

# Adoption of Electronic Commerce amongst Small and Medium Enterprises



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## ABSTRACT

*This paper presents initial phase research results that indicate the adoption of e-commerce applications among Malaysian SMEs from the manufacturing sector. Through a review of related research on innovation adoption and diffusion, a two dimensional model was developed to depict e-commerce adoption. The results indicate that simple e-commerce applications would be adopted first before SMEs embarked on more complex e-commerce applications. In terms of extent of usage, it was found that a majority of Malaysian manufacturing SMEs have adopted e-commerce applications on a parallel basis while very few SMEs have substituted e-commerce applications for traditional methods of conducting business.*

## 1.0 INTRODUCTION

The Internet is receiving much attention from both individuals and firms. Other than providing information and a tool for communication, the Internet has created a global platform for businesses to conduct commerce. For this purpose, many Internet technologies are being developed to support electronic commerce as an efficient and cost-effective means to interact with customers and suppliers. Many firms in Malaysia and other part of the globe are rapidly embracing e-commerce and sizable investments are being made by firms to adopt e-commerce. However, researchers are struggling to determine whether this expenditure is reflected in the rate of e-commerce being adopted and diffused (Zhu et al., 2003).

## 2.0 LITERATURE REVIEW AND MODEL DEVELOPMENT

Diffusion of innovation theory portrays innovations as moving through a series of stages. The stages comprised of initiation, adoption, implementation, and routinisation (Rogers, 1995). Past studies on e-commerce mainly focus on adoption and implementation stages (e.g. Amin, 2000; Daniel et al., 2002; Ang et al., 2003; Teo & Pian, 2004). Few studies have explored routinisation of e-commerce applications among firms such as SMEs. Another

limitation of past studies is that adoption is mainly viewed in terms of a dichotomous outcome such as using or not using e-commerce applications (e.g. Walczuch et al., 2000; Teo and Ranganathan, 2004). These studies offer valuable information about "what" activities or applications being undertaken by firms, nonetheless, information about "how" e-commerce have been used, which can provide a greater understanding about firm's e-commerce adoption pattern is lacking.

Massetti and Zmud (1996) suggest that the actual extent of innovation usage also need to be considered in order to better characterise the nature of innovation adoption. Similar suggestions have been made by Chin and Marcolin (2001) and, Gallivan (2001). To date e-commerce adoption studies such as Daniel et al. (2002), Kraemer and Dedrick (2002) and, Parish et al. (2002) have not considered context of usage but rather have focused only on whether an application has been adopted or not; or in some cases, whether any plans are in place to adopt an application.

Although the EDI research has captured the use of EDI in several ways, For example, Massetti and Zmud (1996) conceptualised EDI use in four facets namely volume, diversity, breath and depth. In the context of B2B e-commerce, the usage research is still in its infancy. Only a handful of research can be found that attempt to follow the steps of EDI used construct. The four facets proposed by Massetti and Zmud (1996) could be represented in two dimensions; the types or level of application adopted and the extent of usage for each application. Past studies had focused mainly on level of adoption (e.g. Burgess & Cooper, 1998; Kraemer and Dedrick, 2002; Lawson et al. 2003). This study utilised this conceptualisation from Massetti and Zmud (1996) to capture B2B e-commerce adoption based on two dimensions as shown in Figure 1.

A review on some related studies conducted by Cockburn and Wilson (1996), Burgess and Cooper (1998), MacKay et al. (2000), Martin and Matlay, (2001), Rao et al. (2003) and, Teo and Pian (2004) have identified nine applications commonly adopted by businesses. The applications are; e-mail, online brochure, online catalogue, Request for Quotation

(RFQ), online order, online invoicing or billing, online payment, online stock checks and, order tracking.

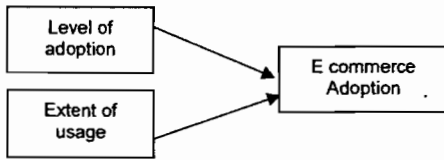


Figure 1: Adoption Framework

Based on studies conducted by Zaltman et al. (1973), Ettlie (1980), Rogers (1995), Fichman and Kemerer (1997) and, Fichman (2001) describing the extent of innovation diffusion, five e-commerce implementation sub-phases were identified. The five phases are: (1)



Figure 2: E-commerce Adoption Phases

Feedback from the vendors and consultants were positive. The level of adoption constitutes types of application adopted ranging from simple e-mail to more sophisticated applications such as online stock checks and order tracking. The sequencing of the e-commerce applications generally conform to the other frameworks developed to describing adoption level (e.g. Burgess & Cooper, 1998; Daniel et al. 2002; Teo & Pian, 2004). Extent of usage refers to usage of e-commerce applications that ranges from measure of awareness of the applications by the CEOs or top management to the substitution phase that reflect the maturity of e-commerce adoption. These two dimensions were used to portray e-commerce adoption.

### 3.0 THE STUDY

A list of manufacturing companies that employed 150 employees or fewer, has e-mail account and / or company website were identified for this study. A list of 1155 SMEs was identified from a total of 2126 registered manufacturing entities in the FMM Directory (2004). Sixty SMEs were excluded because they had no e-mail account or company website. A decision was made to include the entire sample identified to ensure that the completed sample was sufficiently large and robust to meet the criteria of a good sampling frame suggested by Hague and Harris (1993):

knowledge / awareness, (2) not using, (3) use on trial, (4) parallel usage and, (5) substitution. The final output is presented in Figure 2.

In order to check the applications identified from literature review were indeed relevant to the Malaysian manufacturing context; an online web survey was conducted on 100 SMEs websites that involved in manufacturing activities in Malaysia. Exploratory interviews and informal discussions were also conducted with e-commerce vendors who had relevant experience in implementing e-commerce projects specifically for the SMEs. This was aimed to assess the relevance and provide justifications to include these applications and the diffusion phases adapted are indeed suitable for this study.

Pre-testing using a draft questionnaire was conducted with academics, e-commerce vendors, and owners of SMEs. The aims were to test their understanding of the items in the questionnaire. The final draft questionnaires were piloted on 60 SMEs from the samples. As proposed by Oppenheim (1966), the questionnaires were sent out in precisely the same format as envisaged for the main study. From a total of 1095 questionnaires distributed, 187 responses representing 17.07 per cent response rate were achieved after duration of eight weeks. Test on non-response bias was conducted using time trend extrapolation method between early responses and late responses. The results indicated it was not a significant factor that could affect conclusions about the variables being examined in this study.

### 4.0 RESULTS

This section describes the findings on major demographic profile of the sample, levels of adoption and extent of e-commerce usage among the SMEs. Data on CEOs or top management awareness of various e-commerce applications is also presented. The respondents are asked about their awareness of e-commerce applications, identified the types of e-commerce application adopted by their firms and at the same time indicate the extent of usage for each application adopted.

## 5.0 DEMOGRAPHIC PROFILE

food and beverages (10.7 per cent) and plastic products (10.2 per cent).

Table 1 indicates the sample came mainly from the fabricated metal products and chemical sector (12.8 per cent each), electrical and electronic (12.3 per cent),

*Table 1: Sector*

Sector	Frequency	Percentage
Textile and apparel	2	1.1
Food and beverages	20	10.7
Machinery	11	5.9
Wood-based products	11	5.9
Electrical and electronic	23	12.3
Plastic products	19	10.2
Transport equipment	4	2.1
Fabricated metal products	24	12.8
Pharmaceutical	2	1.1
Rubber-based products	13	7.0
Non-metallic mineral products	14	7.5
Chemical	24	12.8
Iron and steel	8	4.3
Others	12	6.4
<b>Total</b>	<b>187</b>	<b>100</b>

*Table 2: Geographical Distribution*

State	Frequency	Percentage
Federal Territory K L	9	4.8
Johor	33	17.6
Melaka	5	2.6
Negeri Sembilan	15	8.0
Phg, T'gannu, K'tan	6	3.1
Penang, Kedah, Perlis	30	16.1
Perak	11	5.7
Selangor	77	41.2
Sabah and Sarawak	1	0.5
<b>Total</b>	<b>187</b>	<b>100</b>

## 6.0 GEOGRAPHICAL DISTRIBUTION OF SAMPLE

Table 2 shows the distribution of the sample throughout the country. The largest number of responding firms is found in Selangor with 41.2 per cent, followed by Johor, 17.6 per cent, with the northern region, comprised of Penang, Kedah and Perlis, 16.1 per cent. Based on the sampling frame, almost 70 per cent of manufacturing firms are located in these three regions. The percentage of manufacturing firms from these three regions that responded to the survey is 74.9 per cent. East Malaysia (Sabah and Sarawak) registered the lowest response rate of 0.5 per cent. The number of firms from this

region is also the lowest, comprising 1.6 per cent of all firms listed in the sampling frame.

## 7.0 RESPONDENT AWARENESS

Table 3 indicates a wide range of awareness level among the sample. More than 90 per cent of the respondents are aware of e-commerce applications such as e-mail, online brochure, catalogue, enquiry and order. The awareness of other transactional applications such as online billing, payment, stock checks and order tracking ranges from 67 per cent to 79 per cent. Overall, about two-thirds of the respondents are aware of all the e-commerce applications undertaken for this study since the lowest percentage is stock checks at 67 per cent.

Table 3: Awareness of Electronic Commerce Online Applications

E-Commerce Application	Aware per cent	Unaware per cent	Total per cent
E-mail	99	1	100
Brochure	98.4	1.6	100
Catalogue	99	1	100
Enquiry	95.3	4.7	100
Order	90.6	9.4	100
Billing	79.7	20.3	100
Payment	79.2	20.8	100
Stock check	66.7	33.3	100
Order tracking	69.8	30.2	100

## 8.0 LEVEL OF ADOPTION

The level of e-commerce application adopted provides an initial picture on types of applications adoption by SMEs. Figure 2 illustrates the distribution of e-commerce applications adopted by the SMEs. The applications adopted are aggregate adoption of each application on trial, parallel and substitution basis.

The results show that e-mail is the most widely adopted application (96.8 per cent), followed by online

brochure (84.5 per cent) and, online catalogue (82.4 per cent). About two-third of the SMEs has also adopted online Request for Quotation (76.5 per cent), while 65.8 per cent have adopted online order. Only 40.6 per cent of the SMEs have adopted online billing and 35.8 per cent online payment Applications with low adoption rate among the SMEs are online stock checks and online order tracking with adoption rate of 17.6 per cent and 18.7 per cent respectively. These two applications are mainly used for logistics and inventory management that required them to be integrated with the back-office systems.

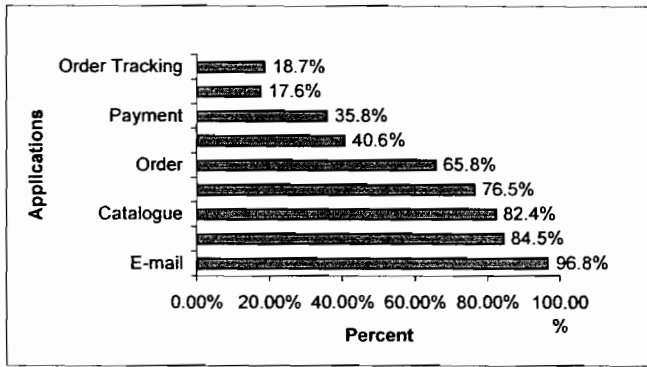


Figure 2: Level of Adoption

Figure 3 shows the number of e-commerce applications adopted by SMEs. It is observed only 12.3 per cent of SMEs has adopted all nine e-commerce applications while 3.2 per cent has not adopted any applications

even though these applications such as e-mail is available to them. The findings also showed about half of the SMEs (46.5 per cent) has adopted between 4 to 6 applications.

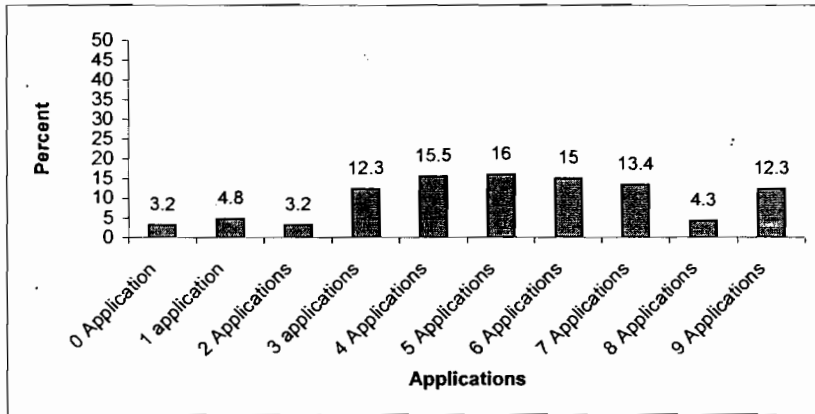


Figure 3: Number of Applications Adopted

## 9.0 EXTENT OF USAGE

Figure 4 indicates e-commerce diffusion using the extent of usage indicators. It is observed online stock checks and order tracking are the least adopted e-commerce applications. For those SMEs that have adopted these two applications, they are mainly used on trial or parallel basis. About 1 per cent of the SMEs have substituted traditional methods of stock checking and order tracking.

SMEs that have adopted online billing and online payment are found to use these applications mainly on parallel basis. In other words, these SMEs are still using traditional business transaction methods such as

sending bills or invoices by mail or fax and, receiving payment by cheques.

A similar trend can be observed for the remaining applications namely online order, Request for Quotation, online catalogue, online brochure and e-mail. SMEs have adopted these applications mainly used these applications on parallel basis that is using them along with other traditional business transaction methods.

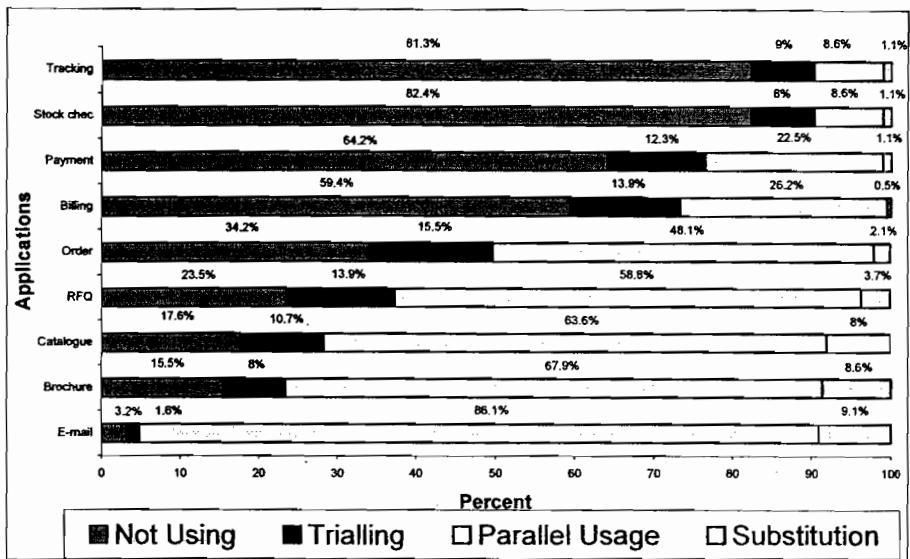


Figure 4: Extent of Usage

It is observed across the nine e-commerce applications, e-mail exhibited the highest level of parallel usage. In contrast, on line stock checks and order tracking exhibited the lowest level of parallel usage. The applications with high percentage currently used on trial by firms are; online orders (15.5 per cent), RFQ (13.9 per cent), online billing (13.9 per cent), online payment (12.3 per cent), and, online catalogue (10.7 per cent). Applications that have substituted traditional business methods are e-mail (9.1 per cent), online brochure (8.6 per cent) and, online catalogue (8.0 per cent). Applications with very low substitution rates are online billing (0.5 per cent), online payment (1.1 per cent), online stock checks (1.1 per cent); online tracking (1.1 per cent). Overall, the results illustrate very few SMEs have substituted conventional business methods with e-commerce applications

## 10.0 DISCUSSION AND CONCLUSION

The study provides empirical findings to supplement anecdotal and case evidence on the types of e-commerce applications adopted and the extent of usage for each application. The results show that only few Malaysian SMEs have adopted all the nine e-commerce applications. This concurs with findings by Lefebvre et al. (2005) that a majority of the SMEs from the manufacturing sector has yet to embrace the full range of e-commerce applications.

The findings show that a majority of Malaysian SMEs from the manufacturing sector had adopted e-mail, online brochure, online catalogue and request for

proposal. It implied that many manufacturing SMEs are still in the informational phase of e-commerce adoption. However, many SMEs have begun offered online transaction processing (Le and Koh, 2002). Nonetheless, online stock checks and order tracking were not widely adopted by these SMEs. The study also indicates that simple application such as e-mail, online brochure and online catalogue are being adopted first before more sophisticated applications especially those involved back-office systems integration. These findings are consistent with the literature which suggests costs and technological demands are perceived to increase as adoption level increases (e.g. Rao et al., 2003; Teo and Pian, 2004).

The study has provided empirical evidence that a majority of the e-commerce applications adopted by SMEs involved in manufacturing activities are being used on a parallel basis along with other conventional business methods. These applications include e-mail, online brochure, online catalogue, request for quotation and online order.

Furthermore, a majority of the applications used to provide firm's information are still being adopted on parallel basis while a large proportion of transactional applications that required linkage with backend office systems have not been adopted and used by Malaysian manufacturing SMEs. Even if these applications are being adopted, they are used mainly on trial or parallel basis with very few applications have substituted conventional business tools. Applications such as e-mail, online brochure and online catalogue have a

higher per cent in terms of substituted conventional business methods compared to other e-commerce applications.

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