

# Barriers to E-Commerce Adoption in SMEs: Underlying Factors from a Swedish Study

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## Abstract

*Barriers to e-commerce adoption in small to medium enterprises (SMEs) have been widely researched and documented. This paper adds to the existing research in two ways. Firstly, it proposes that the sources of e-commerce adoption barriers can be found in the features that are unique to SMEs, in contrast to their larger counterparts. Secondly, it analyses the correlation between the adoption barriers using data collected from more than 300 SMEs in Sweden. The results of this analysis indicate that correlations between the barriers do exist and that the barriers can be grouped according to two distinct factors: the difficulty of implementing e-commerce and the unsuitability of e-commerce to the business.*

## Keywords

Barriers; Electronic commerce; Adoption; Small to medium enterprises.

## INTRODUCTION

The importance of the small to medium enterprise (SME) sector as the cornerstone of Australian economic prosperity is widely recognised (NOIE, 2002). However, research has indicated that the SME contribution to the Australian economy fell from 32% of the GDP to 29% of the GDP between 1994 and 1998 (Office of Small Business, 2001 *cited in* Abernethy, 2002). While the reasons for this decrease are diverse, SMEs are attempting to reverse the trend by turning to global markets. This development has been enabled by the advent of electronic commerce technology. Electronic commerce is defined as “the buying and selling of information, products, and services via computer networks” (Kalakota & Whinston, 1997, p.3). E-commerce has the potential to become a source of competitive advantage to the SME sector because it is a cost effective way of accessing customers globally and competing on par with large businesses. SMEs have started to capitalise on these benefits initially by connecting to the Internet. Indeed, according to the American City Business Journals (IEI, 2003), SMEs using the Internet have grown 46% faster than their counterparts who don't use the Internet. In Australia, 60% of small businesses were connected to the Internet by the year 2000 (Telstra, 2000).

Despite the exponential growth of e-commerce (the U.S. Census Bureau reports that e-commerce retail sales reached \$11.9 billion in the U.S. during the first quarter of 2003), it is the larger businesses that have reaped the benefits (Riquelme, 2002). In contrast, the rate of e-commerce adoption in the SME sector has remained relatively low (Magnusson, 2001; Poon & Swatman, 1998; Van Akkeren & Cavaye, 1999; Small Business Index, 2000). According to the National Research Council (2000), only 25% of SMEs had a web site in mid-1999. Of those that did have a web site, the revenue they generated via business-to-customer (B2C) e-commerce was negligible (Wall Street Journal, August 17, 1999 *cited in* National Research Council, 2000; Ruth, 2000). Similar findings were reported in Australia with only 22% of small businesses using the Internet for e-commerce (Telstra, 1999). In fact, a report by Forrester Research (2000, *cited in* Tedjarati, 2001) indicated that Australian SMEs lagged in e-commerce adoption behind other similarly developed countries, including New Zealand, the U.S., Japan, Canada, Sweden and Singapore.

The sluggish pace of e-commerce diffusion in the SME sector has been attributed to various adoption barriers that are faced by SMEs. These barriers have been well documented in numerous research studies. However, the correlation between the barriers has not been examined. This paper presents a study of Swedish SMEs which investigated the barriers to e-commerce adoption (amongst other things). The aim of the paper is twofold: to examine the source of barriers to e-commerce adoption; and to analyse the correlation between various e-commerce adoption barriers in order to identify any underlying factors. The paper begins by examining the nature of SMEs and identifying features that are unique to SMEs. A discussion of barriers to e-commerce

adoption based on previous research is then presented and the barriers are mapped to the unique SME features. This is followed by a correlation and factor analysis of the Swedish data and a discussion of the results. Finally, the limitations of the study are presented and conclusions drawn.

## THE NATURE OF SMALL TO MEDIUM ENTERPRISES

There have been numerous studies carried out in order to isolate the features unique to SMEs. Most of these studies have focussed on the differences between SMEs and their larger counterparts. Based on an extensive review of the literature, a summary of the features unique to SMEs is shown in Table 1. An analysis of the features revealed that they could be classified as being internal or external to the business. Internal features include management, decision making and planning processes, and the acquisition of resources, while external features are related to the market (products/services and customers) and the external environment (risk taking and uncertainty).

ID	FEATURES UNIQUE TO SMEs	REPORTED BY	
	<i>Features Related to Management, Decision Making and Planning Processes</i>		<b>INTERNAL FEATURES</b>
INT 1	SMEs have small and centralised management with a short range perspective	Bunker & MacGregor (2000) Welsh & White (1981)	
INT 2	SMEs have poor management skills	Blili & Raymond (1993)	
INT 3	SMEs exhibit a strong desire for independence and avoid business ventures which impinge on their independence	Dennis (2000) Reynolds et al (1994)	
INT 4	SME Owners often withhold information from colleagues	Dennis (2000)	
INT 5	The decision making process in SMEs is intuitive, rather than based on detailed planning and exhaustive study	Reynolds et al (1994) Bunker & MacGregor (2000)	
INT 6	The SME Owner(s) has/have a strong influence in the decision making process	Reynolds et al (1994) Bunker & MacGregor (2000)	
INT 7	Intrusion of family values and concerns in decision making processes	Dennis (2000) Bunker & MacGregor (2000) Reynolds et al (1994)	
INT 8	SMEs have informal and inadequate planning and record keeping processes	Reynolds et al (1994) Tetteh & Burn (2001) Miller & Besser (2000) Markland (1974) Rotch (1981)	
	<i>Features Related to Resource Acquisition</i>		
INT 9	SMEs face difficulties obtaining finance and other resources, and as a result have fewer resources	Cragg & King (1993) Welsh & White (1981) Gaskill & Gibbs (1994) Reynolds et al (1994) Blili & Raymond (1993)	
INT 10	SMEs are more reluctant to spend on information technology and therefore have limited use of technology	Walczuch et al (2000) Dennis (2000) MacGregor & Bunker (1996) Poon & Swatman (1997) Abell & Limm (1996)	
INT 11	SMEs have a lack of technical knowledge and specialist staff and provide little IT training for staff	Martin & Matlay (2001) Cragg & King (1993) Bunker & MacGregor (2000) Reynolds et al (1994) Welsh & White (1981) Blili & Raymond (1993)	
ID	FEATURES UNIQUE TO SMEs	REPORTED BY	
	<i>Features Related to Products/Services and Markets</i>		<b>EXTERNAL FEATURES</b>
EXT 1	SMEs have a narrow product/service range	Bunker & MacGregor (2000) Reynolds et al (1994)	

<b>EXT 2</b>	SMEs have a limited share of the market (often confined towards a niche market) and therefore heavily rely on few customers	Hadjimonolis (1999) Lawrence (1997) Quayle (2002) Reynolds et al (1994)	
<b>EXT 3</b>	SMEs are product oriented, while large businesses are more customer oriented	Reynolds et al (1994) Bunker & MacGregor (2000) MacGregor et al (1998)	
<b>EXT 4</b>	SMEs are not interested in large shares of the market	Reynolds et al (1994) MacGregor et al (1998)	
<b>EXT 5</b>	SMEs are unable to compete with their larger counterparts	Lawrence (1997)	
<b><i>Features Related to Risk Taking and Dealing with Uncertainty</i></b>			
<b>EXT 6</b>	SMEs have lower control over their external environment than larger businesses, and therefore face more uncertainty	Westhead & Storey (1996) Hill & Stewart (2000)	
<b>EXT 7</b>	SMEs face more risks than large businesses because the failure rates of SMEs are higher	Brigham & Smith (1967) DeLone (1988) Cochran (1981)	
<b>EXT 8</b>	SMEs are more reluctant to take risks	Walczuch et al (2000) Dennis (2000)	

Table 1: Features unique to small to medium enterprises (SMEs)

It is proposed that the features unique to SMEs detailed in Table 1 are a source numerous inhibitors of technology adoption and use in SMEs. These inhibitors or barriers will be discussed next.

## BARRIERS TO E-COMMERCE ADOPTION IN SMES

It has been demonstrated previously that the rate of e-commerce adoption in SMEs has been low. This slow paced uptake of e-commerce technologies has been documented and researched widely, with results indicating that SMEs face inhibitors or barriers that prevent them from implementing and fully reaping the benefits of e-commerce. In their study of 27 SME manufacturing firms, Cragg and King (1993) identified the lack of financial and managerial resources, and inadequate levels of technical expertise as the major inhibitors of IT grown in small businesses. These three factors were also identified by Welsh and White (1981) as being symptomatic to SMEs. However, other barriers have also been identified.

Like the unique features of SMEs, the barriers to e-commerce adoption can be classified as external or internal to the business. Hadjimanolis (1999), in a study of e-commerce adoption by SMEs in Cyprus, found that external barriers could be further categorised into supply barriers (difficulties obtaining finance and technical information), demand barriers (e-commerce not fitting with the products/services or not fitting with the way clients did business) and environmental barriers (security concerns). Internal barriers were further divided into resource barriers (lack of management and technical expertise) and system barriers (e-commerce not fitting with the current business practices). A summary of e-commerce adoption barriers in SMEs is presented in Table 2. An analysis was undertaken to examine the relationship between these barriers and unique features of SMEs listed in Table 1. Table 2 shows this relationship by indicating which unique features can be mapped to which barriers. For example, one of the most commonly cited barriers to e-commerce adoption is that it is too expensive to implement, a barrier that arises from the fact that SMEs face difficulties obtaining finance, unlike their larger counterparts. If the finance was readily available to SMEs, high cost may not be a barrier to e-commerce adoption. Table 2 is an initial, exploratory attempt at determining the relationship between unique features and barriers. Further research is required to establish the nature of this relationship.

<b>BARRIERS TO E-COMMERCE ADOPTION</b>	<b>REPORTED BY</b>	<b>RELATED TO FEATURE ID</b>
<i>High cost of e-commerce implementation; Internet technologies too expensive to implement</i>	Iacovou et al (1995); Quayle (2002); Puroo & Campbell (1998); Lawrence (1997); Riquelme (2002); Van Akkeren & Cavaye (1999); Fielding (1996)	INT 9
E-commerce too complex to implement	Fielding (1996) ; Quayle (2002)	INT 11
<b>BARRIERS TO E-COMMERCE ADOPTION</b>	<b>REPORTED BY</b>	<b>RELATED TO FEATURE ID</b>
Low level of existing hardware technology incorporated into the business	Lawrence (1997)	INT 10

SMEs need to see immediate ROI and e-commerce is a long-term investment	Lawrence (1997); McGowan & Madey (1998)	INT 1
Organisational resistance to change because of the fear of new technology amongst employees	Lawrence (1997); Van Akkeren & Cavaye (1999)	INT 2; INT 11
Preference for and satisfaction with traditional manual methods, such as phone, fax and face-to-face	Lawrence (1997); Venkatesan & Fink (2002); Poon & Swatman (1999)	INT 10; EXT 3
Lack of technical skills and IT knowledge amongst employees; Lack of computer literate/specialised staff	Quayle (2002); Lawrence (1997); Riquelme (2002); Van Akkeren & Cavaye (1999); Iacovou (1995); Damsgaard & Lyytinen (1998); Chau & Turner (2002)	INT 11
Lack of time to implement e-commerce	Walczuch et al (2000); Lawrence (1997); Van Akkeren & Cavaye (1999)	INT 5; INT 2; INT 1
E-commerce is not deemed to be suited to the way the SME does business	Abell & Limm (1996); Hadjimanolis (1999); Iacovou et al (1995); Poon & Swatman (1997)	INT 5; INT 8; EXT 3;
E-commerce is not deemed to be suited to the products/services offered by the SME	Walczuch et al (2000); Kendall & Kendall (2001); Hadjimanolis (1999)	EXT 1; EXT 5
E-commerce is perceived as a technology lacking direction	Lawrence (1997)	INT 1; INT 10; EXT 8
Lack of awareness about business opportunities/benefits that e-commerce can provide	Iacovou et al (1995); Quayle (2002)	INT 1; INT 2; INT 5; INT 8; EXT 3; EXT 4
Lack of available information about e-commerce	Lawrence (1997)	EXT 8
Concern about security of e-commerce	Quayle (2002); Puro & Campbell (1998); Abell and Limm (1996); Riquelme (2002); Van Akkeren & Cavaye (1999); Poon & Swatman (1999); Hadjimanolis (1999)	EXT 6; EXT 7; EXT 8
Lack of critical mass among customers, suppliers and business partners to implement e-commerce	Abell and Limm (1996); Hadjimanolis (1999)	EXT 2
Heavy reliance on external consultants (who are considered by SMEs to be inadequate) to provide necessary expertise	Lawrence (1997); Van Akkeren & Cavaye (1999); Chau & Turner (2002)	INT 11
Lack of e-commerce standards	Tuunainen (1998); Robertson & Gatignon (1986)	INT 11

*Table 2: Summary of e-commerce adoption barriers and their relationships to the features unique to SMEs*

While research examining the inhibitors to e-commerce adoption in SMEs has identified a number of barriers that prevent SMEs from implementing e-commerce, there has not been any attempt to map the correlations between those barriers. Mapping the correlations between barriers is beneficial because it would indicate whether any logical groupings of barriers exist. A research study, which investigated the barriers to e-commerce adoption and their correlation, will be described next.

## **METHODOLOGY**

A survey instrument was developed for SME managers and, following pilot-testing, used to collect data about the drivers and barriers to e-commerce adoption in SMEs. This paper is only concerned with the barriers to adoption. A set of 10 barriers was identified based on the findings of previous studies. Those barriers which were reported as having a greater than 50% response as important were included in the survey (see Figure 1). Respondents who had not adopted e-commerce were asked to rate the importance of each barrier to their decision not to adopt. A standard 5 point Likert scale was used to rate the importance with 1 being very unimportant and 5 being very important. The Likert scale responses were assumed to possess the characteristics of an interval measurement scale for data analysis purposes. A total of 1170 surveys were distributed by post to randomly selected SMEs in 4 regional areas of Sweden: Karlstad, Filipstad, Saffle and Arvika.

**23. This question relates to the reasons why your organisation is not using e-commerce. Below is a list of statements indicating possible reasons. Based on your opinion, please rank each statement on a scale of 1 to 5 to indicate how important it was to your decision NOT to use e-commerce, as follows:**

- 1 = the reason was very unimportant to your decision not to use e-commerce**
- 2 = the reason was unimportant to your decision not to use e-commerce**
- 3 = the reason was neither unimportant nor important to your decision not to use e-commerce**
- 4 = the reason was important to your decision not to use e-commerce**
- 5 = the reason was very important to your decision not to use e-commerce**

<b>Our organisation does not use e-commerce because:</b>	<b>Rating</b>				
<i>E-commerce is not suited to our products/ services.</i>	1	2	3	4	5
E-commerce is not suited to our way of doing business.	1	2	3	4	5
E-commerce is not suited to the ways our clients (customers and/or suppliers) do business.	1	2	3	4	5
E-commerce does not offer any advantages to our organisation.	1	2	3	4	5
We do not have the technical knowledge in the organisation to implement e-commerce.	1	2	3	4	5
E-commerce is too complicated to implement.	1	2	3	4	5
E-commerce is not secure.	1	2	3	4	5
The financial investment required to implement e-commerce is too high for us.	1	2	3	4	5
<i>We do not have time to implement e-commerce.</i>	1	2	3	4	5
It is difficult to choose the most suitable e-commerce standard with so many different options available.	1	2	3	4	5

*Figure 1: Question about barriers to e-commerce adoption used in survey*

## RESULTS

Responses were obtained from 313 SME organisations giving a response rate of 26.8%. From these, 275 responses were considered to be valid and usable. The total number non-adopters (i.e. SMEs not using e-commerce) was 123, representing 44.7% of the valid responses. The responses of these non-adopters were examined in detail and it was determined that 89 of them responded to every statement in the question regarding barriers to e-commerce adoption. The responses of these 89 SMEs formed the basis for the statistical analysis carried out using SPSS. An inspection of the frequencies indicated that the full range of the scale was utilised by respondents (i.e. every barrier had at least one instance of each rating from 1 to 5).

The aim of the statistical analysis was to establish the correlations between e-commerce adoption barriers in the data set. Therefore, these were examined and the results are shown in the Correlation Matrix (Table 3) below. The barriers have been abbreviated for readability. The Correlations which were significant at the .001 level are shown in bold lettering.

Correlation Matrix

	barr - not match prod/serv	barr - not fit our way of working	barr - not fit cust way of working	barr - no advantages	barr - no knowledge	barr - complicated technique	barr - doubt security	barr - investment too high	barr - no time
barr - not fit our way of working	.746								
barr - not fit cust way of working	.462	.530							
barr - no advantages	.482	.547	.280						
barr - no knowledge	-.030	.054	-.097	0.249*					
barr - complicated technique	-.009	.059	.065	.106	.544				
barr - doubt security	0.184*	0.303**	.098	0.249*	0.277*	.516			
barr - investment too high	-.051	-.138	.092	-.104	.445	.481	0.217*		
barr - no time	-.245*	-.261**	-.056	-.0195*	.432	.587	.174	.448	
barr - many choices	-.056	-.005	-.033	.062	.514	.579	.334	.494	.532

\* Correlation is significant at the 0.05 level

\*\* Correlation is significant at the 0.01 level

Table 3: Correlation matrix of e-commerce adoption barriers

The correlation matrix shows an interesting pattern of results. The first four barriers seem to all correlate with each other, but show weak or no correlations with the last set of barriers. Similarly, it appears that correlations exist between the last five barriers in the Correlation Matrix. Therefore, two distinct groupings of results can be identified in the Correlation Matrix. In the first grouping, there is a strong positive correlation between the barriers “E-commerce is not suited to our products/ services” and “E-commerce is not suited to our way of doing business” (Pearson’s  $r = .747, p < .000$ ). These two barriers also show moderately strong positive correlations with the barriers “E-commerce is not suited to the ways our clients (customers and/or suppliers) do business” and “E-commerce does not offer any advantages to our organisation”. In the second grouping, the barriers relating to the investment, time, number of options, complexity and security aspects of e-commerce adoption generally show moderately strong positive correlations with each other. However, the barriers within these two groupings appear to be unrelated to the barriers in the alternate group, with the exception of very weak correlations for the barriers relating to security and time.

These findings suggested the use of Factor Analysis to investigate any separate underlying factors and to reduce the redundancy of certain barriers indicated in the Correlation Matrix. The results of Kaiser-Meyer-Olkin MSA (.735) and Bartlett’s Test of Sphericity ( $\chi^2 = 343, p = .000$ ) indicated that the data set satisfied the assumptions for factorability. Principle Components Analysis was chosen as the method of extraction in order to account for maximum variance in the data using a minimum number of factors. A two-factor solution was extracted with Eigenvalues of 3.252 and 2.745, and was supported by an inspection of the Scree Plot. These two factors accounted for 59.973% of the total variance as shown in Table 4.

Rotation Sums of Squared Loadings			
Component	Eigenvalue	% of Variance	Cumulative %
1 (Too Difficult)	3.252	32.520	32.520
2 (Unsuitable)	2.745	27.453	59.973

Table 4: Total variance explained

The two resulting components were rotated using the Varimax procedure and a simple structure was achieved as shown in the Rotated Component Matrix in Table 5. Five barriers loaded highly on the first component. These barriers are related to the complexity of implementation techniques, range of e-commerce options, high investments and the lack of technical knowledge and time. This component has been termed the “Too Difficult” factor. The barriers highly loaded on the second component are termed the “Unsuitable” factor and are related to the suitability of e-commerce to the respondent’s business, including the extent e-commerce matched the SME’s products/services, the organisation’s way of doing business, their client’s way of doing business and the lack of advantages offered by e-commerce implementation. These two factors are independent and uncorrelated, as an orthogonal rotation procedure was used. It is interesting to note that the barrier relating to security loaded on both factors, although the loading on the “Too Difficult” factor was slightly higher.

	Component 1 (Too Difficult)	Component 2 (Unsuitable)
E-commerce is not suited to our products/ services.	-.086	.844
E-commerce is not suited to our way of doing business.	-.034	.909
E-commerce is not suited to the ways our clients (customers	-.004	.643

and/or suppliers) do business.		
E-commerce does not offer any advantages to our organisation.	.076	.731
We do not have the technical knowledge in the organisation to implement e-commerce.	.743	.074
E-commerce is too complicated to implement.	.852	.102
E-commerce is not secure.	.525	.385
The financial investment required to implement e-commerce is too high for us.	.703	-.092
We do not have time to implement e-commerce.	.742	-.294
It is difficult to choose the most suitable e-commerce standard with so many different options available.	.800	-.054

Table 5: Rotated Component Matrix

## DISCUSSION

The results of the study indicate that correlations between barriers to e-commerce adoption exist and enable the grouping of barriers according to two factors. These factors have been termed “Too Difficult” and “Unsuitable”. The “Too Difficult” factor is related to the barriers which make e-commerce complicated to implement, including barriers such as the complexity of e-commerce implementation techniques, the difficulty in deciding which standard to implement because of the large range of e-commerce options, the difficulty obtaining funds to implement e-commerce, the lack of technical knowledge and difficulty in finding time to implement e-commerce. The “Unsuitable” factor, on the other hand, is related to the perceived unsuitability of e-commerce to SMEs. These barriers include the unsuitability of e-commerce to the SME’s products/services, way of doing business, and client’s way of doing business, as well as the lack of perceived advantages of e-commerce implementation. Finally, the security barrier was found to be related to both factors, although the factor loading of this barrier was higher in relation to the “Too Difficult” factor (.525). A diagram of these groupings is shown in Figure 2.

The results of this study are significant in several ways. The analysis has shown that ten of the most common barriers to e-commerce adoption can be grouped in relation to two main factors. This gives researchers a powerful explanatory tool because it reduces the “noise” in the data. Instead of accounting for ten different barriers, the inhibitors to e-commerce adoption can be explained as a result of one of two factors: e-commerce is either too difficult or unsuitable to the business. The Rotated Component Matrix also enables the prediction of the scores of each individual barrier based on the score of the two factors, and vice versa, for an SME. This has implications for research into e-commerce barriers. Whereas before researchers have identified various barriers (such as the ones listed in Table 2), this is the first time a study has shown that certain barriers are correlated and can be logically grouped according to two factors. This makes it simpler not only to explain, but also predict barriers to e-commerce adoption in SMEs.

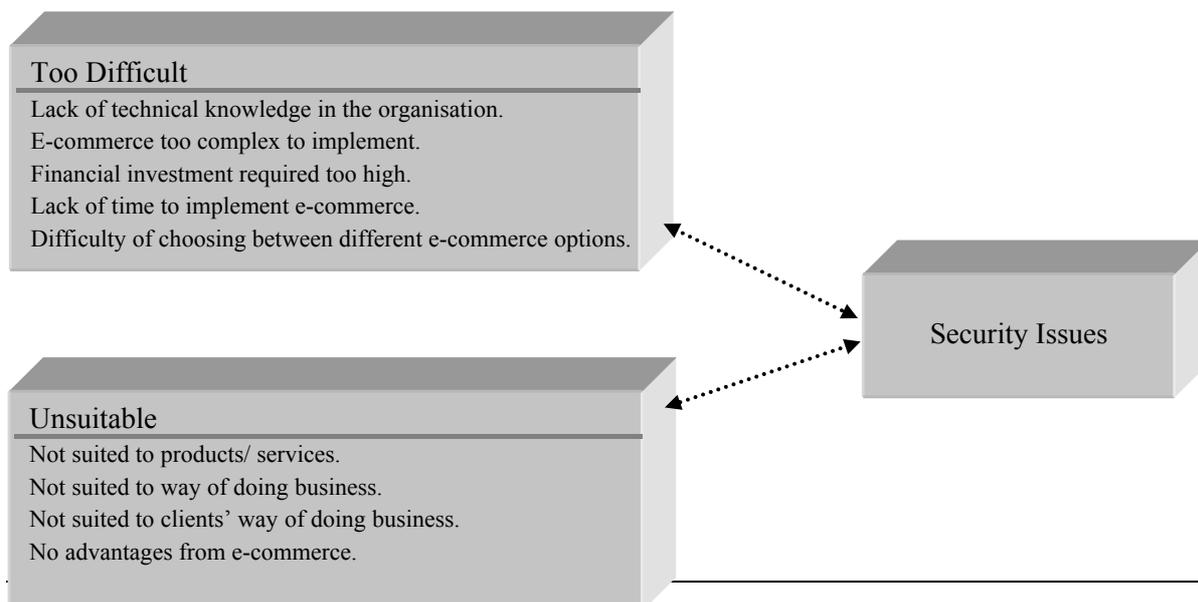


Figure 2: Groupings of e-commerce barriers

### Limitations of the study

It should be noted that this study has several limitations. The data for the study was collected from regional SMEs in four areas of Sweden. Therefore, although conclusions can be drawn, the results may not be generalisable to SMEs in other countries. Also, the data for the study was collected from various industry sectors and it is not possible to make sector specific conclusions. Finally, this is a quantitative study, and further qualitative research is required to gain a better understanding of the key issues raised as a result of this research and described above.

### CONCLUSION

The aim of this paper was twofold: to examine the source of e-commerce adoption barriers; and to analyse the correlation between various e-commerce adoption barriers in order to identify any underlying factors that enable the grouping of barriers. To this end, the unique features of SMEs were presented and mapped to e-commerce adoption barriers indicating a potential relationship between the two. Further investigation is required to identify the exact nature of this relationship. Correlation and factor analyses were then performed on the data set of barriers from a study of Swedish SMEs to determine whether any correlations between the barriers existed. The Correlation Matrix indicated two distinct sets of groupings and a two-factor solution was extracted using factor analysis. It was found that ten e-commerce barriers could be grouped according to two factors. These were termed “Too Difficult” and “Unsuitable”. The results of this study are a significant contribution to the research of e-commerce barriers because they can be used as explanatory and prediction tools by researchers.

The study presented in this paper is only one part of a larger long-term project investigating the drivers and barriers to e-commerce adoption in SMEs. Further research is currently being undertaken in order to overcome some of the limitations outlined above. Specifically, the survey instrument is being replicated in two regional areas in Australia, which will provide comparable results. The results of the Australian survey will be available in time for presentation at the conference.

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