Adoption of Electronic Commerce Technologies by SMEs in Malaysia

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Abstract

Electronic commerce (EC) offers many benefits to organizations of any size including small to medium-sized enterprises (SMEs). At this stage, there is still a need for a better understanding of the potential and relevance of EC in developing countries as well as the behaviour of SMEs towards EC adoption. Moreover, there is still a need for a holistic view of how various widely known factors at the organization, industry and national levels affect EC adoption. Therefore, this study proposes a theoretical model of EC technologies adoption by SMEs in developing countries by incorporating various readiness factors identified in the literature that may determine EC technologies adoption by SMEs in developing countries. It then explores the influence of these factors on the adoption of different EC technologies. The environmental pressure is also considered in this study. Through a survey of SMEs within the grocery industry in Malaysia as an example of a developing country, the study demonstrates how various readiness factors influence the adoption of various EC technologies differently. This study provides additional insights into EC adoption by SMEs in developing countries and has important implications for research and practice.

1. Introduction

The emergence of electronic commerce (EC) technologies has affected many industries and organizations. In this study, EC is defined as the process of buying, selling, transferring or exchanging products, services and/or information via computer networks, including the Internet [1]. Regardless of their size, EC offers organizations enormous opportunities and benefits to improve their business performance. Small to medium-sized enterprises (SMEs) are increasingly realizing the potential benefits of EC technologies [2-3]. SMEs may use EC technologies to communicate with customers and suppliers, collect market research data, promote goods and services, provide detailed information about products and services, support online ordering of goods and services, as well as offer after sales support and assistance [3-4]. Furthermore, research also indicates that SMEs can take advantage of EC technologies in expanding their business [5]. Thus, the use of EC technologies enables SMEs to improve their efficiency and competitive position in the marketplace.
Therefore, the purpose of this study is twofold (i) to propose a comprehensive model that takes into account the readiness factors at the organizational, industry and national levels that potentially determine EC technologies adoption by SMEs in developing countries, and (ii) to explore the influence of each factor on adoption of various EC technologies by SMEs in developing countries by differentiating between adopters and non-adopters of these technologies. In doing so, we first conducted an extensive review of EC adoption by SMEs in both developed and developing countries to identify key determinants for adoption of EC technologies by SMEs in developing countries. Then we conducted a survey of SMEs within the grocery industry in Malaysia as an example of a developing country and assessed the influence of these determinants on the adoption of EC technologies under investigation including e-mail, Internet, Intranet, Extranet, Electronic Data Interchange (EDI), Electronic Funds Transfer (EFT) and Barcode/Scanner. The adoption of EC technologies is measured by whether or not the participating organization uses any of these technologies in carrying out their business operations.

Malaysia shares some common characteristics with other developing countries. For example, Malaysian SMEs represent a large share of Malaysia’s economy because the majority of companies in Malaysia are regarded as SMEs [7]. Furthermore, as a typical developing country, SMEs operate in most business sectors in Malaysia. Furthermore, Malaysia has a supportive environment and economic context that encourages EC adoption among SMEs. Loans with minimum interest over five years have been offered to SMEs to encourage them to buy ICTs applications. Agreement with local Internet service provider has also been signed to increase broadband usage among SMEs [7]. A number of developing countries particularly within the Asia Pacific region have similar condition in this regard [12-13, 23-26]. Therefore, the findings obtained from this study are also likely to be applicable in other developing countries.

The findings highlight the need for more collaboration between industry partners and government to encourage the uptake of EC technologies by increasing their efforts to raise the awareness of SMEs on the benefits of these technologies especially email and Internet. Moreover, there is a need to help SMEs build and maintain their internal organizational resources, structures and governance to fit well with these technologies. In addition, there is a need to set industry and national policies and rules and/or to activate these policies (if currently exist) in order to influence the behaviour of SMEs to adopt various EC technologies.

The remainder of this paper is organised as follows. A summary of the literature review on the EC technologies adoption research and the theoretical model development as well as the hypotheses are first presented. Then, the survey study and the findings are discussed. Finally, conclusions, some limitations and implications for further research are outlined.

2. Literature review and theoretical model development

Existing studies indicate that national non-readiness is the major inhibitor stalling the uptake of EC in developing countries e.g. [27-28]. This assertion is supported by the fact that many developing countries lack adequate technological, social, cultural, legal, logistical, and financial infrastructure needed to effectively adopt and implement EC technologies. This viewpoint considers the conditions of the external environment, or the macro level, as the major determinant of EC technologies adoption at the enterprise level. Similarly, the existing studies on SMEs adoption have independently explored a number of variables that are related to the national readiness (macro level) such as: regulatory environment and support [29], support from technology vendors [15, 30], degree of support of the government [21] and national infrastructure [22]. However, little research has investigated such factors in developing countries e.g. [21-22, 31].

Recently, the scope of the studies has been broadened to include organizational readiness (micro level) as a determining point of EC adoption e.g. [19, 31]. These studies e.g. [32-33] define organizational readiness as the availability of financial and technological resources in the SMEs, while some other studies relate organizational readiness to factors such as: organizational culture [31], organization resources [22], management support [20], firm size [33], compatibility [34-35], perceived benefits [21,36] and employees’ knowledge of IT [36]. In addition to the macro and micro levels, there is a middle (meso) level which signifies the readiness of industry in fostering EC technologies [37]. The industry level readiness concentrates on inter-organizational nature of EC use, dealing with interactions between adopting organizations and external institutions, their mutual dependencies and power relationships. Important characteristics at this level reflect on the industry structure, industry-wide standard of electronic data transfer, presence of coordinating bodies, level of trust among industry players, and so forth. The importance of this level cannot be undermined because it forms the glue that holds the macro and micro level together. However, the impact of industry readiness on EC adoption by SMEs has been largely overlooked in the current literature.

Besides the three levels of readiness, environmental pressure (driving forces) also plays a critical role in the adoption of EC technologies by SMEs and provides the impetus for complying to be ready [37, 48]. Such pressure is exhibited in the shape of customer, supplier, government, and market pressure or changes in external environmental which undermine the competitive position or value proposition, and organizational actions for pursuing business excellence and following innovative technology to remain ahead of competition.

Based on the literature review and to fill the gap in the literature, we have developed a comprehensive research model to guide us in this study and subsequent research. This model uses a combination of variables that determine the adoption and use of EC technologies of SMEs based on previous studies. It is composed of perceived organizational readiness (micro level), perceived industry readiness (meso level), perceived national readiness (macro level) along with the perceived environmental pressure (driving forces). The model is presented in Figure 1. A discussion on each factor is presented below.

2.1. Organizational readiness

Organization readiness refers to the top managers’ perceptions of EC technologies and their perceptions of the availability of resources, rules and procedures within the organization that promotes adoption of these technologies. Since EC is an emerging concept in many developing countries, the
significance of procedures, processes as well as dynamics involved in implementing EC has been widely neglected. There has been a tendency to consider EC applications as trivial appliances, rather than as complex processes of inter-networking made possible by a series of inter-linked computer networks, a compendium of hardware and software, data flows, and human agent [38]. Failure to consider processes and rules that mobilize EC within the context of an organization is of enormous importance and a lapse on part of researchers and policy makers can lead to an overestimation of potential savings as well as an underestimation of the intricacies involved in effective EC implementation planning. In this study we measure organizational readiness by assessing the top manager’s perception of benefits of EC technologies as well as organization resources and governance.

2.1.1. Perceived benefits. Perceived benefits are defined as a set of anticipated advantages that innovation can provide the organization [31]. In classical innovation literature, perceived benefits are referred to as “relative advantages” [39]. Rogers [40] describes relative advantage as the degree to which an innovation is seen as superior to existing practice. Molla and Licker [41] use the term “awareness” to refer to an organization’s perception, comprehension, and projection of the benefits and risks of EC. In this exposition, we use the term “perceived benefits” to capture all of the above narratives, as it succinctly describes how a particular technology is perceived as providing benefits to an organization. It is worth noting here that some studies e.g. [42-43] have regarded perceived benefits as an independent variable impacting the adoption process. However, other studies e.g. [39] also have termed perceived benefits as organizational characteristics, since such benefits are not inherent in the innovation per se but relate to how organization perceives these benefits. In this paper, we regard perceived benefits as part of organization readiness.

Research on EDI adoption and implementation has identified the importance of perceived benefits of the technology on adoption. For example, Iacovou et al. [32] found a positive relationship between perceived benefits and adoption of EDI. However, it is only direct/tangible benefits that have accounted for this positive correlation. Indirect/intangible benefits were insignificant. This observation is reinforced by Seyal and Abd-Rahman [44] where relative advantage was found to be insignificant contributor to EC adoption. The plausible explanation to this idiosyncrasy lies in the fact that that most of the managers in developing countries are not sure about the direct and indirect benefits that can be derived from EC and lack adequate skill or knowledge about what technology can provide. In contrast, Looi [25] found that relative advantage influences EC adoption in Brunei. Based on the above discussion, we hypothesize that the higher SMEs perceive benefits of EC technologies, the more likely they will adopt these technologies (Hypothesis 1).

2.1.2. Perceived organization resources and governance. Another major aspect of organizational readiness is related to organization resources and governance. Perceived organization resources are perceptions of the availability of resources including human, technological, and business resources of a firm [41]. Human resources are concerned with the availability of technical-savvy workforce with adequate know-how to implement EC initiatives. Technological resources are concerned with the level of sophistication of IT usage in an organization. Business or financial resources refer to the availability of capital to carry EC activity without any financial burden. In terms of human resources, Mehrtens et al. [45] advocate that knowledge among non-IT professionals is a very significant factor for Internet adoption. A number of studies have also shown that organization resources, financial and technical resources determine the adoption of EC technologies e.g. [20, 22, 24, 33, 46].

Molla and Licker [41] in their study also analyse the role of “governance” in EC diffusion. According to them, “governance” encompasses strategic, tactical, and operational model that defines the way organizations structure to establish objectives, allocate resources, and make decisions. However, empirical evidence from South Africa negates the importance and significance of this variable. In contrast, Tan et al. [24]
have found that governance was significant in predicting EC technologies adoption in China. In addition, Teo and Ranganathan [35] in their study of Singapore business found that 54.4% of EC adopters had a formal plan and a task force dedicated to deploying EC. Accordingly, we hypothesize that the higher SMEs perceive organization resource and governance, the more likely they will adopt EC technologies (Hypothesis 2).

2.2. Industrial readiness

Industrial readiness refers to the top managers’ perceptions of industry structure and standards, and readiness of trading partners that promotes adoption of EC technologies. The industry level readiness also concentrates on inter-organizational nature of EC use. This level is dealing with interactions between adopting organizations and external institutions, their mutual dependencies and power relationships, which are generally concerned with the industry structure [37]. The availability of standard is crucial for EC adoption. In this study, however, since we envisage that SMEs within the Malaysian grocery industry are still at the early stage of EC adoption and therefore issues related to adoption of more advanced EC technologies and initiatives which include trust and dependency as part of the industry structure are excluded [47-48].

2.2.1. Perceived industry structure and standards. One of the major parts that form the industrial readiness is perception of the availability of industry structure and standards that organise the work of the firms. The perceived industry structure is the extent of compatibility and collaboration between trading partners within the industry. If the industry trading partners collaborate and are compatible, then it would facilitate EC technologies adoption [47]. The perceived industry standards are the perception of the availability of standards, coordinating bodies, and online resources. If the industry as a whole decides and agrees on a single standard of electronic data transfer, the chances of rapid uptake of technology are exponentially amplified. Of particular interest here is how standards are formulated. Successful EC adoption requires that various sectors and segments of the industry work systematically through coordinating bodies to resolve their concerns and project their demands. Existence of coordinating bodies provides a platform from where issues can be raised and formal facilitation processes can be initiated to weed out the thorny issues and disputes confronting the industry as a whole [49]. In concert with the standardization of electronic data transfer, interconnectivity of EC hardware and software also acts as a major impetus for EC surge [49]. If industry partners’ EC applications can easily forward and relay electronic messages back and forth without any difficulty, there is an increment in acceptance of EC. Consequently, we hypothesize that the higher SMEs perceive the industry structure and availability of standards, the more likely they will adopt EC technologies (Hypothesis 3).

2.3. National readiness

National readiness refers to the top managers’ perceptions of the availability of supporting services that promotes adoption of EC technologies. These supporting services may come from government and non-government bodies. For any country to realize the true potential of EC there has to be certain measures undertaken at the core operational level of the country’s infrastructure. These measures can be attributed to the human and physical capital development, political freedom, autonomous economic institutions, high spending on research and development, foreign direct investment, and so forth. All these determinants interplay with each other to cultivate an environment conducive for country’s well-being and economic growth. Having a clear policy regarding the attainment of these crucial macro-economic objectives is a stepping stone towards reaching out for the impact of EC and reaping the benefits. This is especially true in case of developing countries, where the main inhibitor of successful technology adoption is the under-developed core operational infrastructure. Unless there are measures adopted to redress the core operational infrastructure, technology adoption failures are likely to happen. Therefore, we assess perceived supporting services in measuring the national readiness.

2.3.1. Perceived supporting services. Perceived supporting services refers to the availability of supporting services in the country that promote the adoption of EC technologies. A number of studies have identified the availability of capable technology infrastructure and availability and support of skilled labour and software/hardware vendors as factors that determine the EC technologies adoption in SMEs e.g. [30, 50].

In this regard, technology Infrastructure readiness emphasizes on the availability of resources in the area of information and communication technology within the country, community or region. These resources pertain to the availability of EC software and hardware distributors, vendors, support service personnel, and trained human technicians to write, code, and maintain applications in the EC domain area. The presence of big multinational companies such as Compaq and Microsoft can also spur the uptake of EC by providing reliable products and fostering 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 cheap access to skilful individuals will incite the EC uptake especially among SMEs. In the light of the above discussion, we hypothesize that the higher SMEs perceive the supporting services, the more likely they will adopt EC technologies (Hypothesis 4).

2.4. Perceived environmental pressure

Environmental pressure is included in our model to refer to the influence from environment, which compels the SMEs to be readiness compliant. In many cases, a company may adopt a technology due to influences exerted by its business partners and/or competitors [33]. A firm may feel pressure to adopt the technology if its business partners request or recommend it to do so.

Furthermore, a firm may also feel a pressure when it sees more and more companies in the industry adopting the technology and therefore feels the need to adopt in order to remain competitive [25, 33, 46]. Chong and Bauer [43] assert
that critical mass also contributes as a seminal factor for any organization trying to adopt new technology. Kuan and Chau [33] also note that another driving force for SMEs to adopt EC technologies comes from government policies. For example, within the Malaysian shipping industry, the EDI usage is high because shippers and forwarders are forced to transact with Customs Department electronically for duty payments and import/export declaration [51]. Passion for business excellence is another environmental pressure linked to e-readiness and propagation towards EC technologies adoption [46]. Accordingly, we hypothesize that the higher SMEs perceive the environmental pressure, the more likely they will adopt EC technologies (Hypothesis 5).

3. The Survey Study

For the purpose of this study, a survey of the SMEs within the Malaysian grocery industry was conducted. The main method of data collection was a questionnaire which was distributed to a sample of SMEs groceries in Malaysia. The target population for this study is all SMEs groceries in Malaysia. The unit of analysis is individual SME. Many of the survey items were adapted from previous studies, such as [40-41] with some modification to suit the context of this study. We used a purposive sampling method to enable us to identify what was typical, normal, and average adoption of EC. The measurement scales are consistent with prior similar studies in the field. Section A in the survey relates to the SME profile and Section B includes the items used to measure five factors that influence EC technologies adoption. Section C relates to the SMEs used of EC technologies.

The survey was distributed through a personal visit by a research assistant. The participants were explained the purposes of the study and given a pre-paid envelope to return the filled surveys. In all, 300 surveys were administered to SMEs groceries in Malaysia while only 180 surveys were returned. However, after going through a data cleaning process, eliminating those surveys with many missing values and inconsistent responses, only a total of 125 surveys were usable for this study. 82.4% of the surveys were filled by the owners of the SMEs and 17.6% were filled by the managers. 69.6% of the surveys were filled by the owners of the SMEs and given a pre-paid envelope to return the filled surveys. In all, 300 surveys were administered to SMEs groceries in Malaysia while only 180 surveys were returned. In the field. Section A in the survey relates to the SME profile and Section B includes the items used to measure five factors that influence EC technologies adoption. Section C relates to the SMEs used of EC technologies.

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Table 1 summarizes the number of SMEs adopters and non-adopters of each EC technologies involved in the study.

<table>
<thead>
<tr>
<th>EC Technologies</th>
<th>Valid No.</th>
<th>Adopters N (100%)</th>
<th>Non-Adopters N (100%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email</td>
<td>125</td>
<td>28 (22.4)</td>
<td>97 (77.6)</td>
</tr>
<tr>
<td>Internet</td>
<td>124</td>
<td>28 (22.6)</td>
<td>96 (77.4)</td>
</tr>
<tr>
<td>Intranet</td>
<td>124</td>
<td>13 (10.5)</td>
<td>111 (89.5)</td>
</tr>
<tr>
<td>Extranet</td>
<td>124</td>
<td>10 (8.1)</td>
<td>114 (91.9)</td>
</tr>
<tr>
<td>EDI</td>
<td>124</td>
<td>12 (9.7)</td>
<td>112 (90.3)</td>
</tr>
<tr>
<td>EFT</td>
<td>124</td>
<td>17 (13.7)</td>
<td>107 (86.3)</td>
</tr>
<tr>
<td>Barcode</td>
<td>125</td>
<td>36 (28.8)</td>
<td>89 (71.2)</td>
</tr>
</tbody>
</table>

11.2% have some type of diploma, 8% have bachelors degree and more and 11.2% did not provide their qualification. All participants are retailers and employ less than 19 employees. 96% of these SMEs are locally owned, 91.9% are independent and 8.1% are a part of a chain.

Table 1. Summary of SMEs adopter and non-adopter of EC technologies

Table 2. Results of construct reliability assessment

<table>
<thead>
<tr>
<th>Factor</th>
<th>No of items</th>
<th>Valid No.</th>
<th>Mean</th>
<th>Strd. deviation</th>
<th>Cronbach’s alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived benefits</td>
<td>2</td>
<td>124</td>
<td>2.988</td>
<td>0.957</td>
<td>0.822</td>
</tr>
<tr>
<td>Organization resources and governance</td>
<td>6</td>
<td>122</td>
<td>1.866</td>
<td>0.901</td>
<td>0.912</td>
</tr>
<tr>
<td>Industry structure and standards</td>
<td>5</td>
<td>123</td>
<td>1.920</td>
<td>0.663</td>
<td>0.813</td>
</tr>
<tr>
<td>Supporting services</td>
<td>3</td>
<td>121</td>
<td>2.639</td>
<td>0.841</td>
<td>0.789</td>
</tr>
<tr>
<td>Environmental pressure</td>
<td>7</td>
<td>125</td>
<td>1.355</td>
<td>0.587</td>
<td>0.933</td>
</tr>
</tbody>
</table>

Table 3. Results of factor analysis

Table 4. Correlation matrix of research variables

Note: All correlations are statistically significant at p= 0.0
expected, the survey results show that the majority of the SMEs participating in this study have not adopted various EC technologies. About 20% of the participants have adopted email, Internet and barcode/scanner, while less than 15% have adopted other technologies including intranet, extranet, EDI and EFT.

Data analysis involves two processes. First, the reliability and validity of the measurement model were evaluated by computing the Cronbach’s alpha and performing a factor analysis, respectively. Then, the logistic regression technique was used to assess the impact of each factor on the adoption of each EC technology considered in this study.

### 3.1. Validity and reliability

The measurement model was evaluated for reliability, convergent validity and discriminant validity. Construct reliability or internal consistency was assessed by computing Cronbach’s alpha. Table 2 shows the reliability results of the constructs. The alpha values range from 0.789 to 0.933. Construct reliability is achieved if the alpha values are above the acceptable value of 0.7 [52]. Therefore, construct reliabilities of all the five factors used in the study are demonstrated.

### 3.2. The survey findings

This research explores the influence of various factors generally known to affect EC adoption among SMEs on each of the EC technologies summarized in Table 1. The logistic regression technique was applied to test the research model for each EC technology because of two reasons: 1) the dependent variable (adopter versus non-adopters SMEs) is dichotomous and 2) this technique requires fewer assumptions than discriminant analysis [54]. The factors influencing the adoption of various EC technologies that are significant are shown in Table 5. The estimated coefficients and their effect (negatively or positively) on the adoption of the different EC technologies are highlighted. The goodness-of-fit statistics for all different logistic-regression tests indicate that the logistic regression model is satisfactorily significant in discriminating SMEs’ adopters and SMEs’ non-adopters of EC technologies. The accuracy or the discriminating power of the logistic regression tests is also shown in Table 5. The insignificant factors that are not shown in Table 5 suggest that responses of SME adopters and non-adopters for a particular EC technologies do not differ significantly, which mean that these factors do not determine the

### Table 5. Predictors of EC technologies adoption in Malaysian SMEs

<table>
<thead>
<tr>
<th>Variables</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df.</th>
<th>Sig.</th>
<th>Exp (B)</th>
<th>95.0% C.I. for Exp(B)</th>
<th>Model accuracy (%)</th>
<th>Nagelkerke R</th>
<th>Chi-square</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email</td>
<td>-1.20</td>
<td>0.52</td>
<td>5.296</td>
<td>1</td>
<td>0.021*</td>
<td>0.301</td>
<td>0.108 - 0.837</td>
<td>88.1</td>
<td>0.63</td>
<td>59.720</td>
<td>5</td>
<td>0.000</td>
</tr>
<tr>
<td>Perceived benefits</td>
<td>-1.50</td>
<td>0.67</td>
<td>4.958</td>
<td>1</td>
<td>0.025*</td>
<td>0.223</td>
<td>0.060 - 0.825</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organization resources and governance</td>
<td>2.19</td>
<td>0.61</td>
<td>15.115</td>
<td>1</td>
<td>0.000**</td>
<td>8.965</td>
<td>2.721 - 29.540</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived environmental pressure</td>
<td>2.65</td>
<td>0.70</td>
<td>14.366</td>
<td>1</td>
<td>0.000**</td>
<td>14.189</td>
<td>3.600 - 55.928</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internet</td>
<td>-0.96</td>
<td>0.48</td>
<td>3.964</td>
<td>1</td>
<td>0.046*</td>
<td>0.385</td>
<td>0.150 - 0.985</td>
<td>88.9</td>
<td>0.66</td>
<td>63.289</td>
<td>5</td>
<td>0.000</td>
</tr>
<tr>
<td>Organization resources and governance</td>
<td>2.62</td>
<td>0.67</td>
<td>15.115</td>
<td>1</td>
<td>0.000**</td>
<td>13.765</td>
<td>3.670 - 51.624</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supporting services</td>
<td>-1.51</td>
<td>0.68</td>
<td>4.998</td>
<td>1</td>
<td>0.025*</td>
<td>0.221</td>
<td>0.059 - 0.830</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental pressure</td>
<td>2.43</td>
<td>0.74</td>
<td>10.806</td>
<td>1</td>
<td>0.001**</td>
<td>11.391</td>
<td>2.671 - 48.587</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intranet</td>
<td>1.86</td>
<td>0.64</td>
<td>8.349</td>
<td>1</td>
<td>0.004**</td>
<td>6.392</td>
<td>1.816 - 22.497</td>
<td>92.3</td>
<td>0.54</td>
<td>36.834</td>
<td>5</td>
<td>0.000</td>
</tr>
<tr>
<td>Extranet</td>
<td>1.84</td>
<td>0.72</td>
<td>6.585</td>
<td>1</td>
<td>0.010**</td>
<td>6.262</td>
<td>1.542 - 25.423</td>
<td>94.0</td>
<td>0.49</td>
<td>28.889</td>
<td>5</td>
<td>0.000</td>
</tr>
<tr>
<td>EDI</td>
<td>2.60</td>
<td>0.76</td>
<td>11.674</td>
<td>1</td>
<td>0.001**</td>
<td>13.452</td>
<td>3.029 - 59.745</td>
<td>94.0</td>
<td>0.62</td>
<td>41.957</td>
<td>5</td>
<td>0.000</td>
</tr>
<tr>
<td>EFT</td>
<td>1.94</td>
<td>0.61</td>
<td>10.115</td>
<td>1</td>
<td>0.001**</td>
<td>6.958</td>
<td>2.105 - 22.996</td>
<td>89.7</td>
<td>0.52</td>
<td>38.178</td>
<td>5</td>
<td>0.000</td>
</tr>
<tr>
<td>Barcode</td>
<td>2.05</td>
<td>0.56</td>
<td>13.250</td>
<td>1</td>
<td>0.000**</td>
<td>7.749</td>
<td>2.573 - 23.337</td>
<td>83.9</td>
<td>0.50</td>
<td>49.930</td>
<td>5</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Note: * p ≤ 0.05 and ** p ≤ 0.01
adoption of this particular EC technology [15]. All factors except perceived industry structure and standards appeared to influence the adoption of at least one EC technology. Perceived benefits appeared to influence only the adoption of Email and Internet. Perceived organization resources and governance and perceived supporting services appeared to influence only the adoption of Email, Internet and Barcode. Perceived environmental pressure appeared to be a common significant factor in the adoption of all EC technologies. The perceived benefits and perceived supporting services appeared to influence the adoption negatively. Table 6 shows the summary of the influence of the five factors on the adoption of various EC technologies considered in this study. The findings are discussed in more detailed below.

3.2.1. Perceived benefits. Owners and managers of SMEs in our study were asked the extent to which they agreed that they were aware and understand the potential benefits enabled by EC technologies. Perceived benefits were found to have a significant negative impact on Email and Internet adoption for SMEs. This finding is inconsistent with most prior studies that found that perceived benefits were positively associated with adoption of EC technologies e.g. [15, 34]. This finding suggests that adopters perceive lower benefits for Email and Internet. There are a number of explanations for this finding. First, those adopters after adopting these technologies are not satisfied with the benefits as they interact with the technologies. They may have expected more benefits at the beginning and the actual benefits are lower than the expectations. This implies that in general there is a lack of understanding of the benefits that can be obtained from EC technologies among SMEs. 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 set a more realistic expectations. Second, SMEs adopters in this study might be organizationally ready and complied to the environmental pressure while ignoring the influence of potential benefits in adopting Email and Internet. In other words, these SME adopters in this study could be regarded among the first SMEs that adopted Email and Internet without giving much attention to potential benefits of these technologies. Third, the benefits at the adoption stage are not always easy to be perceived by SMEs as most of the managers of SMEs in developing countries are not sure about the direct and indirect benefits that can be derived from EC and lack adequate skill or knowledge about what technology can provide as discussed before.

For non-adopter SMEs, while they might have been able to perceive the benefits of adopting Email and Internet, they were not organizationally ready and they did not perceive pressure from environment to adopt these technologies. Therefore, they decided to delay the adoption decision till they could improve their organizational readiness and feel 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. This suggests that SME adopters and non-adopters are not aware of and understand the potential benefits of these EC technologies which are relatively more complex to understand than Email and Internet. The finding is consistent with [44] who also found that relative advantage was insignificant contributor to EC adoption in the developing countries. However, this finding is in contrast with [15] who found that relative advantage is associated with extranet adoption.

3.2.2. Perceived organization resources and governance. Some SMEs especially in developing countries tend to have a low level of organizational readiness since they lack the resources, infrastructure and procedures that are necessary for EC technologies adoption. Other SMEs may have established their organizational readiness but they do not perceive it and hence considered themselves not to be ready. Therefore, possessing and perceiving the organization readiness is an important determinant of EC technologies adoption by SMEs.

Owners and managers of SMEs in our study were asked about the extent to which they agreed that their organization is ready to adopt EC technologies. It was found that perceived organization resources and governance has a statistically significant, positive impact on Email, Internet and Barcode adoption for SMEs. This finding is consistent with the prior studies that found that perceived organization readiness was positively associated with adoption of EC technologies [19-20, 29-30]. This finding suggests that those non-adopter SMEs actually have not had the necessary resources, infrastructure and procedures to adopt EC technologies, but because they perceive them to be low and therefore have not adopted EC technologies. On the other hand, perceived organization resources and

### Table 6. Summary of the findings

<table>
<thead>
<tr>
<th>Factors</th>
<th>Email</th>
<th>Internet</th>
<th>Intranet</th>
<th>Extranet</th>
<th>EDI</th>
<th>EFT</th>
<th>Barcode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived benefits</td>
<td>-</td>
<td>-</td>
<td>(N)</td>
<td>(N)</td>
<td>(N)</td>
<td>(N)</td>
<td>(N)</td>
</tr>
<tr>
<td>Perceived organisation resources and governance</td>
<td>+</td>
<td>+</td>
<td>(N)</td>
<td>(N)</td>
<td>(N)</td>
<td>(N)</td>
<td>+</td>
</tr>
<tr>
<td>Perceived industry structure and standards</td>
<td>(N)</td>
<td>(N)</td>
<td>(N)</td>
<td>(N)</td>
<td>(N)</td>
<td>(N)</td>
<td>(N)</td>
</tr>
<tr>
<td>Perceived supporting services</td>
<td>-</td>
<td>-</td>
<td>(N)</td>
<td>(N)</td>
<td>(N)</td>
<td>(N)</td>
<td>-</td>
</tr>
<tr>
<td>Perceived environmental pressure</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

- means that the factor influences the EC technology negatively and significantly
- means that the factor influences the EC technology positively and significantly
(N) means that there is insignificant influence of this factor on EC technology
governance is found to be an insignificant factor in determining Intranet, Extranet, EDI, and EFT adoption for SMEs. SMEs adopters and non-adopters do not perceive it as a determinant factor of the adoption of these technologies. This suggests that both SMEs adopters and non-adopters perceive that their organization is not ready to adopt these EC technologies. Furthermore, these types of EC technologies require more resources, specialised infrastructure and detail procedures as well as more coordination with other parties, than adopting email, Internet and barcode/scanner, which are beyond of the SMEs’ capabilities.

3.2.3. Perceived environmental pressure. Owners and managers of SMEs in our study were asked about the extent to which they perceive pressure from environment (i.e. industry, government, customers, suppliers, and competition) to adopt EC technologies. Perceived environmental pressure was found to influence all EC technologies considered in this study (Email, Internet, Intranet, Extranet, EDI, EFT, and Barcode) positively and this relationship is statistically significant. This means that the greater environmental pressure as perceived by SMEs managers and owners, the higher the likelihood of SMEs to adopt EC technologies. SMEs who have not yet adopted EC perceive low pressure from the environment and, therefore, they have not adopted EC technologies. Our findings are consistent with prior studies e.g. [15, 19, 22, 36] but contradict other studies, for example, Thong [55] that suggests environmental pressure in the form of competition has a little influence on adoption of technology and Kuan and Chau [33] that suggest industry pressure has a negative significant relationship with adoption of EDI.

3.2.4. Perceived supporting services. The availability of supporting services in the country that promotes the adoption of EC technologies is a major determinant of EC technologies [30, 50]. Owners and managers of SMEs in our study were asked about the extent to which they agreed that supporting services that promote EC technologies adoption were available. Perceived supporting services were found to have a significant negative impact on Email, Internet and Barcode adoption by SMEs. SMEs that have adopted Email, Internet and Barcode in our study show a lower perception regarding the availability of these supporting services than non-adopter SMEs. There are a number of possible explanations for this finding. First, adopters were disappointed with the available supporting services and perhaps could not seek support when required. On the other hand, those non adopters might think there were adequate supporting services but had not realised the inadequacy of the services. Second, SMEs adopters in this study could have organizational readiness in place, complied to the environmental pressure and ignored the influence of the availability of supporting services in adopting Email, Internet and Barcode. In other words, these SMEs adopters could be the early adopters of Email, Internet and Barcode and were not concerned with the availability of the supporting services that facilitate the adoption of these technologies. While non-adopter SMEs might have been able to see the availability of such supporting services, they were not organizationally ready and they did not perceive pressure from the environment to adopt these technologies. Therefore, they decided to delay the adoption decision until they become organizationally ready and feel a pressure to adopt.

In contrast, perceived supporting services were found to be an insignificant factor in determining Intranet, Extranet, EDI, and EFT adoption for SMEs. SME adopters and non-adopters do not perceive it as a determinant factor of the adoption of these technologies. This may mean that SMEs adopters and non-adopters perceive the supporting services as not up to standards to satisfy the requirements of these EC technologies.

3.2.5. Perceived industry structure and standards. The influence of perceived industry structure and standards on EC adoption by SMEs has hardly been explored in prior research. Owners and managers of SMEs in our study were asked about the extent to which they agreed that there were rules and standards endorsed to promote EC technologies adoption. Perceived industry structure and standards was found to be an insignificant factor in determining EC technologies adoption for SMEs. This means SME adopters and non-adopters do not perceive it as a determinant factor for the adoption of these technologies. Plausible explanation for this insignificant influence is that the participants may not be aware of the available industry structure and standards or perhaps there are no existing standards within the grocery industry in Malaysia.

4. Discussion and Conclusions

In this study we have provided a more holistic view than what is currently available in the literature of EC adoption by SMEs in a developing country by considering various e-readiness factors affecting EC adoption by SMEs in developing countries at three different levels namely organization, industry and national. Previous studies of EC adoption by SMEs typically explore those various factors independently. We have also explored the impact of the industry readiness on EC adoption by SMEs which has been largely overlooked in the existing studies. Furthermore, we have demonstrated the importance of the context particularly the specific EC technologies being investigated in understanding factors that affect the adoption. By considering a number of widely known factors that determine SMEs adoption of technology in general and EC in particular, this study demonstrates that these well known factors have different influences on the adoption of different EC technologies.

The study findings demonstrate that perceived benefits, perceived organization resources and governance, perceived supporting services and perceived environmental pressure have different influences on the adoption of different EC technologies. For example, perceived organization resources and governance determines the adoption of Email, Internet and Barcode only, but it is insignificant in determining the adoption of Intranet, Extranet, EDI and EFT. This means that there are certain factors that determine SMEs’ adoption of a specific EC technology, which highlights the importance of these determinants to this specific technology. In the case of Email, Internet and Barcode, the decision to adopt these three technologies is mainly based on internal and external factors, particularly the organization resources and governance of SMEs and environmental pressure. In the case of Intranet, Extranet, EDI and EFT, the decision to adopt these technologies is largely depends upon the environmental pressure. Likewise, perceived benefits were found to be significant in determining the adoption of Email and Internet only and insignificant in determining the adoption of
Intranet, Extranet, EDI, EFT and Barcode. Thus, to encourage a particular EC technology adoption, it is important to understand what factors are relevant in order to devise a more appropriate strategy for the specific context.

In terms of the influence of the industry readiness on EC adoption by SMEs, our study findings suggest that the perception of industry structure and standards is not a significant determinant for the adoption of all EC technologies considered in this study, although there is a relationship demonstrated between this factor and the adoption of various technologies. The insignificant influence of perceived industry structure and standards suggests that both adopters and non-adopters of EC had equal perceptions about the impact of this factor on SMEs adoption of EC technologies in Malaysia. Further research is required to obtain a better understanding of the influence of this factor on EC adoption.

For practice, the understanding obtained from this study regarding the influences of adoption factors on the adoption of a specific EC technology can be used as a guide to highlight relevant factors for a given EC technology that an organization is considering. For example if an SME is considering to adopt E-mail or Internet, the focus should be on raising their awareness about the potential benefits of these technologies, building the internal organizational readiness and issuing policies and procedures to adopt the technology. This also implies that the owner/manager of the SME needs to know and understand the potential benefits of EC technologies by learning from the experiences of other SME adopters as well as through better education programs that can be initiated by industry body or government.

Since the findings also demonstrate that the environmental pressure plays a very strong role in the adoption of EC technologies, the awareness of managers and owners of SMEs of this pressure should be increased to encourage them to take actions to adopt EC technologies. The government will need to work with the SMEs industry to set up rules, standards, resources and training programs that promote the adoption of EC technologies. The commission responsible for SMEs among each industry need to set up standards and procedures that encourage SMEs to adopt EC technologies.

In general, the findings suggest that SMEs need ongoing support from the government, industry or any bodies that are interested in the development of SMEs. This support includes providing a more comprehensive view about EC technologies such as raising the awareness of SMEs about the potential benefits of EC technologies, supporting SMEs with human, financial, technological resources that facilitate the adoption of these technologies, supporting them with professional experience and conducting training courses that help SMEs to set up rules, procedures and strategies on how to implement the adoption of various EC technologies.

However, due to the small sample size of this study, it cannot be claimed that the findings are generalizable to all SMEs or to all developing countries. Future research involving multiple case studies would be valuable in further exploring the findings of this study. Further research employing the same research instrument conducted in other developing countries would be valuable to test and improve the generalizability of the current study findings. In addition, although this study predicts the influence of e-readiness factors on EC technology adoption, it is difficult to infer a causal relationship between them because this is a cross sectional study.

5. References

[38] Pare, D., "Does This Site Deliver? B2B E-Commerce Services for Developing Countries". The Information Society, 19(2003), 2003, pp. 123-134.