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ABSTRACT

Predictions that SMEs would be the primary beneficiaries of e-business have not materialized. One of the main reasons is the failure to understand the value of e-business in the SME environment. Researchers have argued that a classification of the myriad of possible e-business applications is a necessary first step in understanding this value. Some classifications exist, but few are based on established conceptual frameworks, are not comprehensive and do not permit useful comparisons. We propose a classification scheme based on the value chain model, consisting of 102 applications within nine categories. We apply the model to assess the current state of e-business among SMEs. The classification scheme and knowledge of the current state of e-business is expected to be of use to researchers, to SMEs and service providers and government agencies on whom SMEs are dependent, given limited internal resources.

Keywords

E-business applications, typology, classification, SME, value chain

INTRODUCTION

The commercialization of the Internet in the mid-1990s led to predictions that this new technology would be of immense value to Small and Medium-sized Enterprises (SMEs) and help them 'level the playing field' against their larger counterparts. However, e-business adoption by SMEs has been limited (Thong 1999; Zank and Vokurka 2003; Grandon and Pearson 2004). Reasons offered include a lack of financial and human resources and a failure to understand the value of e-business (Barnes et al. 2003; Vlosky and Smith 2003). This paper begins to address the problem of not understanding the value of e-business. At a fundamental level, this may be because SMEs are not aware of the types of applications possible. Indeed, Lockett and Brown (2001) argue that classification of e-business is a pre-requisite to understanding e-business engagement. However, few classifications of e-business applications exist that can help SMEs identify and match applications with their strategic goals. Some classifications are very broad. For instance, applications are classified as B2B vs. B2C (Phan 2003), in-house vs. upstream vs. downstream (Elia et al. 2004) or based on level of complexity (Lockett and Brown 2001; Lefebvre et al. 2004; Beck et al. 2005). Other, more specific classifications tend to focus on a subset of an organization's activities, such as those externally focused (Tagliavini et al. 2001). The purpose of our paper is to develop a classification based on the value chain model (Porter and Millar 1985; Porter 2001) and use this classification to assess the current state of e-business among SMEs.

LITERATURE REVIEW

In this section we review recent literature on classifying e-business applications and the state of e-business among SMEs.

Classification Schemes

Some efforts have been made in recent years to classify EC applications. Tagliavini, et. al (2001) identify five categories of applications based on previous work. These include public relations, company promotion, pre and post sales support, order processing and payment management. Lockett and Brown's (2001) classification includes communication, marketing, productivity, e-commerce, collaboration, enterprise, collaborative enterprise marketplace and collaborative platform. Elia et. al (2004) use a business process view of the organization and identified 36 applications and classified them into five categories: product development, engineering and design, procurement/purchasing, production/operations, sales marketing,

and after-sales service, and distribution and logistics. In another paper (Lefebvre et al. 2004), they classified the same 36 applications into four categories based on stages of adoption – information search and content creation, electronic transactions, complex electronic transactions and electronic collaboration. Beck et. al. (2005) identify seven categories of applications based on increasing complexity of integration – online advertising, online sales, after sales customer service, online procurement, EDI with suppliers, EDI with customers, and internet-based supply chain management. These classifications have several shortcomings. Most significantly, they are not comprehensive, in that they do not capture all of the physical activities that an organization may be engaged in, that may be supported by e-business applications. For instance, none of these classifications include HR applications such as online job application and web-based training. In addition, they are not based on any established conceptual models.

Porter (2001) identifies 33 e-business applications categorized into 9 categories of the value chain model. Hooft et. al (2001) suggest additional categories of applications that overlay the value chain model (e.g., e-procurement, e-service) but offer no empirical support. Magal, et. al, (2001) used a modified value chain framework and classify 20 applications into 10 categories (they added public relations as a separate category). However, their list of applications is limited and their data is limited to applications that are publicly visible from the firm's website.

State of e-business among SMEs

Some studies have attempted to identify the state of e-business application among SMEs. Of the most recent studies Elia et. al (2004) identified four clusters of firms based on the extent of e-business adoption – limited focus, supplier focus, customer focus and supplier and customer focus. Forty two of 96 firms placed into the limited focus group, 16 in the supplier focus group, 32 in the customer focus group and six in the last group. For all four groups, the overwhelming emphasis is on externally focused applications, likely due to pressures from business partners. Beck, et. al. (2005) found that, among US firms, e-business activities are focused on online procurement (76% of firms) and online advertising (72%), while online sales (26%) and internet-based supply chain management (34%) are supported in the least number of firms.

It is difficult to make sense of these findings because the classifications used were either not comprehensive or not systematically derived from any conceptual model. This can potentially lead to overlapping or missing applications, further supporting the need for a comprehensive classification framework.

Understanding the current state of e-business among SMEs is important for two reasons. First, this 7provides SMEs with a benchmark that can be used to assess their position relative to their peers, competitors, etc. The second reason is to help service providers. Brown and Lockett (2004) argue that much of the research on SMEs is concerned with the user perspective and ignores the provider perspective, and that this is partly the cause of the limited application of e-business among SMEs. The quality of the services of these providers (ISPs, consultants, etc.) and interventions by government agencies is important to e-business adoption by SMEs (Pflughoeft et al. 2003; Scupola 2003). Arguable, SMEs are largely dependent on service providers and agencies given the limited internal expertise available.

Our classification is based on the value chain model (Porter 2001). We retained the nine categories consisting of five primary and four support functions in Porter's model. Porter provided a sampling of 33 applications in these nine categories and Magal et. al (2001) identified 20 applications while using the same model. Our model includes one hundred two applications that were identified from these and other previous studies and supplemented by observations from websites of SMEs. This model is presented in Figure 1.

DATA COLLECTION

A questionnaire was developed as part of a larger effort to study the implementation of e-business technologies among small, family-owned businesses. Respondents were asked to indicate whether or not they had implemented the 102 applications in our proposed model. Within the U.S., family owned firms account for between 80 and 95 percent of all incorporated businesses (Poza 2004; SBA 2004), making family-owned SMEs the most common form of business organization in the U.S. (Daily and Dollinger 1991). Consequently, a sample of small family-owned businesses is considered representative of SMEs at large. The questionnaire was mailed to 9,365 CEOs (or owners) of family owned businesses in the United States with number of employees less than 500. For research purposes, U.S. Small Business Administration (SBA) has traditionally defined small businesses as less than 500 employees (SBA 2004a). Four hundred and thirty nine responses were returned for a response rate of 4.7%. The low response rate appears to be typical in studies of SMEs. Pflughoeft et al. (2003) had a response rate of 3.35%. Other researchers have experienced similar response rates (Thong 1999; Pavlou 2003; Grandon and Pearson 2004).

Firm Infrastructure

Mission statement / goals / vision statement		Information on key personnel	
Maps / directions	Location of offices	Company history	
Organizational chart	Ethics statements	Corporate news	Press releases
Financial statements	Investor news	Investor publications	Stock prices
Shareholder services (e.g., buy stock online)		Local news and information (weather, events, etc.)	
Information about sponsorship of community programs (educational, charity, etc.)			
Terms of use	Privacy policy	Disclaimers	Returns policies

Human Resources Management

Job description	Application forms	Employment policies information
Career information	Application submission	Benefits information
Handbooks and manuals	Training documents	Training software
Training videos	Professional development	
Employee directory	Downloadable documents	Document management

Technology development

Collect customer preference information   Collect demographic data
Access tracking
Competitor information (products, pricing, promotion)   Environment scanning (industry publications, online information)

Procurement

Research new suppliers	Access supplier stock lists	Access supplier pricing
Utilize intelligent agents	Conduct online bidding	
Order transmission	Payment processing	Order confirmation

Inbound Logistics	Operations	Outbound Logistics	Marketing and Sales	After-sales Service
• Downloadable documents • Document management • Delivery planning and scheduling • Receive product or service via Web • Receive product or service via FTP • Receive product or service via e-mail • Order status tracking • Shipment Tracking	• Production / service planning • Workforce scheduling • Forecasting • Production / service scheduling • Inventory management • Quality assurance	• Product / service customization • Order receipt • Order processing • Payment processing • Order confirmation • Delivery planning and scheduling • Receive product or service via Web • Receive product or service via ftp • Receive product or service via e-mail • Order status tracking • Shipment tracking	• Product description • Inventory/availability information • Pricing information • Product usage information • New product announcement • Process description • Store / branch locator • Auto responders • Customer inquiries • Advertising on other sites (banners, etc.) • Links to store / branch websites • Paid listing on search engine • Infobots (interactive intelligent agents) • Frequent buyer program • Preferred customer program • Newsletters • Online members-only club • Discussion forum for customers • Freebees: gifts, games, recipes, e-mail accounts, web space, etc. • Information about sponsorship of promotional events • Links to other sites (web-based resources)	• Marketing and promotion tips (e.g., displays) • Business management tips • Technical product information • Training • FAQs and support documents • Chat with customer service • Customer feedback form • Auto responders • Virtual helpdesk (auto route questions to the right person and track progress)

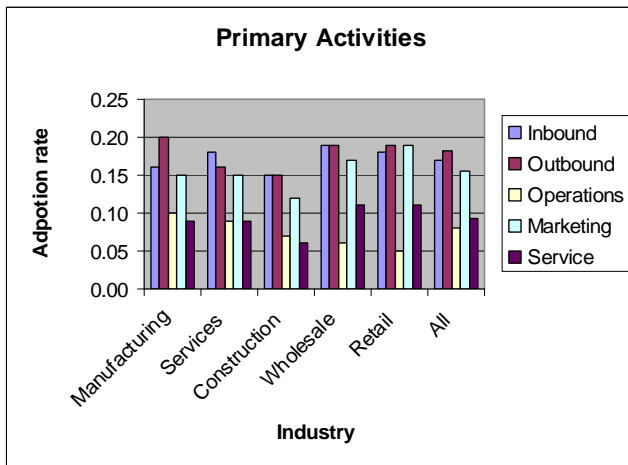**Figure 1. Classification of e-business applications**
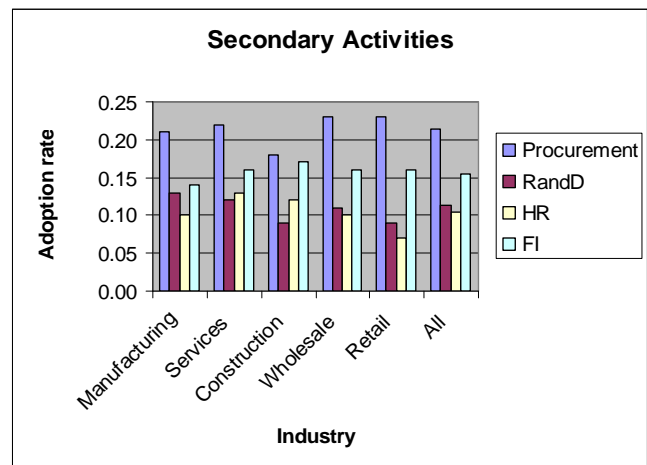
Figure 2a. Primary Activities
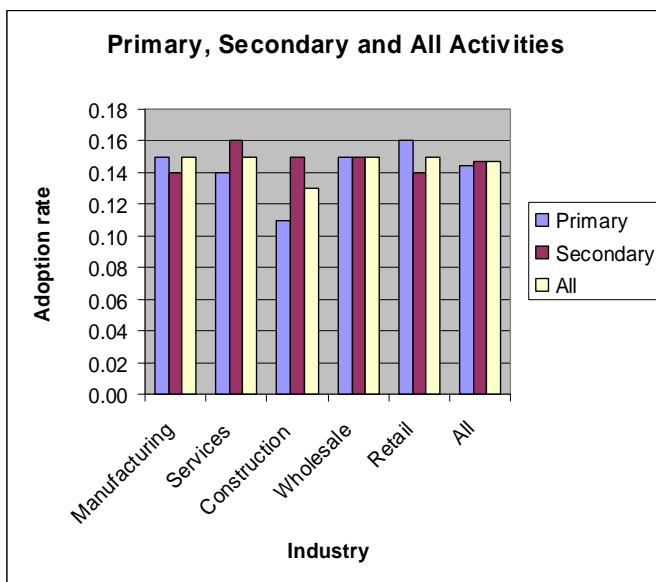

Figure 2b. Secondary Activities

Figure 2c. All Activities

	Manufacturing	Services	Construction	Wholesale	Retail
N	127	68	49	57	56
Inbound	16%	18%	15%	19%	18%
Outbound	20%	16%	15%	19%	19%
Operations	10%	9%	7%	6%	5%
Marketing	15%	15%	12%	17%	19%
Service	9%	9%	6%	11%	11%
Procurement	21%	22%	18%	23%	23%
RandD	13%	12%	9%	11%	9%
HR	10%	13%	12%	10%	7%
FI	14%	16%	17%	16%	16%
Primary	15%	14%	11%	15%	16%
Secondary	14%	16%	15%	15%	14%
All	15%	15%	13%	15%	15%

Table 1. Results

RESULTS

The results are summarized in Figures 2 a-c and Table 1. We offer the following preliminary observations. The overall adoption rate is 15%. That is, on average, only 15% of the potential applications are implemented by SME, confirming the perception that e-business is still at a nascent stage in SMEs. The most common applications support procurement activities (21%). The next group of applications supports outbound logistics (18%), inbound logistics (17%), marketing (16%) and firm infrastructure (15%). Operations and service were the least supported function at 9% and 8%, respectively.

While, the adoption rates for both primary and support activities are the same (15%), an analysis of applications by industry offers some interesting differences. Applications focused on primary activities are used more than those supporting secondary activities in manufacturing and retail; while applications focused on support activities are used more in the services and construction industries. Among primary activities, both inbound and outbound activities have the highest adoption rates across all industries, followed by marketing. Among secondary activities, procurement has the highest adoption rate,

followed by firm infrastructure. Operations and R&D had the greatest disparity in adoption across industries. Applications to support operations are used the most in manufacturing (10%) and least (5%) in retail; applications to support R&D are used the most in manufacturing (13%) and least in construction and retail (9%).

In the manufacturing and services industries, procurement, inbound and outbound logistics have the highest e-business adoption rates (> 15%), while service has the least (<10%). In the wholesale and retail industries, procurement, inbound and outbound logistics, marketing and firm infrastructure have the highest e-business adoption rates (> 15%), while operations has the least (<10%) in wholesale and operations, R&D and HR have the least (<10%) in retail. In the construction industry, procurement and firm infrastructure see the highest adoption rates (>15%) while operations, services and R&D see the lowest (<10%).

DISCUSSION AND CONCLUSION

These preliminary results confirm that e-business adoption among SMES is limited. However, there is evidence that e-business is not limited to one area within an organization, but supports functions across the organization. While the overall extent of adoption are the same across the industries (with the exception of construction, where it is lower), there are differences in how and where e-business is used. Manufacturing and services tend to have lower breadth (number of function supported) and depth (extent of adoption in a function) than wholesale and retail. The categories with the highest adoption rates are supplier focused (procurement and inbound logistics) and customer focused (outbound logistics). Our results support the findings of prior studies that show an external focus of e-business applications (Elia et al. 2004; Beck et al. 2005). Logistics (inbound and outbound) are more amenable to e-business than areas such as operations given that logistics has a large communication component, which is a strength of the technologies underlying e-business applications. Further, there may be pressures from trading partners, who are likely to be larger firms. Finally, external support from service providers in the form of portals and electronic marketplaces to facilitate procurement activities and may be a factor in the high adoption of procurement applications.

The purpose of our paper is to develop a classification based on the value chain model and use this classification to assess the current state of e-business among SMEs. The results have theoretical and practical significance. For research, a good classification is a pre-requisite to "appreciate e-business engagement." (Lockett and Brown 2001, p. 657). Our classification, grounded in an established conceptual framework, is a modest first step that may be useful to assess and compare the state of e-business in different settings. Using a common classification will permit comparisons of different data across different studies. For practice, the current state of e-business identified in this study provides a valuable benchmark for SMEs and can be a starting point for service providers and government agencies in formulating their strategy regarding support for SMEs.

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