

The Role of Enterprise Wide Business Systems in the Adoption and Use of E-Commerce in SMEs: A Study of Swedish SMEs

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Abstract

This paper examines and compares two approaches to e-commerce adoption, the linear and the housed approach, and their effect on regional SMEs. In particular, the effects of these approaches on the barriers to e-commerce adoption and the benefits from e-commerce adoption are investigated. Data collected from a study of Swedish SMEs is used for the purpose. The findings suggest that differences resulting from the two approaches to e-commerce adoption in SMEs are 'localised' to specific sections of the population.

Keywords

Enterprise business systems; information systems; electronic commerce; adoption; small to medium enterprises.

INTRODUCTION

E-commerce is not just another mechanism to sustain and enhance existing business practices, it is a paradigm shift that is radically changing traditional ways of doing business. Lee (2001), who describes e-commerce as a 'disruptive technology', suggests that the focus has shifted from lean manufacturing and total quality management, within the organisation, to synthesis and distribution of information outside the organisation. He terms the shift in focus as moving from 'economics of scarcity' to 'economics of abundance'. There are many offerings in the literature, noting changes brought about by the adoption and use of e-commerce technology. These include: changes in communication (Chellappa et al 1996); changes in day-to-day activities (Doukidis et al 1998); improved competitiveness (Auger & Gallagher 1997); shortening of supply chains (Barry & Milner 2002); and global market presence (Ritchie & Brindley 2000). Not only has the adoption and use of e-commerce changed the processes carried out within the organisation, it has radically altered the structure of many organisations. Indeed, Dignum (2002) states that while computer technology is important, the biggest mistake made by companies is that they believe that by simply introducing e-commerce, they would succeed without having to worry about organisational structure.

These changes to the structure and processes of the organisation, which are brought about by e-commerce, have, in turn, given rise to a number of alternative approaches for e-commerce adoption. These approaches can be loosely categorised into two types. The first of these, found particularly in government produced literature, suggests a stepwise process to e-commerce adoption, termed a linear or ladder approach. This approach, which is particularly directed to smaller businesses, suggests that the organisation begins with email, moves through website development, and then develops e-commerce with other customers and businesses. The final step in this process is the development of an enterprise wide business system that incorporates all existing systems together with e-commerce. The alternative places the development of an enterprise wide business system as the first step in the process of adopting e-commerce. The choice and use of e-commerce is then 'housed' within the enterprise wide business system.

This paper examines both approaches to e-commerce adoption and their effect on regional SMEs. The paper particularly focuses on the effect of these approaches on the ratings of criteria for adoption of e-commerce by SMEs, the rating of barriers to adoption of e-commerce by SMEs, and the benefits derived from e-commerce adoption. The paper begins by examining the nature of SMEs, in particular their adoption and use of e-commerce. The paper then briefly compares the two adoption models. Finally, the paper presents a study of 250 regional Swedish SMEs, 148 that had developed an enterprise wide business system, 102 that had not. The study compares the rating of adoption criteria, barriers and benefits between the two groups, to determine whether these differ depending upon the model of adoption used.

SMALL TO MEDIUM ENTERPRISES

There have been many studies carried out attempting to examine the characteristics of SMEs. Most of these studies have focussed on the difference between SMEs and their larger counterparts. Brigham & Smith (1967) found that SMEs tended to be more risky than their larger counterparts. This view is supported in later studies (Walker, 1975, DeLone, 1988). Cochran (1981) found that SMEs tended to be subject to higher failure rates while Rotch (1987) suggested that SMEs had inadequate records of transactions. Welsh & White (1981), in a comparison of SMEs with their larger counterparts found that SMEs suffered from a lack of trained staff and had a short-range management perspective. They termed these traits 'resource poverty' and suggested that their net effect was to magnify the effect of environmental impact, particularly when information systems were involved.

These early suggestions have been supported by more recent studies that have found most SMEs lack technical expertise (Barry & Milner 2002), most lack adequate capital to undertake technical enhancements (Gaskill et al 1993, Raymond 2001), most SMEs suffer from inadequate organisational planning (Tetteh & Burn 2001, Miller & Besser 2000) and many SMEs differ from their larger counterparts in the extent of the product/service range available to customer (Reynolds et al 1994). A number of recent studies (see Reynolds et al 1994, Murphy 1996, Bunker & MacGregor 2000) have also examined the differences in management style between large businesses and SMEs. These studies have shown that among other characteristics, SMEs tend to have a small management team (often one or two individuals), they are strongly influenced by the owner and the owner's personal idiosyncrasies, they have little control over their environment (this is supported by the studies of Westhead & Storey (1996) and Hill & Stewart (2000)) and they have a strong desire to remain independent (this is supported by the findings of Dennis (2000) and Drakopolou-Dodd et al (2002)).

THE ACQUISITION AND USE OF E-COMMERCE BY SMES

As with the nature of SMEs, many researchers have examined the adoption (or non-adoption) of e-commerce by SMEs. A comparison of some of these studies has provided conflicting results. For example, Poon & Swatman (1997) found that e-commerce led to improved relationships with customers, while Stauber (2000) noted a decline in contact with customers. Some of these differences are clearly due to the nature of the research. However, many of the differences denote the non-homogeneous nature of the SME arena. Much of the recent work carried out in examining e-commerce acquisition and use in SMEs falls under one of three headings:

- criteria employed for the adoption and use of e-commerce in SMEs,
- benefits derived from the use of e-commerce by SMEs,
- barriers to the adoption of e-commerce in SMEs.

These will now be examined separately.

Criteria Employed for the Adoption and Use of E-commerce in SMEs

A study carried out on 146 SMEs by Poon & Swatman (1997) provided five 'drivers' or criteria for e-commerce adoption by respondents. These were: new modes of direct or indirect marketing, strengthening of relationships with business partners, the ability to reach new customers, improvement to customer services and the reduction of costs in communication. Similar studies have been carried out in a variety of SME communities. Some of the criteria for adoption and use have been similar to those found by Poon & Swatman, others have provided alternative responses. Abell & Limm (1996) found that reduction in communication costs, improvement in customer services, improvement in lead time and improvement in sales were the major criteria for e-commerce adoption and use, adding that external technical support was considered vital to any adoption and use strategies.

Lawrence (1997), in an examination of Tasmanian SMEs noted that improved marketing and the ability to reach new customers were the most common incentives for adopting and using e-commerce. Lawrence also noted that decisions concerning e-commerce adoption were often forced onto SMEs by their larger trading partners. This is supported by studies carried out MacGregor & Bunker (1996), MacGregor, Bunker & Waugh (1998),

Reimenschneider & Mykytyn (2000) and Raymond (2001). Auger & Gallagher (1997) noted that improvement in customer services and improvement to internal control of the business were strong criteria for e-commerce adoption in SMEs. The strong desire for control was also noted in studies carried out by Reimenschneider & Mykytyn (2000), Poon & Joseph (2001) and Domke-Damonte & Levsen (2002). A number of studies (Reimenschneider & Mykytyn 2000, Power & Sohal 2002) have found that some SMEs have adopted e-commerce nominating pressure from customers as one of the motivating criteria.

Benefits Derived from the Use of Electronic Commerce by SMEs

Many of the substantial benefits provided by e-commerce fall into the category of intangible benefits and are often not realised by owner managers at the time of e-commerce adoption. Studies by Poon & Swatman (1997) and Abell & Limm (1996) found that SMEs benefited in their ability to reach new customers and new markets through the use of e-commerce. This has been supported in more recent studies (Vescovi 2000, Ritchie & Brindley 2001, Sparkes & Thomas 2001, Raymond 2001, Quayle 2002).

Earlier studies found that other benefits reported by SME operators included reduced production costs, lowering of administration costs, reduced lead time, increased sales, improved relations with business partners and improved quality of information (Poon & Swatman 1997, Abell & Limm 1996). A recent study by Quayle (2002) found that benefits derived from e-commerce use, as reported by SME managers/owners included reduced administration costs, reduced production costs, reduced lead time, reduced stock, improved marketing and improved quality of information.

Barriers to the Adoption of Electronic Commerce in SMEs

Hadjimanolis (1999) in a study of e-commerce adoption by SMEs in Cyprus considers that barriers to adoption can be categorised as either external or internal to the organisation. External barriers include difficulties in obtaining finance, difficulties in obtaining technological information and difficulties choosing the appropriate hardware and software. These difficulties he terms supply barriers. He further nominates two other sub-categories of external barriers which he terms demand barriers and environmental barriers. Demand barriers found by Hadjimanolis include e-commerce not fitting with products and services offered or not fitting with the way their customers wished to conduct their business. Environmental barriers found by Hadjimanolis included complicated governmental regulations and security concerns. Hadjimanolis subdivided his internal barriers into two categories. These he termed resource barriers (which included lack of management enthusiasm and lack of technical expertise) and systems barriers (which included e-commerce not fitting with current business practices).

In a similar study, Lawrence (1997) defined three categories. These she termed company, personal and industry barriers. Company barriers found by Lawrence included low level of technology use within the business, limited financial and technical resources available, organisational resistance to change and lack of perceived return on investment. Barriers categorised as personal included lack of information on e-commerce, management preferring conventional approaches to business practice and inability to see the advantages of using e-commerce. Industry barriers included some respondents believing that the industry, as a whole was not ready for e-commerce technology.

A number of other research initiatives, while not providing categories of perceived barriers have produced similar findings to those of Lawrence and Hadjimanolis. Purao & Campbell (1998) who conducted a series of interviews with SME owners found that major barriers included a failure to see any advantage in using e-commerce. They also found that lack of technical know how, prohibitive set up costs and security concerns were strong disincentives to many SME managers/operators. Abell & Limm (1996) found many SME owner/managers felt that e-commerce did not suit either the day-to-day business procedures or the product mix offered by the business. In a cross cultural study of Hong Kong and Finnish SMEs, Farmoohand et al (2000) found that both cultures reported a lack of technical know how and a failure to see how e-commerce fitted the current mode of business practices.

Recent studies have shown that many of the barriers reported in the late 1990's by Lawrence and Hadjimanolis are still current in today's SMEs. Tambini (1999) and Eid et al (2002) found that SME managers are still not convinced that e-commerce fits the products or services that their businesses offer. Studies by Bakos & Brynjolfsson (2000), Sawhney & Zabin (2002), Merhtens et al (2001) have found that there is still a reluctance for SME managers to adjust their businesses to the requirements and demands placed on it by e-commerce participation. Bakos & Brynjolfsson (2000) and Kulmala et al (2002) found that many SMEs felt that e-commerce did not suit the current mix of customers while Chau & Hui (2001) have reported that many respondents did not see any advantage to using e-commerce in their businesses. Other barriers reported in the

literature include a reported lack of technical know how (Mirchandani & Motwani 2001), security and cost concerns (Reimenschneider & McKinney 2001).

FACTORS AFFECTING THE ADOPTION OF E-COMMERCE BY SMES

A number of authors (Hawkins et al 1995, Hawkins & Winter 1996, Hyland & Matlay 1997) have noted that because SMEs are diverse in terms of size, business sector, market etc, results are not generalisable across the entire SME sector. A number of studies have been carried out to determine which factors may affect SME adoption of e-commerce technology. Fallon & Moran (2000) found significant links between the size of the SME in terms of the number of employees and the level of internet adoption. Matlay (2000) showed that the business sector was significantly associated with e-commerce adoption. Both studies showed that the same results were achievable despite varying geographic spread or market focus. These studies showed that smaller SME's (fewer than 10 employees) were less likely to adopt e-commerce technology than larger SME's. They also found that service organisations were more likely to adopt e-commerce than manufacturing or retail based SME's. Riquelme (2002), in a study of 75 Chinese SME's found that those involved in service tended to adopt e-commerce far more than their manufacturing counterparts.

Blackburn & Athayde (2000) identified not only size and sector but also the level of international marketing as a factor associated with adoption of e-commerce technology. As with the adoption of IT, a number of studies (Tetteh & Burn 2001, O'Donnell et al 2001) have concluded that successful e-commerce adoption and use is associated with both the level of IT skill within the SME as well as with the development, prior to e-commerce adoption, of business wide systems. These studies support earlier findings with EDI adoption (see MacGregor et al 1998, Iacovou et al 1995, Turban et al 2000). In a study of 102 SME's, Mazzarol et al (1999) found that the gender of the CEO was significantly associated with the level of adoption of e-commerce, while the age and level of education of the CEO did not show any significant association. This study is supported by the findings of Venkatesh & Morris (2000). By comparison, studies by Martin et al (2001) and Hyland & Matlay (1997) suggest that educational background was a significant factor when examining e-commerce use, rather than adoption, in the SME environment.

ALTERNATIVE METHODS OF ADOPTION OF E-COMMERCE IN SMES

As already stated, the methodologies for the adoption of e-commerce by SMEs, found in the literature, can be loosely categorised into two groups. The first of these proposes a linear approach, beginning with email, moving through website development, and then developing e-commerce with other customers and businesses. The final step in this process is the development of an enterprise wide business system that incorporates all existing systems together with e-commerce. This approach, which is the basis of many governmental pamphlets (see Blair 2000, European Commission 2000, National Office of the Information Economy 1998) is supported by a number of authors (Gramignoli et al 1999, Chesher & Skok 2000, Giustiniano & Fracocchi 2002). These authors argue that since most SMEs do not understand organisation-wide strategies and have in the past, been driven by technical concerns, it is easier to apply a similar approach to the adoption of e-commerce.

As with any approach suggested in the literature, the linear model has not only found advocates, it has found its share of critics. Studies by Martin & Matlay (2001) and Fallon & Moran (2000) suggest that linear models inherently contain a view that the SME sector is homogeneous. As such, the model fails to account for factors such as size, ethnicity, business sector or location of the SME. Studies by MacGregor et al (1998) have suggested that the linear approach utilises pre-e-commerce criteria that are not viable in the post-e-commerce context, while Culkin & Smith (2000) describe the linear model in even more emotive terms as: "naïve, oversimplistic understanding of the motivations of those in the small business sector, that means that these interventions are inevitably blunt instruments destined to fail given the limited understanding shown of the complexity of the small business market" (Culkin & Smith 2000, pp 145).

The alternate approach involves the development of an enterprise wide business system prior to the adoption of e-commerce, such that changes brought about by e-commerce are disseminated across the entire organisation. Brandon (2002) suggests that failure to develop such a system reduces the benefits of e-commerce, particularly in the area of supply chain management. Sussman (2002) and Heidorn (2002) suggest that the existence of an enterprise wide business system serves as a mediator between production systems and e-commerce adoption. A number of authors (Tetteh & Burn 2001, Jeffcoate et al 2002, Schindehutte & Morris 2001) state that only through the planning and development of enterprise wide business systems can the necessary infrastructure be put in place to successfully adopt and use e-commerce. The following section details a study carried out on 250 Swedish SMEs.

Aims of the Study

The current study had three aims. These were:

- To determine whether the development of an enterprise wide business system was associated with the age of the business, the size of the business, the business sector, the market focus, the level of computer skills within the SME, the sex of the CEO or the educational level of the CEO.
- To compare the ratings of criteria, benefits and barriers of e-commerce adoption between those SMEs that had developed an enterprise wide business system and those that had not.
- To determine whether differences in the ratings of criteria, benefits or barriers between those SMEs that had developed an enterprise wide business system and those that had not, was specific to SMEs of a certain age, size, business sector, or market focus.

Survey Instrument

A questionnaire was developed for SME managers. Respondents were asked to rate the criteria, barriers and benefits of e-commerce across a 5 point Likert scale (with anchors 1 – not applicable to my situation, 5 very applicable to my situation). Respondents were also asked: whether they had adopted e-commerce, whether they developed an enterprise wide business system, the age of the business (< 1yr, 1-2 yrs, 3-5 yrs, 6-10 yrs, 11-20 yrs, >20 yrs), the size of the business (0 employees, 1-9 employees, 11-19 employees, 20-49 employees), the business sector (industrial, service, retail, finance), their market focus (local, regional, national, international), the sex of CEO, and whether the CEO had a tertiary qualification. 1170 questionnaires were distributed around 4 regional areas of Sweden: Karlstadt, Arvika, Saffle, Filipstad.

Analysis of Responses

Responses were obtained from 350 SMEs, giving a response rate of 29.9%. As SMEs are normally considered to have 50 or less employees (see Meredith 1994), 37 responses were removed as having employee sizes larger than 50, leaving 313 responses. 63 responses were removed through incompleteness, leaving 250 useable responses, or 21.4%. Table 1 provides a cross section of respondents. The first goal of the study was to determine whether the development of an enterprise wide business system was associated with the age of the business, the size of the business, the business sector, the market focus, the level of computer skills within the SME, the sex of the CEO or the educational level of the CEO. A series of chi-square test were carried out to determine whether any of the factors (the age of the business, the size of the business, the business sector, the market focus, the level of computer skills within the SME, the sex of the CEO or the educational level of the CEO) was associated with the development of an enterprise wide business system. For brevity, only significant data is shown (see Table 2).

Adopted E-commerce			Not adopted E-commerce		
136			114		
No. of years in business					
<1 year	1-2 years	3-5 years	6-10 years	11-20 years	>20 years
2	13	35	51	64	85
Size of Business					
0 employees		1-9 employees		10-19 employees	
37		132		43	
Business Sector					
Industrial	Service	Retail	Finance	Other	
49	102	53	2	37	
Market focus					
Local	Regional		National	International	
125	22		78	26	
Developed an enterprise wide business system					
Yes			No		
148			102		
Sex of CEO					
Male			Female		
218			32		
CEO has a tertiary qualification					
Yes			No		

102			148	
Average Level of Computer Skill in the SME				
None	Low	Normal	High	Expert
4	44	138	45	18

Table 1: Description of Respondent Population

Size of Business	Developed EBS	Did not	Business Sector	Developed EBS	Did not
0 employees	15	22	Industrial	42	7
1-9 employees	66	66	Service	44	58
10-19 employees	33	10	Retail	38	15
20-49 employees	33	4	Finance	0	2
			Other	18	19
p<.001			p<.001		

Computer Skill	Developed EBS	Did not	Market Focus	Developed EBS	Did not
None	1	3	Local	69	56
Little	17	27	Regional	8	14
Normal	84	54	National	53	25
High	31	14	International	18	8
Expert	13	5			
p<.05		3	p<.05		

Table 2: Chi Square Analysis of factors affecting the decision to develop an enterprise wide business system (EBS)

The second aim of the study was to compare the ratings of criteria, benefits and barriers of e-commerce adoption between those SMEs that had developed an enterprise wide business system and those that had not. For those SMEs that had adopted e-commerce a series of two-tailed t-tests were carried out to compare the means of ratings of criteria between those respondents that had developed an enterprise wide business system and those that had not. Table 3 provides the details.

Criteria	Mean devt	No. devt.	Mean not devt	No. not devt.	t-value	Signif.
Demand/Pressure from Customers	2.01	85	2.18	33	-.729	.467
Pressure of competition	2.45	85	2.44	32	.037	.971
Demand/Pressure from Suppliers	2.04	84	1.90	30	.522	.603
Reduction of costs	3.47	86	3.22	32	.823	.415
Improvement to customer service	4.19	86	3.97	32	1.015	.312
Improvement in lead time	3.02	84	2.72	32	.944	.350
Increased sales	3.46	85	2.74	31	2.573	.011*
Improvement to internal efficiency	3.85	89	4.03	32	-.823	.412
Strengthen relations with partners	3.40	85	3.00	32	1.594	.114
Reach new customers/markets	3.53	86	3.03	31	1.800	.075
Improvement in competitiveness	3.85	86	3.38	32	1.564	.125
External Technical Support	1.58	84	1.38	32	1.071	.286
Improvement in marketing	3.53	85	3.41	32	.471	.675
Improvement in control and follow-up	3.13	85	2.38	32	2.687	.005**

Table 3: Comparison of means of ratings of criteria used for E-commerce adoption between those respondents that had developed an enterprise wide business system and those that had not

For those SMEs that had adopted e-commerce a series of two-tailed t-tests were carried out to compare the means of ratings of benefits between those respondents that had developed an enterprise wide business system and those that had not. Table 4 provides the details.

Adoption Benefit Criteria	Mean devt	No. devt.	Mean not devt	No. not devt.	t-value	Signif.
Lower administration costs	3.11	87	2.97	33	.551	.582
Lower production costs	2.88	84	2.94	33	-.206	.837
Lower cost for staff	2.40	84	2.32	31	.306	.760
Reduced lead time	3.20	85	3.13	32	.264	.792
Reduced Stock	2.43	81	1.97	30	1.637	.104
Increased Sales	2.88	85	2.71	31	.660	.511
Increased internal efficiency	3.28	83	2.79	33	1.850	.071
Improved relations with partners	3.00	84	3.13	33	-.415	.680
Adoption Benefit Criteria	Mean devt	No. devt.	Mean not devt	No. not devt.	t-value	Signif.
New customers and markets	3.38	85	3.27	33	.380	.706
Improved competitiveness	2.40	85	2.19	31	.804	.668
Improved marketing	3.51	86	3.19	32	1.151	.252
Improved quality of information	3.40	86	3.00	32	1.565	.120
Improved control and follow up	3.28	87	2.91	32	1.360	.176

Table 4: Comparison of means of ratings of benefits used for E-commerce adoption between those respondents that had developed an enterprise wide business system and those that had not

For those SMEs that had not adopted e-commerce a series of two-tailed t-tests were carried out to compare the means of ratings of barriers between those respondents that had developed an enterprise wide business system and those that had not. Table 5 provides the details.

Adoption Barrier Criteria	Mean devt	No. devt.	Mean not devt	No. not devt.	t-value	Signif.
EC doesn't fit with products/services	2.62	52	2.97	62	-.933	.353
Doesn't fit with the way we do business	2.54	52	2.89	62	-.985	.327
Doesn't fit the way our customers work	2.60	52	2.66	62	-.186	.852
We don't see the advantage of using EC	2.17	52	2.76	62	-1.743	.084
Lack of technical know how	2.33	52	2.82	62	-1.426	.157
Seems too complicated	1.94	52	2.02	62	-.242	.810
Security risks	1.90	52	2.26	62	-1.146	.254
Cost too high	2.38	52	2.19	62	.578	.564
Not had the time	2.46	52	2.37	62	.265	.792
Not sure what to choose	2.65	52	2.10	62	1.614	.109

Table 5: Comparison of means of ratings of barriers used for E-commerce adoption between those respondents that had developed an enterprise wide business system and those that had not

The third goal of the study was to determine whether differences in the ratings of criteria, benefits or barriers between those SMEs that had developed an enterprise wide business system and those that had not, was specific to SMEs of a certain age, size, business sector, or market focus. The data was split into 6 groups, one for each of the age categories. For those SMEs that had adopted e-commerce a series of two-tailed t-tests were carried out to compare the means of ratings of criteria and benefits between those respondents that had developed an enterprise wide business system and those that had not. For those SMEs that had not adopted e-commerce a series of two-tailed t-tests were carried out to compare the means of ratings of barriers between those respondents that had developed an enterprise wide business system and those that had not. For brevity, only those criteria, benefits and barriers that showed significant differences between the means are shown. Table 6 provides the details.

*p<.05 ** p<.01

6-10 yrs						
Criteria	Mean devt	No. devt.	Mean not devt	No. not devt.	t-value	Signif.
I	3.76	17	2.55	11	3.164	.004**
K	4.06	17	2.91	11	2.065	.049*
L	1.47	17	1.00	11	2.704	.016*

N	3.47	17	1.91	11	3.574	.001**
Benefits	Mean devt	No. devt.	Mean not devt	No. not devt.	t-value	Signif.
M	3.69	16	2.70	10	2.287	.031*
11-20 yrs						
Criteria	Mean devt	No. devt.	Mean not devt	No. not devt.	t-value	Signif.
G	3.29	24	1.75	4	2.153	.041*
J	3.38	24	1.75	4	2.357	.026*
Benefits	Mean devt	No. devt.	Mean not devt	No. not devt.	t-value	Signif.
L	3.57	18	3.11	27	-2.684	.010*

Table 6: A comparison of means of ratings of criteria, benefits and barriers to E-commerce adoption for the 6 business age categories

The data was split into 4 groups, one for each of the 4 size categories. For those SMEs that had adopted e-commerce a series of two-tailed t-tests were carried out to compare the means of ratings of criteria and benefits between those respondents that had developed an enterprise wide business system and those that had not. For those SMEs that had not adopted e-commerce a series of two-tailed t-tests were carried out to compare the means of ratings of barriers between those respondents that had developed an enterprise wide business system and those that had not. Again, for brevity, only those criteria, benefits and barriers that showed significant differences between the means are displayed. Table 7 provides the details.

*p<.05

1-9 emp's						
Barriers	Mean devt	No. devt.	Mean not devt	No. not devt.	t-value	Signif.
G	2.11	18	3.11	27	-2.684	.010*

Table 7: A comparison of means of ratings of criteria, benefits and barriers to E-commerce adoption for the 4 business size categories

The data was split into 4 groups, one for each of the 4 business sector categories. For those SMEs that had adopted e-commerce a series of two-tailed t-tests were carried out to compare the means of ratings of criteria and benefits between those respondents that had developed an enterprise wide business system and those that had not. For those SMEs that had not adopted e-commerce a series of two-tailed t-tests were carried out to compare the means of ratings of barriers between those respondents that had developed an enterprise wide business system and those that had not. No significant differences were found.

The data was split into 4 groups, one for each of the 4 market sector categories. For those SMEs that had adopted e-commerce a series of two-tailed t-tests were carried out to compare the means of ratings of criteria and benefits between those respondents that had developed an enterprise wide business system and those that had not. For those SMEs that had not adopted e-commerce a series of two-tailed t-tests were carried out to compare the means of ratings of barriers between those respondents that had developed an enterprise wide business system and those that had not. Again, for brevity, only those criteria, benefits and barriers that showed significant differences between the means are displayed. Table 8 provides the details.

*p<.05

Local						
Criteria	Mean devt	No. devt.	Mean not devt	No. not devt.	t-value	Signif.
N	3.09	33	3.29	17	2.039	.047*
Benefits	Mean devt	No. devt.	Mean not devt	No. not devt.	t-value	Signif.
H	3.31	32	2.39	17	2.265	.031*
M	3.64	33	2.78	18	2.228	.030*
National						
Criteria	Mean devt	No. devt.	Mean not devt	No. not devt.	t-value	Signif.
E	4.46	41	3.67	9	2.643	.011*
G	3.83	40	2.67	9	2.577	.013*
N	3.28	39	2.11	9	2.589	.013*

Table 8: A comparison of means of ratings of criteria, benefits and barriers to E-commerce adoption for the 4 market focus categories

DISCUSSION

Table 1 provides a description of the respondent population. As can be seen, the respondent population provides a broad enough coverage of SMEs to adequately carry out the aims of the research. A detailed analysis of Table

5 shows that 54.4% of the study population had adopted e-commerce. 59.2% of the respondent population had developed an enterprise wide business system prior to e-commerce adoption. 80.8% of the respondent population reported that they had an average or above average level of computer skill within their business. Thus, responses to questions concerning e-commerce and enterprise wide business systems are assumed to be made from a background of understanding of the concepts.

The first aim of the study was to determine whether the development of an enterprise wide business system was associated with the age of the business, the size of the business, the business sector, the market focus, the level of computer skills within the SME, the sex of the CEO or the educational level of the CEO. A series of chi-square analyses was carried out to determine which, if any, factors was associated with the development of an enterprise wide business system. 4 factors gave significant associations and are displayed in Table 2. An examination of Table 2 shows that 2 factors, size of business and business sector were associated with the development of an enterprise wide business system (at the .01 level). The results showed that the larger SMEs (10 - 19 employees and 20 – 49 employees) were more likely to develop an enterprise wide business system. 76.7% of those respondents that had 10 – 19 employees had developed an enterprise wide business system, while 89.1% of SMEs with more than 20 employees had developed an enterprise wide business system. By comparison, smaller SMEs were at best equivocal.

An examination of the data for the business sectors shows that 85.7% of the industrial respondents had developed an enterprise wide business system, 71.7% of the retail respondents had also developed an enterprise wide business system. This figures falls to 43% for those respondents in the service industry. Two factors, the level of computer skill and market focus showed a significant association with the development of an enterprise wide business system (at the .05 level). As would be expected, those responding SMEs that had a higher level of computer skill were more likely to develop an enterprise wide business system. For normal, high and expert levels of computer skill, the percentages having developed an enterprise wide business system were 60.1%, 68.9% and 72.0% respectively. For those SMEs that had a lower level of skill, this figure dropped to 38.6%.

An examination of the data pertaining to market focus shows that with the exception of those respondents that indicated that they were mainly regional in focus, all other sections had more respondents that had developed an enterprise wide business system, than had not. Of particular interest is the fact that despite the findings of Mazzarol et al (1999), Venkatash & Morris (2000), Martin et al (2001) and Hyland & Matlay (1999), who found that the sex and/or educational level of the CEO significantly affected the adoption processes of e-commerce in SMEs, the current data showed no such associations. One possible reason for this is the possibility that such associations are cultural in nature and thus cannot be generalised across the entire SME population.

The second aim of the study was to compare the ratings of criteria, benefits and barriers of e-commerce adoption between those SMEs that had developed an enterprise wide business system and those that had not. A series of two-tailed t-tests was carried out to compare the means of ratings of criteria, barriers and benefits of e-commerce adoption in SMEs between those respondents that had developed an enterprise wide business system and those that had not. Tables 3, 4, 5 provide the details of the two-tailed t-tests. An examination of the three tables shows that there was no significant difference between any of the barriers or benefits for e-commerce adoption.

The data, in Table 3, shows that two of the criteria, increased sales and improvement to control and follow-up, showed a significant difference in their mean ratings (at .05 and .01 respectively). The mean rating for increased sales for respondents that had developed an enterprise wide business system was 3.46, compared to 2.74 for those that had not developed an enterprise wide business system. Similarly, the mean rating for the criterion improved control and follow-up was 3.13 for those respondents that developed an enterprise wide business system, compared to 2.38 for those respondents that had not. Again, it is interesting to note that despite the findings of Brandon (2002), Sussman (2002), Heidorn (2002), Jeffcoate et al (2002) and Schindehutte & Morris (2001), that only through development of an enterprise wide business system are benefits able to be maximised, the current study found no significant differences in the perceptions of benefits between the two groups.

The final aim of the study was to determine whether differences in the ratings of criteria, benefits or barriers between those SMEs that had developed an enterprise wide business system and those that had not, was specific to SMEs of a certain age, size, business sector, or market focus. The data was subdivided separately by business age, by business size, by business sector, and by market focus and a series of two-tailed t-tests was applied to determine whether, for particular sections of the population, there were significant differences between the means of criteria, barriers or benefits, between those respondents that had developed an enterprise wide business system and those that had not. Table 6, 7, 8 provide the significant findings only.

An examination of Table 6 shows that for 2 business age groups (6 – 10 yrs in operation and 11 – 20 yrs in operation), there were significant differences in the ratings of some criteria and benefits. For the group that were in the 6 – 10 yr category, four criteria (strengthen relations with business partners, improved competitiveness, offer of external support, and improvement in control and follow-up) showed a significant difference in the

means of ratings (at the .01, .05, .05, .01 levels respectively). In all cases, the mean rating for respondents that had developed an enterprise wide business system was higher than for those that had not. One benefit, improved quality of information, was rated significantly higher (3.69) by those respondents that had developed an enterprise wide business system, compared to 2.70 for those that had not. For the group of respondents that were in the 11 – 20 yr category, two criteria (increased sales and reaching new customers and markets) and one benefit (improved marketing) showed a significant difference (at the .05 level) between those that developed an enterprise wide business system and those that had not. Again, in all 3 cases, those respondents that had developed an enterprise wide business system rated these higher than those that had not.

Table 7 provides the significant differences in the means of ratings for the various business size categories. As can be seen, only one business size category (1-9 employees) showed any significant differences in the means of the rating and this was in the barrier (security). The mean rating of this barrier for those that had not developed an enterprise wide business system was 3.11, compared to 2.11 for those that had.

Table 8 shows the significant differences in the means of ratings for the market focus categories. As can be seen, only 2 categories of market focus, local and national, showed any significant differences in the means of ratings between those respondents that had developed an enterprise wide business system and those that had not. For the local category, one criterion (improved control and follow-up) and two benefits (improved relations with business partners and improved quality of information) showed a significant difference (all at the .05 level). An examination of the data shows that those respondents that had not developed an enterprise wide business system rated the criterion, Improved control and follow-up, higher (3.29) than those respondents that had developed an enterprise wide business system (3.09). An examination of the mean ratings of the benefits (improved relations with business partners and improved quality of information) shows that those respondents that had developed an enterprise wide business system rated the benefits higher than those that had not developed an enterprise wide business system.

For those respondents that had a national market focus, 3 criteria (improved customer services, increased sales and improved control and follow-up) showed significant differences in the means of their ratings between those respondents that had developed an enterprise wide business system and those that had not. In all cases, those that had developed an enterprise wide business system rated the criteria higher than those that had not. It is interesting to note that the rating of the criterion improved control and follow-up is rated higher by those respondents that had not developed an enterprise wide business system for the local market category, while the opposite occurs for the national market focus category. This would tend to support the views of Martin & Matlay (1999) and Culkin & Smith (2000), that the SME population cannot be considered homogeneous.

CONCLUSION

There are a number of limitations that must be considered to the present study. Firstly, the generalizability of these results across SMEs in other cultures needs to be considered. As shown in the data, results cannot be generalised across the entire population and appear to be specific to certain sections of the current population. Secondly, while previous studies (Raymond 2001) have shown the methodology to be valid, reliance on one key informant, the owner or CEO of the SME, may imply cognitive biases. Unlike previous studies that have focussed on one of the two approaches to e-commerce adoption, this study has attempted to compare SMEs involved in both approaches. The findings suggest that differences resulting from the two approaches to e-commerce adoption in SMEs are 'localised' to specific sections of the population rather than the entire group. Clearly, more research is needed to determine how decisions about e-commerce adoption are made in SMEs.

REFERENCES

- Abell W. & Limm L. (1996) Business Use of the Internet in New Zealand: An Exploratory Study
<http://www.scu.edu.au/sponsored/ausweb96>
- Auger P. & Gallagher J.M. (1997) Factors Affecting Adoption of an Internet-based Sales Presence for Small Businesses *The Information Society* vol 13, no. 1, pp 55 - 74
- Bakos Y. & Brynjolfsson E. (2000) Bundling and Competition on the internet *Marketing Science* 19(1) 63-82
- Barry H. & Milner B. (2002) SME's and Electronic Commerce: A Departure from the Traditional Prioritisation of Training? *Journal of European Industrial Training* vol 25, no. 7, pp 316 - 326
- Blackburn R. & Athayde R. (2000) Making the Connection: The Effectiveness of Internet Training in Small Businesses *Education and Training* vol 42, no. 4/5
- Blair T. (2000) UK Prime Minister, Press release re the launch of UK Online opengov site 11th September

- Brandon D. (2002) Managing Global Chemical Operations: Achieve enterprise and Extended Enterprise SCM Visibility *Chemical Week* vol 164, no. 34, pp 19 - 21
- Brigham E.F. & Smith K. (1967) The cost of capital to the small firm *The Engineering Economist* 13(1), 1-26
- Bunker D.J. & MacGregor R.C. (2000) Successful Generation of Information Technology (IT) Requirements for Small/Medium Enterprises (SME's) – Cases from Regional Australia *Proceedings of SMEs in a Global Economy* Wollongong, Australia, pp 72 – 84
- Chau P.Y.K. & Hui K.L. (2001) Determinants of Small Business EDI Adoption: AN Empirical Investigation *Journal of Organisational Computing and Electronic Commerce* vol 11, no. 4, pp 229 – 252
- Chellappa R., Barua A. & Whinston A. (1996) Looking Beyond Internal Corporate Web Servers in Kalakota R. & Whinston A. (eds) *Readings in Electronic Commerce* Addison Wesley, Reading MA, pp 311 - 321
- Chesher M. & Skok W. (2000) Roadmap for Successful Information Technology Transfer for Small Businesses *SIGCPR* Evanston Ill, pp 16 - 22
- Cochran A.B. (1981) Small Business Mortality Rates: A review of the Literature *Journal of Small Business Management* vol 19, no. 4, pp 50 - 59
- Culkin N. & Smith D. (2000) An Emotional Business: A Guide to Understanding the Motivations of Small Business Decision Takers *Qualitative Market Research: An International Journal* 3(3), 145 - 157
- DeLone W.H.: (1988), Determinants for Success for Computer Usage in Small Business *MIS Quarterly*, 51-61
- Dennis C. (2000) Networking for Marketing Advantage *Management Decision* vol 38, no. 4, pp 287 - 292
- Dignum F. (2002) E-Commerce in Production: Some Experiences *Integrated Manufacturing Systems* vol 13, no. 5, pp 283 - 294
- Domke-Damonte D. & Levsen V.B. (2002) The Effect of Internet Usage on Cooperation and Performance in Small Hotels *SAM Advanced Management Journal* summer, pp 31 - 38
- Doukidis G., Poulymenakou A., Terpsidis I, Themisticleous M. & Miliotis P. (1998) *The Impact of the Development of Electronic Commerce on the Employment Situation in European Commerce* Athens University of Economics and Business
- Drakopoulou-Dodd S. Jack S. & Anderson A.R. (2002) Scottish Entrepreneurial Networks in the International Context *International Small Business Journal* vol 20, no. 2, pp 213 - 219
- Eid R., Trueman M. & Ahmed A.M. (2002) A Cross-Industry Review of B2B Critical Success Factors *Internet Research: Electronic Networking Applications and Policy* vol 12, no. 2, pp 110 - 123
- European Commission (2000) European Survey of the Information Society *European Society Indicators in the Member States of the EU* <http://www.europa.eu.in/ISPO/esis>
- Fallon M. & Moran P (2000) Information Communications Technology (ICT) and manufacturing SMEs 2000 *Small Business and Enterprise Development Conference* University of Manchester, pp 100 - 109
- Farhoomand A.F., Tuunainen V.K. & Yee L.W. (2000) Barriers to Global Electronic Commerce: A Cross-Country Study of Hong Kong and Finland *Journal of Organisational Computing and Electronic Commerce* vol 10, no. 1, pp 23 - 48
- Gaskill L.R., Van Auken H.E. & Kim H. (1993) The Impact of Operational Planning on Small Business Retail Performance *Journal of Small Business Strategy* vol 5, no. 1, pp 21 – 35
- Giustiniano L. & Fratocchi L. (2002) The Virtual Internationalisation of Italian SMEs in the Food Industry *International Journal of Business Performance management* vol 4, no. 2-4, pp 231 – 247
- Gramignoli S., Ravarini A. & Tagliavini M. (1999) A Profile for the IT manager within SMEs *SIGCPR*, New Orleans, pp 200 - 208
- Hadjimonolis A. (1999) Barriers to Innovation for SMEs in a Small Less Developed Country (Cyprus) *Technovation* vol 19, no. 9, pp 561 - 570
- Hawkins P., Winter J. & Hunter J. (1995) *Skills for Graduates in the 21st Century* Report Commissioned from the Whiteway Research, University of Cambridge, Association of Graduate Recruiters, Cambridge
- Hawkins P. & Winter J. (1996) The Self Reliant Graduate and the SME *Education and Training* 38(4), 3-9
- Heidorn M. (2002) The Importance of Design Data management *Printed Circuit Design* vol 19, no. 7, pp 8 - 13

- Hill R. & Stewart J. (2000) Human Resource Development in Small Organisations *Journal of European Industrial Training* vol 24, no. 2/3/4, pp 105 - 117
- Hyland T. & Matlay H. (1997) Small Businesses, Training needs and VET Provisions *Journal of Education and Work* vol 10, no. 2
- Iacovou C.L., Benbasat I. & Dexter A.S. (1995) Electronic Data Interchange and Small Organisations: Adoption and Impact of Technology *MIS Quarterly* vol 19, no. 4, pp 465 - 485
- Jeffcoate J., Chappell C. & Feindt S. (2002) Best Practice in SME Adoption of E-Commerce *Benchmarking: An International Journal* vol 9, no. 2, pp 122 – 132
- Kulmala H.I., Paranko J. & Uusi-Rauva E. (2002) The Role of Cost Management in Network Relationships *International Journal of Production Economics* vol 79, no. 1, pp 33 - 43
- Lawrence K.L. (1997) Factors Inhibiting the Utilisation of Electronic Commerce Facilities in Tasmanian Small-to-Medium Sized Enterprises *8th Australasian Conference on Information Systems* pp 587 - 597
- Lee C.S. (2001) An analytical Framework for Evaluating E-commerce Business Models and Strategies *Internet Research: Electronic Network Applications and Policy* vol 11, no. 4, pp 349 - 359
- Lee J. & Runge J. (2001) Adoption of Information Technology in Small Business: Testing Drivers of Adoption for Entrepreneurs *Journal of Computer Information Systems* vol 42, no. 1, pp 44 - 57
- MacGregor R.C. & Bunker D.J. The Effect of Priorities Introduced During Computer Acquisition on Continuing Success with It in Small Business Environments *Information Resource Management Association International Conference* Washington pp 271 - 277, 1996
- MacGregor R.C., Bunker D.J. & Waugh P. Electronic Commerce and Small/Medium Enterprises (SME's) in Australia: An Electronic Data Interchange (EDI) Pilot Study, *Proceedings of the 11th International Bled Electronic Commerce Conference*, Slovenia, June 1998
- Martin L.M. & Matlay H. (2001) "Blanket" Approaches to Promoting ICT in Small Firms: Some Lessons from the DTI Ladder Adoption Model in the UK *Internet Research: Electronic Networking Applications and Policy* vol 11, no. 5, pp 399 - 410
- Martin L.M., Halstead A. & Taylor J. (2001) Learning Issues in Rural Areas *Contemporary Readings in Post-compulsory Education Triangle*
- Matlay H. (2000) Training in the Small Business Sector of the British Economy in Carter S. & Jones D. *Enterprise and Small Business: Principles, Policy and Practice* Addison Wesley Longman, London
- Mazzarol T., Volery T., Doss N & Thein V. (1999) Factors Influencing Small Business Start-ups *International Journal of Entrepreneurial Behaviour and Research* vol 5, no. 2, pp 48 - 63
- Meredith G.G.: (1994), *Small Business Management in Australia* McGraw Hill, 4th Edition
- Mehrtens J., Cragg P.B. & Mills A.M. (2001) A Model of Internet Adoption by SMEs *Information and Management* vol 39, pp 165 - 176
- Miller N.L. & Besser T.L. (2000) The Importance of Community Values in Small Business Strategy Formation: Evidence from Rural Iowa *Journal of Small Business Management* vol 38, no. 1, pp 68 - 85
- Mirchandani D.A. & Motwani J. (2001) Understanding Small Business Electronic Commerce Adoption: An Empirical Analysis *Journal of Computer Information Systems* vol 41, no. 3, pp 70 - 73
- Murphy J. (1996) *Small Business Management* Pitman London
- National Office of the Information Economy (1998) A Strategic Framework for the Information Economy: Identifying Priorities for Action *Australian Commonwealth Government*
- O'Donnell A., Gilmore A, Cummins D & Carson D (2001) The Network Construct in Entrepreneurship Research: A Review and Critique *Management Decision* vol 39, no. 9, pp 749 - 760
- Poon S. & Swatman P. (1997) The Internet for Small Businesses: An Enabling Infrastructure *Fifth Internet Society Conference* pp 221 - 231
- Poon S. & Joseph M. (2001) A Preliminary Study of Product Nature and Electronic Commerce *Marketing Intelligence & Planning* vol 19, no. 7, pp 493 – 499

- Power D.J. & Sohal A.S. (2002) Implementation and Usage of Electronic Commerce in Managing the Supply Chain: A Comparative Study of Ten Australian Companies *Benchmarking: An International Journal* vol 9, no. 2, pp 190 - 208
- Purao S. & Campbell B. (1998) Critical Concerns for Small Business Electronic Commerce: Some Reflections Based on Interviews of Small Business Owners *Proceedings of the Association for Information Systems Americas Conference* Baltimore, MD, 14 – 16 August, pp 325 - 327
- Quayle M. (2002) E-commerce: The Challenge for UK SMEs in the Twenty-First Century *International Journal of Operations and Production Management* vol 22, no. 10, pp 1148 - 1161
- Raymond L. (2001) Determinants of Web Site Implementation in Small Business *Internet Research: Electronic Network Applications and Policy* vol 11, no. 5, pp 411 - 422
- Reimenschneider C.K. & McKinney V.R. (2001) Assessing Beliefs in Small Business Adopters and Non-Adopters of Web-Based E-Commerce *Journal of Computer Information Systems* 42(2), 101-107
- Reimenschneider C.K. & Mykytyn P.P. jr (2000) What Small Business Executives Have Learned about Managing Information Technology *Information & Management* vol 37, pp 257 – 267
- Reynolds W., Savage W. & Williams A. (1994) *Your own business: A Practical guide to success* ITP
- Ritchie R. & Brindley C. (2000) Disintermediation, Disintegration and Risk in the SME Global Supply Chain *Management Decision* vol 38, no. 8, pp 575 - 583
- Riquelme H. (2002) Commercial Internet Adoption in China: Comparing the Experience of Small, Medium and Large Business *Internet Research: Electronic Networking Applications and Policy* 12(3), 276 - 286
- Rotch W. (1987) *Management of Small Enterprises: Cases and Readings* University of Virginia Press
- Sawhney M. & Zabib J. (2002) Managing and Measuring Relational Equity in the Network Economy *Journal of the Academy of Marketing Science* vol 30, no. 4, pp 313 - 332
- Schindehutte M. & Morris M.H. (2001) Understanding Strategic Adaption in Small Firms *International Journal of Entrepreneurial Behaviour and Research* vol 7, no. 3, pp 84 - 107
- Sparkes A. & Thomas B. (2001) The Use of the Internet as a Critical Success Factor for the Marketing of Welsh Agri-food SMEs in the Twenty First Century *British Food Journal* vol 103, no. 4, pp 331 - 347
- Stauber A (2000) *A Survey of the Incorporation of Electronic Commerce in Tasmanian Small and Medium Sized Enterprises* Tasmanian Electronic Commerce Centre, 37pp
- Sussman D. (2002) New glue for age-old gaps *MSI* vol 20, no. 9, pp 55 - 62
- Tambini A.M. (1999) E-Shoppers Demand E-Service *Discount Store News* vol 11, no. 38
- Tetteh E. & Burn J. (2001) Global Strategies for SME-business: Applying the SMALL Framework *Logistics Information Management* vol 14, no. ½, pp 171 – 180
- Turban E., Lee J., King D. & Chung H. (2000) *Electronic Commerce: A Managerial Perspective* Prentice Hall
- Venkatash V. & Morris M.G. (2000) Why Don't Men Ever Stop to Ask for Directions? Gender, Social Influence and their Role in Technology Acceptance and Usage Behavior *MIS Quarterly* vol 24, no. 1
- Vescovi T. (2000) Internet Communication: The Italian SME Case *Corporate Communications: An International Journal* vol 5, no. 2, pp 107 - 112
- Walker E.W. (1975) Investment and Capital Structure Decision Making in Small Business in Walker E.W. (ed) *The Dynamic Small Firm: Selected Readings* Austin Press, Texas
- Welsh J.A. & White J.F. (1981) A Small Business is not a little Big Business *Harvard Business Review* Jul.
- Westhead P. & Storey D.J. (1996) Management Training and Small Firm Performance: Why is the Link so Weak? *International Small Business Journal* vol 14, no. 4, pp 13 – 24

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