

**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 adopters, despite its potential benefits. Using the Technology Acceptance Model (TAM), and literature pertaining to Electronic Data Interchange (EDI), 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 and Australia SMMEs were used to compare developments in developed and comparatively undeveloped countries

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INTRODUCTION

Small to Medium Enterprises (SMEs)' concerns regarding adoption of Business-to-Business Electronic Commerce (B2BEC) have recently provoked much research [4][9][16]. Business-to-Business (B2B) techniques are designed to facilitate transactions between trading partners; Small to Medium Manufacturing Enterprises (SMMEs) predominantly conducting business with other organisations can generally obtain more benefits from B2B adoption than businesses providing services. A report from United Nations Conference on Trade and Development (UNCTAD) [10: 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 [1][19]. They have encouraged B2B adoption by persuading and influencing many SMMEs who conduct business with them to adopt the technology. SMMEs are therefore more likely to have an interest in and be motivated to adopt B2B technology than their service sectors counterparts. In spite of the many potential advantages of B2BEC, pressure from trading partners, and governmental encouragement, its adoption by SMMEs remains limited, especially in developing countries [5][19].

Because SMMEs' decision making processes are dominated by owners/managers, their adoption of B2BEC is heavily influenced by individuals' acceptance of a particular technology. It is therefore important to understand what factors influence individuals' acceptance of technologies. The Technology Acceptance Model (TAM) [6][20] is appropriate for this study. Because B2B adoption is a relatively recent phenomenon 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) designed to explain and predict user acceptance of specific types of technology [6][15]. A number of studies have successfully used TAM to explain the acceptance of new technologies such as personal computers [12]. Researchers have recently use TAM in various Internet and electronic commerce contexts to predict acceptance of technology. These include email usage [8], electronic supermarkets [10] and the use of websites [14].

TAM model contains two major independent variables: *Perceived Usefulness* (PU) and *Perceived Ease of Use* (PEU). Perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her performance" [6, p. 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" (ibid). Many studies from the EDI adoption literature have also considered a factor similar to perceived usefulness labelled *Perceived Benefits* (PB). Perceived benefits are defined as "the level of recognition of the relative advantage that technology can provide to an organisation" [11, p. 468]. This concept is similar to perceived usefulness. It is reassured to have indications that perceived usefulness is a factor strongly influencing B2BEC adoption. Although SMMEs' owners/managers are leaders of their organisations, it is still possible for them to be hands-on users of many new technologies. If they perceive particular techniques to be easy to use

and/or beneficial, they will be encouraged to adopt the technologies and persuade subordinates to use them.

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 owners/managers' *technological knowledge* was one of many factors strongly influencing SMMEs' technology adoption decisions [18] [17] [4]. Cloete et al [4] noted that low computer literacy and lack of technological knowledge will probably result in a business being less likely to adopt electronic commerce. Thong [17] and Fink [7] concluded that technological knowledge is one of the factors primarily influencing individuals' decision to adopt technology. A better understanding of particular technology and sufficient technological skill tend to positively influence the individual's perceptions of usefulness and ease of use and consequently encourages faster and/or more widespread adoption of a technology.

These considerations suggest the hypotheses:

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

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

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

In the context of Small and Medium Enterprises, two factors that have been frequently studied in the context of EDI adoption and are claimed to have major influences on SMMEs' technology adoption decisions are *the influence of trading partners* and *the number of B2BEC adopting organisations in an industry*.

SMMEs' weak bargaining power and their dependant positions in industry imply that it is less likely that they will be proactive in B2B adoption. Their adoption decisions 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 larger competitors in the same industry [7]. The actions of industry members, especially trading partners, therefore strongly influences technology adoption decisions [2][3][13].

Low rates of B2BEC participation by SMMEs' trading partners impede SMMEs' adoption of B2B techniques, especially in developing countries. If SMMEs have a high percentage of online trading partners, then not adopting B2BEC will be a competitive disadvantage. The usefulness of B2BEC, like other types of electronic business, is an enormously enhanced by a critical mass of users. If the concept of B2BEC, and B2B techniques becomes a de facto standard in an industry, then it is reasonable that SMMEs will perceive great potential benefits in B2BEC adoption. Failing that, large and dominant suppliers and (especially) customers may compel SMEs to adopt B2B technologies to retain their status as suppliers.

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.

THAI SMMEs' ADOPTION OF B2BEC

Data was collected from 15 Thai SMMEs using a semi-structured interview process. The interviewed organisations were located mostly in Bangkok, the rest 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 uncover factors that might not have emerged from literature review process. B2BEC is a dynamic technology and practitioners' concerns might not have emerged in academic literature. The sample for the qualitative study was obtained from responses to the quantitative study. The final page of the questionnaire was a separate detachable page on which respondents could indicate their willingness to participate in a semi-structured interview. Eleven Thai respondents agreed to be interviewed. We hope to increase that number to at least 15.

To increase the number of interviews, the non-probabilistic sampling technique known as snowballing was used. The snowball technique comprises "a variety of procedures in which initial respondents are selected by probability methods, but in which additional respondents are then obtained from information provided by initial respondents" [21, p. 430]. Considering its cost and effectiveness, it was the appropriate technique to use to increase the number of suitable respondents.

In each consenting organisation, the owner or manager (usually an owner acted as manager) was interviewed to gain a clear understanding of all hypothesised factors. The contact details of each owner/manager were acquired from the KOMPASS database (A database subscribed to by Monash University: <http://lib.monash.edu.au/databases/1313331.html>) that provided information including the name of the owner(s) or main manager(s) (this was used to establish a direct communication to a target group), the number of employees (which was used to eliminate large organisation's), and the organisation's product type (used to eliminate non--manufacturers).

Informants were told that B2BEC is defined as a supply chain innovation that generates inter-organisational process integration. It includes (but is not limited to) Internet based transactions, EDI, and Website communication used, for example, in placing an order, making or receiving payments and/or tracking deliveries; but excludes simple e-mail communication, and website's used only to present an organisation's products. Two organisations (identified as organisations A & B) had already adopted at least one of the technologies and one organisation (C) is still implementing the technology. Five of twelve non-adopted organisations have websites, but these were used only for promoting the organisation and presenting product catalogues. Some demographic data pertaining to interviewing organisation are shown in Table 4.

Table 1: Summary of Basic Demographic Information

	Owners/Managers Education Background	Size by employee	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

As hypothesized, when owners/managers perceive that a particular technology is useful, they are more inclined to adopt it [6]. 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 could give them competitive advantages and help improve their organisations by, for example, improving internal communications, reducing price is costs, and making them more responsive.

“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 or realised that B2B techniques might be able to add something to their organisations, but they were still doubtful and were concerned by possible difficulties for example, current employees inability to handle the new techniques; the cost of adoption; inadequate infrastructure (this fear pertained mostly to Internet network speed and reliability, specially for organisation outside metropolitan areas); and investment in B2BEC is not 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 to undertake training. An owner/manager from organisation “D” noted that, because of his age and unfamiliarity with computers, it was difficult to learn new IT skills. However, he recognised that he had to learn, otherwise he could not communicate with those trading partners in other countries cheaply by email. This is consistent with previous studies of Davis [6, p 1000]. The interviewee stated that *perceived usefulness* is more strongly linked to IT adoption and usage than *perceived ease of use* as people may to tolerate a complex technology if they can gain an advantage from IT adoption.

In term of *technological knowledge*, owners/managers A & B demonstrated significant IT knowledge and experience and a great interest in IT learning and training. For example, the organisation A owner initiated the creation of an organisational website. The organisation B owner also stated that he has been using computers for almost 16 years:

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

“I have an experience with computer for at least 15–16 years since it was based on 186 [sic] 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-adopting 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 [to].”

Most owners/managers that have IT skills tend to handle computer and Internet activities – e.g. communicate by email and check information from website – by themselves, but 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 or my secretary handles 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 lack of technological knowledge does not imply a lack of perception of benefits of B2BEC. Most of interviewees understood the basic benefits of B2BEC quite well, despite the lack of IT background or training. Information about B2BEC can be easily obtained from the Internet, media, government promotions, and trading partners. Technological knowledge also does not show any clear relation with the perceived ease of use or the decision to adopt B2BEC. There is no consistent difference between adopters and non-adopters.

Two B2BEC adopting organisations and one implementing organisation shared similar reasons for adoption. One common reason is the influence of major trading partners. Most of the time, this will be manifest as threats however, organisation B was promised increased business if it adopted the technology. organisation C’s owner/manager admitted that he was reluctant and declined to implement B2B techniques the first few times his major trading partners approached him regarding B2BEC adoption. This is partly because he did not initially and pay much attention to B2BEC issues. But, influenced by trading partners, he started to realise how important B2BEC might be to his business and started investigating the potential benefits. A few months later, he decided to implement B2B techniques when his major trading partners approached him again, since he better appreciated the potential benefits of B2BEC. Contrastingly, non-adopting organisations that were interviewed never sensed no *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’ B2BEC decisions. The interviews suggested that both adopting and non-adopting organisations agreed that they were not influenced by the number of competitors or other organisations in their industry using B2B techniques. There was no effect on how they conduct their businesses. A lot of non-adopting organisations were not concerned as to whether their trading partners have adopted B2BEC or not, as long as they can still conduct businesses with them in conventional ways. This is exemplified by an answer to the question “*Is there any influence to your organisation if there is a significant numbers of a B2BEC adopting organisation by your competitors or other organisations in your industry?*” Organisation F gave an 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 wanting them to adopt B2BEC technologies.

Some unanticipated issues arose in interviews. Those located outside Bangkok, had difficulty in accessing government services and alluded to the low quality of network infrastructure. They also had difficulty in hiring skilled employees, most of whom prefer to work in the capital. Most of them mentioned that although there are a lot of news stories describing government plans and projects designed to encourage SMMEs to adopt B2BEC techniques, most of the plans and projects disappear without trace or discernible effect. This may be attributable to corruption, a very fluid politics, or the almost unbearable pressures on developing countries’ governments. Although many Thai organisations could profit from B2B techniques, implementation obstacles are considerable. Infrastructure is unreliable especially outside the capital. An SME’s scarcest

resource is often managerial time, the owner/manager may not be able to take time to manage the implementation of a technology that could and should touch every aspect of the organisation. Significant customers may prefer to use the old methods and cultures exemplified by face-to-face negotiation and a network of mutual obligations. Staff, perhaps with fewer relevant skills than their first world counterparts, may be less willing to undertake the necessary training.

CONCLUSION

B2BEC has been available to industry for a number of years but 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 SMME principals in Thailand; discovering that few have adopted B2BEC techniques. The results of this study have shown that perceived usefulness and the influence of trading partners positively influences the decision of owners/managers and play a part in B2BEC adoption decisions.

We also found that SMMEs' owners/managers will tolerate new technology – even if it is difficult to use – if its use is beneficial. The factors perceived usefulness and perceived ease-of-use do not fully explain B2BEC adoption in Thai SMMEs. A critical mass of organisations using B2BEC in industry has little influence on adoption decisions. Major trading partners have tried to persuade Thai SMEs to adopt B2B techniques but have not yet resorted to strong-arm tactics.

This paper reports on only some factors compromising the TAM, and some features of EDI and B2BEC adoption. We considered only a few factors operating at individual and inter-organisational level. There are many more factors that merit researching especially those operating at organisational and environmental levels. From the interviews, not only we have confirmed hypotheses, but we have 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.

This research program is in progress, interviews in Australia and surveys of Australian and Thai SMME owner/manager have not yet been analysed.

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