.51	0.68	4.998	0.025*	0.221	0.059	0.830
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**Environmental**

pressure	2.43	0.74	10.806	0.001**	11.39 1	2.671	48.587
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**Intranet**

						92.3	0.54	36.834	0.00 0
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**Environmental**

pressure	1.86	0.64	8.347	0.004**	6.392	1.816	22.497
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**Extranet**

						94.0	0.49	28.889	0.00 0
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**Environmental**

pressure	1.84	0.72	6.585	0.010**	6.262	5.542	25.423
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**EDI**

						94.0	0.62	41.957	0.00 0
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**Environmental**

pressure	2.60	0.76	11.674	0.001**	13.45 2	3.029	59.745
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**EFT**

						89.7	0.52	38.178	0.00 0
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**Environmental**

pressure	1.94	0.61	10.115	0.001**	6.958	2.105	22.996
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**Barcodes**

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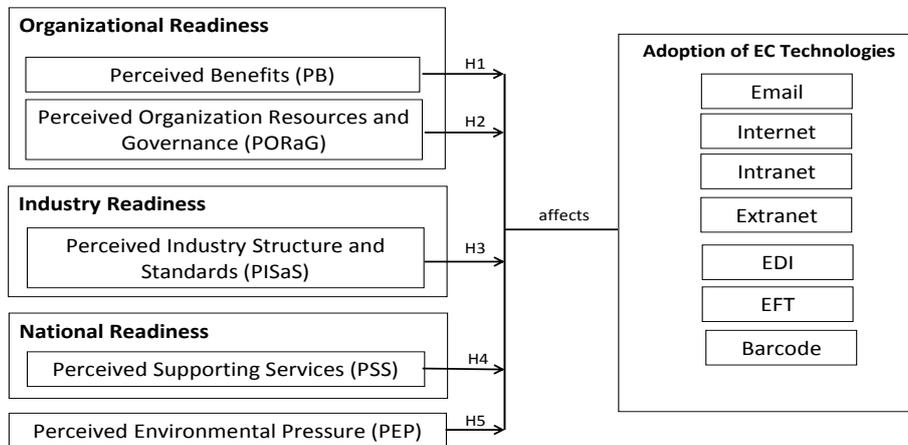


Perceived							
Supporting Services (PSS)	-	-	(N)	(N)	(N)	(N)	-
Perceived							
Environmental Pressure (PEP)	+	+	+	+	+	+	+

- means that the factor influences EC technology adoption negatively and significantly

+ means that the factor influences EC technology adoption positively and significantly

N means that there is insignificant influence of this factor on EC technology adoption



**Figure 1. A multi-level EC adoption framework for SMEs in developing countries context**

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