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Abstract

This paper proposes a framework for the engagement of SMEs in e-business, which includes a classification for SMEs, e-business application complexity and online aggregations together with taxonomies of offline aggregations and e-business engagement.

Keywords: E-Business, e-commerce, SME, business model

Introduction

It has long been recognised that SMEs form an integral component of any economy – for example in the UK they generate nearly 60% of enterprise turnover. However, in both government and industry there is growing anxiety that with the ever-increasing complexity of e-business SMEs are proving slow to engage, beyond elementary e-mail and web hosting services. This is the core concern of the paper. In 1998 the UK government set three targets for SMEs by the year 2002. Firstly, 1.5 million (40%) of SMEs would be connected, secondly 1.0 million (27%) of SMEs would be trading online, and thirdly the performance of small businesses in the UK would be up with the best in the world. Against these targets a recent UK Department of Trade and Industry (DTI) study concluded: 1) that 1.7 million (46%) were connected (Oct 2000), 2) that with 27% trading online the UK is ahead of all other benchmarked countries, and 3) good progress had been made on performance (DTI 2000a). On this basis progress seems admirable. However, on closer inspection, this and other studies highlight minimal engagement by SMEs in higher complexity e-business applications such as supply chain management (SCM) or customer relationship management (CRM). Overall the superficial reporting of high levels of connectivity by SMEs in many countries does little to encourage critical analysis of this lack of engagement in higher complexity e-business applications.

One recent development that is potentially relevant to meeting this challenge is the growth in Application Service Providers (ASPs), who provide hosted e-business applications. However, to-date there is little evidence of significant uptake by SMEs (Lee 2001). Access for SMEs therefore appears problematic – on their own they are simply too small to be served cost effectively by ASPs and many lack the knowledge or resources to act independently. In order to establish a framework for investigating the concern that SMEs are being bypassed by the e-business revolution this paper considers the current levels of SME engagement with reference to application complexity. The paper is divided into five main parts: the first section summaries definitions for SMEs, the second proposes a scale of e-business application complexity against which SME engagement can be compared, the third is a review of the current data on SMEs and e-business engagement, the fourth an exploration into aggregation and the role intermediaries, and finally proposes a framework for investigation.

Definitions

Defining SMEs can be problematic. For the purpose of statistical analysis there are at least five major conventions and an understanding of these is a perquisite for interpreting current trends and for reporting on the research area. The UK DTI defines three categories of SMEs in turns of employment (DTI 2001a): 1) Micro: 0-9 employees; 2) Small: 0-49 employees (includes micro); 3) Medium: 50-249 employees. Oftel, the Office for Telecommunication in the UK, conducts regular surveys on SMEs and defines two categories based on employment and turnover (t/o) (Oftel 2001a): 1) Small: 1 to 50 employees; t/o more than £50K; 2) Medium 51-500 employees. The European Commission defines three categories of SMEs in terms of turnover (t/o);

balance sheet (b/s); employment; and ownership [maximum % owned by other enterprise(s)] (EC 2001): 1) Micro - maximum: 9 employees; 2) Small - maximum: t/o 7M; b/s 5M; 49 employees; ownership 25%; 3) Medium - maximum: t/o 40M; b/s 27M; 249 employees ownership 25%. The US Small Business Administration (SBA 2000), has no categorisation beyond that of small business however this is dependent on industrial sector. A simplified US definition for small business is less than 500 employees for most manufacturing and mining industries, less than $5.0M receipts for most non-manufacturing industries and affiliate ownership of 50% (SBA 2000). In practice small businesses with less than 100 employees are often reported separately. Finally, the Canadian Federation of Independent Business (CFIB) defines five categories of SMEs for member surveys (CFIB 2001): 1) 0 to 4 employees; 2) 5 to 19 employees; 3) 20 to 49 employees; 4) 50 to 99 employees; 5) 100 to 499 employees.

In order that data from various sources can be compared the following working definition is proposed: *An SME is any business which employs less than 500 people and comprises five categories, namely: 1) Micro - Sole (M-S): 0 employees, 2) Micro - Employer (M-E): 1 to 9 employees, 3) Small (SML): 10 to 49 employees, 4) Medium (MED): 50 to 249 employees, 5) Large - Mini (L-M): 250 to 499 employees*. Table 1 shows the main existing conventions for SMEs, together with the proposed new classification.

Table 1. Comparison of SME Categorisations and Proposed Classification (Source: authors)

Number of Employees	Proposed Classification	DTI	OFTEL	EC	SBA	CFIB
0	M-S	Micro		Micro	Small	1, 2, 3
1 to 9	M-E	Micro	Small	Micro	Small	1, 2, 3
10 to 49	SML	Small (Includes Micro)	Small	Small	Small	1, 2, 3
50 to 249	MED	Medium	Medium	Medium	Small	4, 5
250 to 499	L-M		Medium	Medium	Small	4, 5

Because SMEs represent 99.9% of the number of UK businesses – analysis of employment and turnover can provides a more meaningful focus for market value or opportunity, Table 2. With SMEs in the UK providing over 60% of the employment and generating 59% of the turnover they are significant and command attention (DTI 2000a). Importantly the proposed classification of SMEs will support the tracking of e-business engagement from a variety of published sources. The latter being of particular interest to service providers looking to address the market opportunities presented by SMEs in general.

Table 2. SME Market Value by Category UK 1999 (DTI 2000a)

Number of Employees		Proposed Classification	Number of Businesses (000s)		Employment (000s)		Turnover (£M)	
0	SME	M-S	2,324	63.2%	2,708	12.5%	90,463	4.7%
1 to 9	SME	M-E	1,165	31.7%	3,854	17.7%	345,015	17.7%
10 to 49	SME	SML	156	4.2%	2,995	13.8%	296,956	15.3%
50 to 249	SME	MED	24	0.7%	2,491	11.5%	258,131	13.3%
250 to 499	SME	L-M	3	0.1%	1,121	5.2%	149,275	7.7%

E-Business Application Complexity

E-Commerce is transaction focused and defined as the selling or buying of goods or services using Internet-based technologies. E-Business is transaction, process and collaboration focused and is defined as the use of Internet-based technologies to integrate processes, enable transactions and support collaboration in business markets. Thus e-business incorporates e-commerce. But in order to appreciate e-business engagement we need to classify e-business applications, as there are significant differences between e-mail and e-marketplace applications both in terms of complexity and added value. The International Data Corporation uses application complexity to segment the ASP market (Gillian et al. 1999) and forms a basis for a second proposed classification, Table 3. Importantly the proposed classification stresses the role of collaboration as a key feature of e-business and recognises the resultant increase in complexity.

Table 3. Proposed Classification of E-Business Application Complexity (Source: authors)

Proposed Classification		Examples	Complexity
Communication	COM	E-Mail, Web Access	Very Low
Marketing	MAR	Web site	Low
Productivity	PRO	MS Office, Intranet	Low
E-Commerce	E-C	Buying & Selling On-line	Medium
Collaboration	COL	Extranet	Medium
Enterprise	ENT	Financials, SFA, Vertical Applications	High
Collaborative Enterprise	C-E	SCM, CRM	High
Marketplace	M-P	E-Marketplaces	Very High
Collaborative Platform	C-P	Emerging Platforms*	Very High

*Collaborative E-Business Platform (Intisoft 2001); Community Trust Platform (Lockett & Brown 2000); Community Platform (OTEX 2001); E-Business Platform (SAP 2001); Exchange Platform (Oracle 2001).

In the next section we will consider SMEs in relation to the higher complexity e-business applications that are currently being used by large enterprises throughout the world. For example: Ariba's B2B Commerce Platform, which includes extended e-marketplace functionality, cites over 200 customers including American Express, BMW, Dell and Kraft Foods (Ariba 2001); Covisint, the B2B car industry exchange, which includes General Motors, Daimler-Chrysler, Ford, Renault and Nissan has recently launched a collaborate design platform (Veitech 2001); i2 Technologies site over 30 automotive and industrial customers including Volvo Trucks using a production planning application (i2 2001); SAP details over 20 cases studies, alone, for the mySAP supply chain management (SCM) applications including Hewlett-Packard, Unilever and Colgate Palmolive (SAP 2001); Siebel Systems detail over 100 case studies including customer relationship management (CRM) implementations for Compaq, Pitney Bowes and Thomas Cook (Siebel 2001). Clearly the adoption of higher complexity applications is a reality for many large enterprises. The provision of these e-business applications to SMEs is increasing via ASPs, such as Corio (Corio 2001) and USinternetworking (USI 2001). In the next section we will consider SMEs in relation to these higher complexity e-business application engagement by analysing multiple data sources.

Current Engagement of SMEs in E-Business

It is possible to gain significant insights into the current position regarding SME engagement in e-business from various local and international studies. In the UK 49% of SMEs are connected to the Internet (end 2000) – a rise of 5% in 6 months. This ranges from less than 48% for M-E & SML to more than 90% for MED & L-M (Oftel 2000a). For categories MED & L-M 20% are buying and 19% selling online (Oftel 2000b). A qualitative survey into the Internet and SMEs concludes that there was poor understanding of its strategic importance with the main motivation for Internet access being e-mail, which was considered essential (Oftel 2000c).

Two recent surveys of SMEs with less than 100 employees in the US show 61% (SBA 2000) and 70% (Dun & Bradstreet 2001) had Internet access (end 1999) and with 43% buying and 26% selling online. In total 85% of US SMEs expected to conduct business via the Internet by the end of 2002 (SBA 2000).

In Canada SMEs are increasingly using the Internet with 69% connected (mid 2000) – a rise of 8% in 12 months. This ranges from less than 60% for M-S to more than 95% for MED & L-M (CFIB 1999 & 2000). Nearly all businesses that are online use e-mail with low and medium complexity applications rapidly gaining acceptance. For categories MED & L-M 28% are buying and 19% selling online. It is the firms that are transacting with other businesses (B2B) that are more likely to engage in Internet technologies. The main barriers to engagement are lack of benefits, low use by customers, security and lack of knowledge of strategy or technology. In conclusion Canadian SMEs are using the Internet in large numbers, with larger ones leading the way, however this is not extended into higher complexity applications. A detailed qualitative study in Western Canada concludes that SMEs are still in a state of transition with barriers including: being overwhelmed by information, lack of confidence, security and resources (capital and staff) that results in a 'wait and see' approach to e-business engagement by many SMEs (WED 2000). The report recommends that the regional governments provide information to SMEs via a dedicated portal and actively promote e-business engagement.

An international study of businesses was commissioned by the DTI to investigate the use of Internet applications for Canada, France, Germany, Italy, Japan, Sweden, UK and US. The connectivity levels for Canada, Sweden, UK, and US are 90% or more

with UK businesses having high levels of adoption of low complexity applications such as, e-mail (88%) and Internet access (90%) though less for Intranet use (51%). However comparison with Canada, Sweden and US, which have slightly higher levels of connectivity, indicates lower adoption rates by SMEs generally and by UK SMEs of medium complexity collaborative applications, such as Extranets, in particular, Table 4. Where an Intranet uses Internet technologies with an LAN and an Extranet allows external access to an Intranet. More detailed consideration of engagement by UK SMEs highlights the significant reduction in engagement as application complexity increases, table 5.

Table 4. Analysis of Application Usage by SME Category (DTI 2000a)

Category	Intranet (low complexity)				Extranet (medium complexity)			
	UK	Canada	Sweden	US	UK	Canada	Sweden	US
MS & ME	19%	29%	23%	23%	5%	7%	10%	7%
SML	32%	51%	50%	43%	9%	16%	18%	16%
MED	44%	65%	58%	49%	11%	18%	17%	10%

Table 5. E-Business Engagement by Application Complexity and UK SME Category (Source: various cited studies)

Category	Very Low	Low	Medium E-Commerce	Medium Collaborative	High	Very High
	(COM)	(MAR, PRO)	(E-C)	(COL)		
MS & ME	61%	38%	22%	5%	No evidence of engagement	
SML	78%	54%	22%	9%		
MED	93%	65%	26%	11%		

Clearly the engagement of SMEs in higher complexity e-business applications remains problematic with all the available data indicating significant reduction in engagement as application complexity increases. In short, most SMEs are comfortable with email and web access, are tentative with the use of the Internet for online buying and selling, but have virtually no involvement with the high or very high complexity applications. The five proposed categories of SMEs will support the tracking of e-business engagement but does not expose the high heterogeneity of SMEs. Even within a single category SMEs are not necessarily a homogenous grouping, but rather a complex mixture of businesses which if considered in totality could be misleading. Dimensions of industry, location, size (both turnover and employment), stage of development, trading arrangements, ownership structure, organisation, culture, and degree of interaction help to support meaningful analysis. When considering the uptake of higher complexity applications by SMEs the one to many relationships that a large enterprise will have with its supply chain, service providers etc is inappropriate. Therefore, for both economic and competency reasons, some form of aggregation is needed for SMEs. In the next section we explore the phenomenon of aggregation and its impact upon SME e-business engagement.

Aggregation

The need to encourage SMEs engagement of in e-business is recognised by the previously cited studies with some recommending SME-specific portals as a means of achieving this objective. Existing UK government SME-specific portals include general advice such as the Small Business Service, formed April 2000 (SBS 2001) and the UK Online for Business (DTI2001b). The latter states that it "exists to help UK small businesses exploit the business benefits of ICT - a major driver of competitiveness". Proposed SME-specific portals can be regional (WED 2000) or industry (MAFF 2000) focused with the latter recommending the development of a rural portal and farming specific e-business applications provided by ASPs.

Many authors in the area of Internet business models have recognised the importance of online aggregation through new intermediaries, including:

– E-Portal for B2C, "any intermediary or middleman offering an aggregated set of services for a specific well-defined group of users." (Kalakota & Robinson 2000)
– E-Market Maker for B2B, "an online intermediary that connects disparate buyers and sellers within a common vertical industry." (Kalakota & Robinson 2000)
– Aggregation Types, "intermediate between producers and customers" – superaggregations, e-sources, e-brokers, integrator b-webs, industry hubs, consumer portals (Tapscott et al. 2000)

- Technology and Enterprise Intermediaries, "the role of the technology intermediary is to provide the ICT platform on which services can be provided" by "the enterprise intermediary, including: applications, hosting and consultancy." (Brown and Lockett 2001)
- Value-Adding Intermediaries, "Internet business is driven by relationships, collaboration, and community – and fuelled by intermediaries that add value to the customer and supplier by combining all these." (Earle & Keen 2000)
- Intermediary Roles, "four roles for intermediaries: aggregation, pricing, search, trust." (Bailey 1998)

Commercial organisations are attempting to aggregate by SME-specific portals including: in the US – AllBusiness (NBCi 2001), bCentral (Microsoft 2001), NetBusiness (Netscape 2001), Yahoo Small Business (Yahoo 2001); in Canada – BellZinc (Bell 2001); in the UK – BT Click for Business (BT 2001), ClearlyBusiness (Freeserve 2001), Work24 (RBS 2001); in Switzerland – Plenaxx (Plenaxx 2001); in Europe – BusinessEurope (BusinessEurope 2001). These intermediaries represent a deliberate attempt to aggregate in order to engage SMEs in e-business. All offer low complexity applications with some giving access to higher complexity applications via partnerships, such as bCentral with VerticalNet (Microsoft 2001) and AllBusiness with BigVine (NBCi 2001). It is also possible for SMEs to access high complexity applications like B2B e-marketplaces through vertical industry-specific aggregators epitomised by VerticalNet with 58 marketplaces (VerticalNet 2001a) and BizProLink with 135 marketplaces (BizProLink 2001), directly to e-marketplaces us as the Achilles utility marketplace (Achilles 2001) and the Covisint exchange (Covisint 2001) or through SME-specific marketplaces such as Oniva (Oniva 2001), PointSpeed (PointSpeed 2001). For industries where SMEs form a significant part, like the construction, aggregators such as BuildOnline need to insure the engagement of SMEs in order to develop a trading community (BuildOnline 2001). There is clearly a significant amount of investment by these aggregators however it is not possible to determine the level of SME engagement.

For the purpose of this paper a new simplified classification of online aggregators is proposed:

- *Structural Aggregators*: *Horizontal* (financials, e-commerce): AllBusiness, ClearlyBusiness, Work24 and *Vertical* (e-marketplaces, vertical applications): Ariba, Oniva, VerticalNet Solutions.
- *Contextual Aggregators*: who address aggregations based on their membership profile (industry specific trading communities): Achilles, BuildOnline, Covisint, VerticalNet Exchanges.

Interestingly some contextual aggregators offer structural services, including VerticalNet who in addition to hosting 58 marketplaces with products, news and editorial, launched, in September 2000, a Solutions division offering e-marketplace applications, (VerticalNet 2001b). In addition CEO Mike Hagan claims "VerticalNet's business model is unique because we are the only B2B company building supplier onramps connecting small and medium-sized businesses (SMEs) to public and private marketplaces."

Whilst online aggregation, at SME or industry level, is seen as one way of engaging the SMEs, consideration needs to be given to existing offline aggregations or groupings. SMEs operate in business markets comprising relationships within their supply chain or industry sector, which can range from simple to complex in nature. The degree of structure (informal to formal) and degree of integration (independent to integrated) provides a taxonomy of offline aggregations relevant to SMEs, which comprise four types, Figure 1.

- **Limited**: any relationships are loose and participants are independent, characterised by local business groups or forums.
- **Association**: including trade associations, guilds, professional and registering bodies, where reputation is enhanced by membership but businesses remain largely independent.
- **Cluster**: forming part of an identifiable business market, business cluster (DTI 2001c) or economic cluster (Porter 1998) where SMEs are increasingly dependent on complex linkages within a sector. A recent study in the UK highlighted 154 business clusters classifying them by stage of development, cluster depth, employment dynamics and significance (DTI 2001c).
- **Network**: represents a highly developed form of cooperation, often described from a large business perspective and comprises business networks (Ford et al. 1998 and DTI 1999), strategic alliances (Child & Faulkner 1998), and strategic networks (Jarillo 1993). The formation of SME networks and the activity of networking by SMEs are important structures and processes
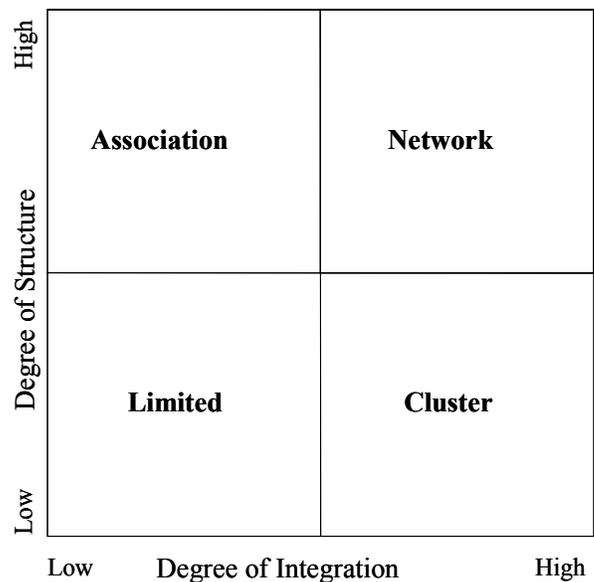

**Figure 1. Taxonomy of SME Offline Aggregations (Source: authors)**

for business creation, development and growth (Shaw and Conway 2000). SME networks are a function of membership, linkages, transactions, function, stage and location.

It is self-evident that both online and offline aggregations are underpinned by the interaction between participants and in the next section the final component in the proposed framework is explored.

Interaction

Business markets, of which SMEs are an integral part, recognises the interdependence of companies and the importance of interaction in support of business relationships. It is predicted that the role of internet enabled inter-organisations systems (I-OS) will become essential for most SMEs both in order to access business networks and for marketing (Brock 2000). Interaction emerges as a critical dimension for investigating the engagement of SMEs in e-business, due to its dual role in relationships and ICT. The degree of interaction (low to high) and level of application complexity (low to high) provides a taxonomy for SME e-business engagement, which comprise four types, Figure 2.

– **Trade**: e-commerce and e-transactions focus
– **Communicate**: connectivity and external communication focus
– **Transform**: enterprise and e-process focus
– **Collaborate**: collaborative and e-business focus

Figure 2. Taxonomy of SME E-Business Engagement (Source: authors)
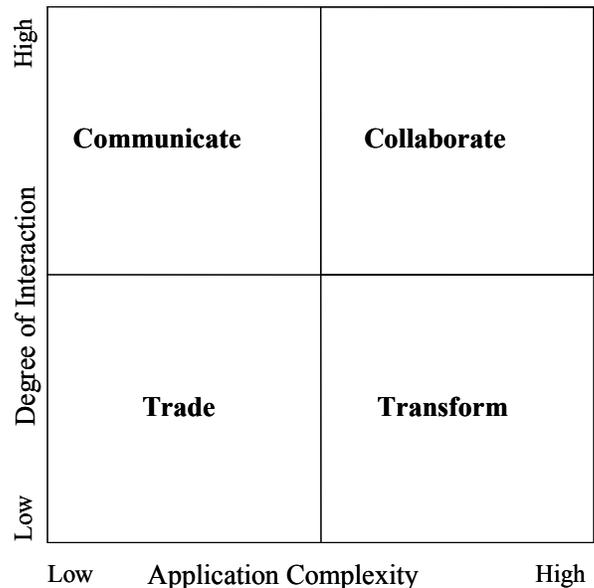
Conclusion

As governments continue to focus attention of connectivity and engagement in lower complexity application a more critical analysis is of SMEs e-business engagement is required. Clearly this paper highlight the need for such analysis and proposes two SME focused taxonomies together with both a classification of the emerging online aggregations and a value driven SME categorisation as a framework for investigating the engagement of SMEs in e-business. Areas for future research include identifying the roles of intermediaries and the rapidly evolving ASP sector in facilitating this e-business engagement. Careful consideration will need to be given to both the provider and SME perspectives.

Acknowledgements

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