

**FACTORS AFFECTING SMALL TO MEDIUM MANUFACTURING  
ENTERPRISES IN ADOPTING BUSINESS-TO-BUSINESS  
ELECTRONIC COMMERCE IN THAILAND**

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**Abstract**

The importance of Business-to-Business Electronic Commerce (B2BEC) is now widely acknowledged. However, while large organisations have been implementing and using the technology, Small to Medium Manufacturing Enterprises (SMMEs), have been slow to adopt it, despite its potential benefits. Using the Technology Acceptance Model (TAM), and literature pertaining to Electronic Data Interchange (EDI) as a framework, this study identifies the factors that influence SMMEs' adoption of Business-to-Business (B2B) techniques by investigating the effect of perceived usefulness, perceived ease of use, technological knowledge, the influence of trading partners and the number of adopting organisations. Thai SMMEs were used as a sample framework due to lack of study in this country, and the opportunity to conduct research in a developing country.

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# **FACTORS AFFECTING SMALL TO MEDIUM MANUFACTURING ENTERPRISES IN ADOPTING BUSINESS-TO-BUSINESS ELECTRONIC COMMERCE IN THAILAND**

## **INTRODUCTION**

Small to Medium Enterprises (SMEs)' concerns regarding adoption of Business-to-Business Electronic Commerce (B2BEC) have recently attracted much research (Cloete, Courtney, & Fintz, 2002; Grandon & Pearson, 2004; Teo & Ranganathan, 2004). Business-to-Business (B2B) techniques are designed to facilitate business transactions between trading partners; Small to Medium Manufacturing Enterprises (SMMEs) that usually conduct business with other organisations can obtain more benefits from B2B adoption than the service sectors. The report from United Nations Conference on Trade and Development (UNCTAD) (2003: 20) noted that the leading adopters of B2BEC are manufacturers. Large organisations, notably in the automotive and steel industry, are playing a key role in implementing B2B techniques (Chan & Swatman, 2000; UNCTAD, 2003). They have encouraged B2B adoption by persuading and influencing many SMMEs who conduct business with them to adopt the technology. Hence, SMMEs are likely to have an interest in and be more motivated to adopt B2B technology than service sectors.

In spite of many potential advantages of B2BEC, pressures from trading partners, and encouragement from governments, its adoption by SMMEs remains limited, especially in developing countries (Dai & Kauffman, 2002; UNCTAD, 2003).

Because decision making processes in SMMEs are dominated by owners/managers, adoption of B2BEC by such organisations is heavily influenced by individuals' acceptance of a particular technology. It is therefore important to understand what factors lead to an individual's acceptance of a technology. Hence, the Technology Acceptance Model (TAM) (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989; Venkatesh & Davis, 2000) is ideal for this study. Because adopting B2B techniques is a relatively recent technological innovation for most organisations, and Electronic Data Interchange (EDI) is considered one of the backbones of B2BEC, we frequently cite literature from technological innovation management and EDI adoption to support theoretical perspectives.

We proposed a theoretical framework, based on an extension of TAM, to explain the factors that affect the decisions of SMMEs' owners/managers on B2BEC adoption. The aims of this paper are: to identify the factors affecting the decision to adopt B2BEC by SMMEs and develop an explanatory model of such decisions.

## **THEORETICAL PERSPECTIVE**

TAM hypothesises factors causing an individual to accept or reject an IT innovation. The model attempts to explain individuals' decisions to adopt technology by considering the impact of external factors on internal beliefs, attitudes, and intentions. It is an adaptation of the Theory of Reasoned Action (TRA) specifically designed to explain and predict user acceptance of specific types of technology (Davis et al., 1989; Riemenschneider, Harrison, & Mykytyn Jr., 2003). A number of studies have successfully used TAM to explain the acceptance of new technologies such as personal computer (Igbaria, Zinatelli, Cragg, & Cavaye, 1997). Researchers have recently use TAM in various Internet and electronic commerce contexts to predict acceptance of technology. These include email usage (Gefen & Straub, 1997), electronic supermarket (Henderson & Divett, 2003) and the use of website (Lederer, Maupin, Sena, & Zhuang, 2000).

TAM model contains two major determinants: *Perceived Usefulness* and *Perceived Ease of Use*. Perceived usefulness is defined as “the degree to which a person believes that using a particular system would enhance his or her performance” (Davis, 1989: 320). Perceived ease of use is defined as “the degree to which a person believes that using a particular system would be free of effort” (Davis, 1989: 320). Many studies from the EDI adoption literature have also considered a similar factor with perceived usefulness: they labelled the factor – perceived benefits. Perceived benefits are defined as “the level of recognition of the relative advantage that technology can provide to an organisation” (Iacovou, Banbasat, & Dexter, 1995 p. 468). This idea is similar to the idea of perceived usefulness. Hence, it is reassured to have indications that perceived usefulness is an important factor regarding B2BEC adoption. Although SMMEs’ owners/managers are positioned as the leader of organisation, it is still possible for them to be hands-on users of many new technologies introduced to their organisations. If they perceive particular techniques to be easy to use, it should encourage them to adopt the technologies.

These considerations lead to the hypotheses:

*Hypothesis 1: Perceived Usefulness of B2BEC is positively correlated with SMMEs’ decisions to adopt B2B techniques.*

*Hypothesis 2: Perceived Ease of Use of B2BEC is positively correlated with SMMEs’ decisions to adopt B2B techniques.*

The literature suggested that the owners/managers’ *technological knowledge* was one of many factors dominating SMMEs’ technology adoption decisions (Thong & Yap, 1995; Thong, 1999; Cloete et al., 2002). Cloete et al. (2002) mentioned that low computer literacy and lack of technological knowledge will probably result in a business being less likely to adopt electronic commerce. Thong (1999) and Fink (1998) concluded that technological knowledge factor is one of the primary factors influencing individuals’ decision to adopt technology. A better understanding of particular technology and sufficient technological skill tends to positively influence the individual’s perceived usefulness and perceived ease of use, and, of course, encourages more adoption of particular technology.

These considerations lead to the hypothesis:

*Hypothesis 3: Owners/managers’ Technological Knowledge is positively correlated with Perceived Usefulness of B2BEC adoption.*

*Hypothesis 4: Owners/managers’ Technological Knowledge is positively correlated with Perceived Ease of Use of B2BEC adoption.*

*Hypothesis 5: Owners/managers’ Technological Knowledge is positively correlated with SMMEs’ decisions to adopt B2B techniques.*

With the uniqueness of SMMEs and B2B techniques, two factors that have been frequently studied in the context of EDI adoption and are claimed to have major effect on the decision to adopt technology by SMMEs are *the influence of trading partners* and *the number of B2BEC adopting organisations in an industry*.

SMMEs’ weak bargaining power and their positions in industry imply that it is less likely that they will be proactive in B2B adoption. SMMEs’ actions will depend heavily on the collective actions of their major trading partners and large organisations in their industry. SMMEs usually face a high level of environmental uncertainty, some of which is attributable to larger trading partners and other competitors in the same industry (Fink, 1998). The actions of

industry members especially trading partners, therefore, strongly influences technology adoption decisions (Chong & Bauer, 2000; Chau, 2001; Kuan & Chau, 2001).

Low rate of B2BEC participation by SMMEs' trading partners is another impediment to the adoption of B2B techniques, especially in developing countries. If SMEs have a high percentage of online trading partners, then not adopting B2BEC will be a competitive disadvantage. B2BEC, like other types of electronic business, requires reaching a critical mass among trading partners. If the concept of B2BEC and B2B techniques becomes a standard in conducting a business by the majority organisations in industry, then it is reasonable that SMMEs will see the great opportunity to join in B2BEC adoption or they may be forced to adopt by the situation in order to stay competitive.

These considerations lead to the hypotheses:

*Hypothesis 6: The influence of major trading partners is positively correlated with SMMEs' decisions to adopt B2B techniques.*

*Hypothesis 7: The number of B2BEC adopting organisations in the industry is positively correlated with SMMEs' decisions to adopt B2B techniques.*

## **B2BEC ADOPTION OF SMMEs IN THAILAND**

Data was collected from 15 Thai SMMEs using a semi-structured interview process. The interviewed organisations are located mostly in Bangkok and a few in surrounded provinces. The interviews followed a previously conducted survey that collected data used to test several hypotheses. The interviews were used to check conclusions obtained from the survey and to explore more factors that might not have emerged from literature review process, since B2BEC is a dynamic technology and practitioners' concerns might not have appeared in academic literature.

In each organisation, an owner/manager was interviewed to gain a clear understanding of all hypothesised factors. The contact details of each owner/manager were acquired from the KOMPASS<sup>1</sup> database which provided information including the name of the owner(s) or main manager(s) (which was used to establish a direct communication to a target group), the number of employees (which was used to sort the sample regarding SMMEs' size), and the organisation's product type (which was used to verify the sample regarding manufacturing industry criterion).

Informants were told that B2BEC is defined as a supply chain innovation that generates inter-organisational process integration. It includes Internet based transactions, EDI, and Website communication in term of placing an order, receiving payment and/or delivering tracking procedure, but excludes simple e-mail communication, and website's used only for the purpose of presenting organisation's product. Two organisations (identified as organisation A & B) had already adopted at least one of them and one organisation (identified as organisation C) is still implementing the technology. Five of twelve non-adopted organisations have websites, but these were used only for promoting organisation and presenting product catalogues. Some demographic data pertaining to interviewing organisation are shown below in Table 1.

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<sup>1</sup> A database subscribed by Monash University: <http://lib.monash.edu.au/databases/1313331.html>

**Table 1: Summary of Basic Demographic Information**

	Owners/Managers Education Background	Size (employees)	Type of Industry	Main Business Product
A	Bachelor in Engineer and Master in Industrial Management	70	Steel and Metal	High quality steel material for construction
B	Bachelor in Architecture	42	Wood and paper product	Raw material for furniture
C	Bachelor in Engineer	160	Steel and Metal	Industrial chemical and steel raw material supply
D	Master in Marketing	33	Petroleum, chemical and associated product	Lab equipment for Petroleum and Chemical manufacturer
E	Bachelor in Engineer	90+	Machinery and equipment	Machinery for food processing and production line
F	Bachelor in Business	90	Textile, clothing, footwear and leather	Children clothes
G	Bachelor in Economic	85	Steel and metal product	Raw steel to be a part of automobile material
H	MBA	65	Textile, clothing, footwear and leather	Jeans and Pants (before attached the brand)
I	Bachelor in Electrical Engineer	165	Non-metallic product	Aluminium
J	Bachelor in Marketing	20	Food and beverages	Canned food
K	High School	70+	Printing and publishing	Advertising Product
L	Bachelor in Chemical Engineer	27	Petroleum, chemical and associated product	Chemical equipment
M	Bachelor in Food Science	78	Food and beverages	Canned food
N	Master in Marketing	54	Machinery and equipment	Small accessories for industrial machine
O	High School	30+	Other manufacture	Glassware and packaging

## Discussion

It is likely that when owners/managers perceive that particular technology is useful, they are more inclined to adopt it (Davis et al., 1989). This was exemplified by two informants who had adopted B2B techniques and another who was still implementing the technology at the time of interview. They *perceived the usefulness* of B2BEC adoption and viewed B2B

techniques as one of the tools that can give them competitive advantages and help improving their organisations.

*“Not even we can communication with our main trading partners faster, we still can gain the benefit of checking our inventory, controlling a supply chains and managing the logistics.” – Organisation “A”,*

*“Adopting B2B is to help us to gain competitive edge. It can possibly add value to my product and my organisation. I can also gain more business deal with my trading partners” – Organisation “B”, and*

*“Right now, I foresee a lot of opportunities that I can get from this adoption. Once it is successful, we should be able to conduct our business much better than before” – Organisation “C”.*

However, those owners/manages who choose not to adopt B2BEC suspected and/or realised that B2B techniques might be able to add something to their organisations, but they were still in doubt and were concerned by possible difficulties for example, current employees cannot handle this highly skilled technique; the cost of adoption; inadequate infrastructure to handle the adoption (mainly pertaining to Internet network speed and reliability, specially for organisation outside metropolitan areas); and B2BEC is not being a priority for their businesses.

It was clear from the interviews that both adopters and non-adopters agree that it is not easy for them to understand or use B2B techniques or other Internet technology. It takes time to learn by trial and error, or receive training. An owner/manager from organisation “D” noted that, because of his age and unfamiliarity with computers, it was hard to learn new IT skills. However, he recognised that he had to learn otherwise; he cannot communicate with those trading partners in other countries cheaply by email. This is confirmed by previous studies from Davis (1989: 333; 1989: 1000). He stated that perceived usefulness is more strongly linked to IT adoption and usage than *perceived ease of use* as people may be willing to tolerate a complex technology to gain an advantage from IT adoption.

In term of *technological knowledge*, both owners/managers from adopted organisations showed significant IT knowledge and experience, as well as a high interest in IT learning and training. For example, owner from organisation “A” was initiated to create an organisation website. He also has a number of IT experiences as that we asked about IT training aspect.

*“Yes, we do. Because I believe that IT is significant to every organisation, not only with my organisation. Thus, acquiring a new IT knowledge is crucial. Normally, I will read from textbook and sometimes take a course about Microsoft Office, Internet and email. Occasionally, we will also hire our IT consultant company to train our staff and myself, especially regarding Microsoft office and SAP. It can assure that I give a high priority to IT” Organisation “A”, and*

*“I have an experience with computer for at least 15 – 16 years since it was based on 186 processor and monochrome screen” – Organisation “B”.*

However, an owner/manager of organisation “C” stated that he does not know much about IT, he answered “It is my weakness, most of my computer related work I will ask my secretary to do. However, it is only apply to me. Since our organisation always update and improve in IT aspect all the time.” On the other hand, many owners/managers from non-adopted organisations do not have much personal involvement in IT training. They prefer to learn something that relates directly to their businesses, for example an owner/manger from organisation “F” said “I never took any IT training class. Mostly, I tend to invest in knowledge

that related to my career and occupation such as learning about creating master block, setting scale plotter and designing a clothing pattern. Those computer skills will only learn by trial and error, and only when really need.”

Most owners/managers that have IT skills tend to handle computer and Internet activities – communicate by email and check information from website – by themselves, while others tend to ask their secretaries to deal with it. Owner/Manager of organisation “I” stated that *“I have a high interested in technology and realise how important it is. However, I prefer to let a younger generation handle it or ask them to do this job for me, since it is faster than I am doing it by myself.”*

The interview suggested that technological knowledge does not entirely influence the benefits of B2BEC. Most of interviewees understood the basic benefits of B2BEC quite well, although some of them did not have any IT background or received any IT training. This is because nowadays, B2BEC information can be easily accessing via Internet, newspaper, and/or from government promotion.

Two B2BEC adopting organisations and one implementing organisation shared similar reasons for adoption. One reason is the influence of major trading partners. Most of the time, it will come in a form of pressure and threats, however, organisation “B” was promised increased business, if it adopted the technology. Owner/manager from organisation “C” admitted that he was reluctant and declined to implement B2B techniques when his major trading partners approached regarding B2BEC adoption for the first few times. This is because he did not pay much attention to B2BEC before. But with the influence of his trading partners, he started to realise how important of B2BEC to his business and started enquiring about its benefits from many sources. A few months later, he decided to implement B2B techniques when his major trading partners approached for another time, since he understood more about the benefits of B2BEC. On the other hand, those non-adopting organisations never received any *influence from their major trading partners* at all.

The *number of B2BEC adopting organisation in industry* seems to have no effect on the owners/managers’ decisions. The interviews suggested that both adopting and non-adopting organisations agree that they were not influence by the number of competitors and other organisations in their industry using B2B technique. They said that there is no effect on how they conduct their businesses. Even with their trading partners, a lot of non-adopting organisations also were not concerned whether their trading partners have already adopted B2BEC or not as long as they can still conduct businesses with them. This can be exemplified by the interview question *“Is there any influence to your organisation if there are a significant numbers of B2BEC adopting organisation by your competitors or other organisations in your industry?”* Organisation “F” gave the following answer, similar to that of many non-adopting organisations; *“Not at all, since they do not involve with us in any way. In term of our trading partners, I am not sure whether they already have this technology or not. But up until now, we haven’t discussed anything regarding this issue.”* Consequently, the number of B2BEC adopting organisations in industry does not concern most SMMEs as long as they can still carry on their businesses, and they are not approached by trading partners regarding B2BEC adoption.

## **CONCLUSION**

B2BEC has been available to industry for a number of years. However, SMMEs are still slow to adopt this technology. From the studies based on an extension of TAM and EDI literature as a framework, we have interviewed a number of SMMEs in Thailand; few have adopted B2BEC techniques. The results of this study have shown that perceived usefulness and the

influence of trading partners positively influence the decision of owners/managers and play a part of B2BEC adoption.

We also found that owners/managers will tolerate new technology – even though it is not that easy to use – if its use is beneficial. Technological knowledge might help the person to understand and use the technology better but, it does not measure and fully influence B2BEC adoption in SMMEs. Interviews also suggested that even owners/managers unfamiliar with B2B technique were mostly keenly aware of B2BEC potential benefits in general. They think that they are not ready for it and/or it is not yet necessary for their organisations. A critical mass of B2BEC adopting organisation in industry tends to play little role, especially when these are competitors. What matter is the trading partners, but only when they suggest adopting techniques.

This study reports on only some factors compromising the TAM, and some features of EDI and B2BEC adoption. We only considered few factors operating at individual level. There are many more factors that merit researching especially other factors operating at organisational, inter-organisational, and environmental levels. From the interviews, not only we have been confirmed hypotheses, but we also received a variety of useful information relevant to analysis of organisational and environmental factors. Further studies of different aspects might not only confirm on the results found in this study, but also enable a more insightful analysis of SMMEs' adoption of B2BEC techniques.

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