



Potential of critical e-applications for engaging SMEs in e-business: a provider perspective

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Abstract

Against a background of the low engagement of small and medium-sized enterprises (SMEs) in e-business, this paper investigates the emergence of, and potential for, critical e-applications defined as 'an e-business application, promoted by a trusted third party, which engages a significant number of SMEs by addressing an important shared business concern within an aggregation.' By a review of secondary data and empirical investigation with service providers and other intermediaries, the research shows that such applications can facilitate the engagement of SME aggregations. There are three key findings, namely: the emergence of aggregation-specific e-business applications; the emergence of collaboratively based 'one to many' business models; and the importance of trusted third parties in the adoption of higher-level complexity e-business applications by SMEs. Significantly, this work takes a deliberately provider perspective and complements the already considerable literature on SME IT adoption from a user and network perspective. In terms of future research, the importance of a better conceptual understanding of the impact of complexity on the adoption of information technologies by SMEs is highlighted.

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Introduction

The purpose of this paper is to report some recent research that seeks to deepen our understanding of the engagement of small and medium-sized enterprises (SMEs) in e-business from a provider perspective and to do so in a way that informs both theory and practice. As is argued below that in both these areas there are shortcomings and difficulties. In the case of theory, the adoption of information technology (IT) into SMEs is largely concerned with a user perspective, with only limited recognition of the provider view. And in the case of practice the issue is the relative, and unexpected, *non-engagement* of SMEs in e-business. Clearly, both these areas are linked – the latter serving to highlight the limitations of the former.

The presentation and interpretation of this research is structured into four main parts. In the first part, the current engagement by SMEs in e-business is reviewed and some of the problems are highlighted, particularly the neglected importance of application complexity. Because of the economic significance of the SME sector, this review of e-business engagement is done within the context of government expectations. The second part positions the research theoretically. In addition to the central concern of IT diffusion within SMEs, the research framework explicitly considers the theories of networks and aggregation since both of these

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provide a possible underpinning mechanism for the facilitation of e-business engagement by SMEs. Part three details the methodology and in particular the empirical design including the limitations. Finally, part four presents the research outcomes and the interpretation of these together with some implications for ongoing research.

SMEs and e-business engagement

E-business as a concept has matured and can be defined as 'the use of inter-organisational electronic networks to transact, process, and collaborate in business markets' – it incorporates e-commerce. Defining SMEs, however, can be problematic because of the many different international conventions. This paper adopts the European Union (EU) and UK convention, which defines an SME as 'any business, which has less than 250 employees (SBS, 2003). The economic importance of such enterprises is widely recognised. Within the EU, there are over 18 million SMEs generating 67 percent of the employment and 59 percent of the total economy (CORDIS, 2002); in the UK alone the equivalent figures are 3.7 million SMEs generating 55 percent employment and 51 percent of the economy (SBS, 2002). With such an important role in the creation of national wealth, it is not surprising that governments pay attention to those factors, such as the emerging technology of e-business, which could affect this sector's performance.

Before, the Internet commercial activity based on proprietary networks was mainly the province of larger companies for reasons of cost. However, the advent of the Internet offered relatively low-cost access to network infrastructure, and hence new channels to market, which appeared to be particularly promising for smaller enterprises (Kalakota & Whinston, 1996). This has been acknowledged by both international agencies (OECD, 1998) and national governments. For example, in the UK the Government has set three clear targets for the engagement of SMEs in e-business for the year 2002 (DTI, 2001a):

- The first was to ensure the connectivity of 1.5 million SMEs. Connectivity measures the number of businesses within the benchmarked countries (US, Canada, Japan, Germany, Australia, France, Italy and Sweden) that either have a website, make frequent use of external e-mail or use electronic data interchange (EDI). In the UK, the target has already been exceeded and totalled 1.9 million by mid-2001.
- In contrast, the second target of 1 million SMEs trading on-line looks unlikely to be met with just 540,000 trading by mid-2001. A business is defined as trading on-line if it is engaging in both ordering and paying on-line with either customers or suppliers. A recent international benchmarking study highlighted the 'stalling or in some cases declining, willingness of

businesses to trade on-line' (pp 116) and noted that this was particularly evident in small businesses and the UK (Booz Allen Hamilton, 2002).

- The third target of reaching parity with the best world practice was expressed in terms of SMEs' progress up a five-stage 'adoption ladder' with each stage representing increased complexity. The stages are: (1) e-mail, (2) website, (3) e-commerce (i.e. trading online), (4) e-business (i.e. integrated supply chain) and (5) transformed organisation (i.e. new business models based on interworking between organisations).

For this third target, because the adoption rate is believed to be so low, the Government has not tried to measure engagement in complex applications beyond e-commerce (stage 3). The other leading economies against which the UK was benchmarked exhibit similar traits, namely that with the ever-increasing complexity of e-business applications SMEs are proving slow to engage, beyond elementary e-mail and Web hosting services (DTI, 2001a). This conclusion is further supported by earlier independent research (Poon & Swatman, 1999). In the absence of any national statistics, the North West of England provides a recent and detailed confirmation of the low uptake of the more complex forms of e-business among SMEs. In Lancashire West, only 1.3 percent of firms are networked with suppliers as part of a formal e-supply chain (Davies, 2001).

This failure of SMEs to engage in the more complex e-business applications was unexpected by both academics and policy makers alike. The anticipation was that large organisation e-practices would migrate and influence the practices and behaviours of SMEs. In selected instances, such as the motor and aerospace industries, there is some emerging evidence that this is occurring but it is clearly not widespread (Booz Allen Hamilton, 2002). From a theory perspective, the issues are significant and suggest that our understanding of small firm behaviour and in particular their adoption of information and communications technology (ICT), either alone or within sector aggregations, is too limited. To date, typical and well cited research on ICT adoption by SMEs (e.g. Cragg & King, 1993; Iacovou *et al.*, 1995) is characterised by a user perspective and by a focus on the technical or organisational factors underpinning adoption, rather than the influence of application complexity on the adoption decision. In all cases, such research takes as the unit of analysis the individual enterprise, and then combines the results to draw conclusions.

The above clearly suggests that a discussion of application complexity is important in the context of engaging SMEs. A taxonomy of complexity which goes beyond the UK Government classification suggested above and which provides example applications is shown in Table 1. Using this classification, and the most recently available survey data, the authors have analysed e-business engagement by SMEs in terms of application complexity and this is shown in Figure 1.

Table 1 Classification of e-business application complexity (Lockett & Brown, 2001)

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 and Selling on-line	Medium
Collaborative	COL	Extranet	Medium
Enterprise	ENT	Financials, SFA, vertical applications	High
Marketplace	M-P	E-marketplaces	High
Collaborative enterprise	C-E	ESCM, eCRM	Very high
Collaborative platform	C-P	Emerging platforms ^a	Very high

^aCollaborative e-business platforms: e-business platform (SAP, 2002) and e-business suite (Oracle, 2003).

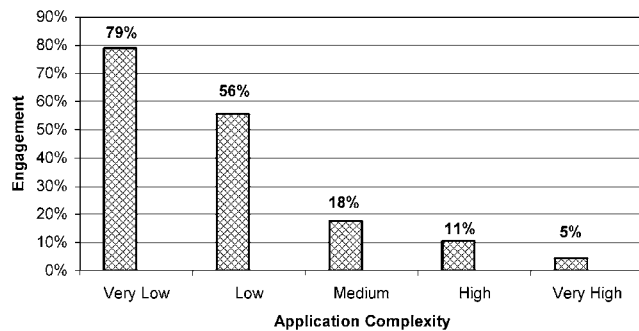


Figure 1 SMEs e-business engagement by application complexity (DTI, 2001a; Mazzi, 2001; EC, 2002).

In summary, the analysis in Figure 1 suggests that most SMEs appear comfortable with e-mail and Web access (low complexity) are tentative with the use of the Internet for on-line buying and selling (medium complexity), but have little or no engagement in the high or very high complexity applications, such as e-marketplaces, supply chains or inter-organisational collaborative networks. This is despite the early promise of Application Service Providers (ASPs) facilitating such access to complex applications. Typically, the small number of enterprises (11 percent or less) engaged in the more complex e-business applications appear to do so for two main reasons. Firstly, they form part of an existing supply chain, many of which will have had previous EDI links, such as transport-based SMEs supporting supermarket logistics. Secondly, there are those companies that are required to do so by larger companies as the latter take steps to migrate to Web-based supply networks – the automobile and defence industries are current examples. Hence, the trend in Figure 1 is not merely surprising in terms of the early expectations of engagement, but raises the important question of what this relative lack of engagement will mean not only for SMEs but also the larger organisations that have significant numbers of SMEs in their supplier networks.

In sharp contrast to SMEs is the experience of larger organisations in their adoption of e-business applications. Frequently, the e-business agenda has been provider led with large software companies (e.g. Oracle,

Peoplesoft, SAP) supplying and developing with these organisations systems such as Enterprise Resource Planning (eERP) and Customer Relationship Management (eCRM), which support core business processes including planning, production, distribution and sales. The provision of these so-called 'critical applications', most recently through Web-based technologies, has been central to the rapid adoption of e-business by large enterprises. Critical applications are so called because they purport to offer a route to 'best practice' that firms find difficult to ignore (SAP, 2002; Oracle, 2003). This is not to suggest that provider led innovation is not problematic – it can be especially when the importance of the role of the user is underestimated (Swan & Clark, 1992; Robertson *et al.*, 1996). In reality, the combination of a high level of implementation support from the provider, together with user commitment, IS experience and clarity of their own organisational processes and priorities can mitigate the implementation risk. However, such a partnership is resource rich on both parties. For the provider, this can be recovered in their pricing structures; for the user their size facilitates access to the necessary resources. Neither of these options is normally available to SMEs.

In summarising this first part of the paper, the significant issue is the clear impact of application complexity on e-business adoption by SMEs and that this factor is largely absent in current theories of adoption. A complementary insight is the contrast with larger organisations in which the role of 'critical applications' developed by providers has proved significant. It is against this background that the paper explores the potential of applications designed specifically to encourage SMEs to engage in the more complex e-business applications. In the next part the research is positioned theoretically.

Theoretical frameworks

The broad research setting for this work is the relative lack of engagement of SMEs in e-business; the focused research area is the extent to which critical applications, electronically available on an e-networked basis, can facilitate such engagement. In terms of both informing the research design and the subsequent interpretation of

the research data, three main strands of theory are relevant. The first is the adoption of ICT by SMEs. The second is the concept of aggregation and of networks as an organisational form. The latter provides the wider context within which the third strand of theory dealing with the emerging e-business models can be discussed.

IT adoption by SMEs

Studies on the adoption of e-commerce by SMEs are relatively recent, but research antecedents are well established. Rogers' work (1962, 1983, 1995) on the diffusion of innovations, while initially neither IT nor SME focused, has evolved to incorporate diffusion networks and critical mass in order to appreciate the adoption of interactive innovations, such as the Internet (Rogers, 1995, p 313). This early work of Rogers took a provider (or supplier) perspective and identified the characteristics of innovation, which would impact on its rate of diffusion including such factors as complexity, trialability, compatibility and relative advantage. Other work, however, has tried to develop a better understanding of adoption in the specific context of IT and SMEs. Three stands of work can be identified, which although overlapping can usefully be separated, namely strategic, technological and organisational. The first is that which emphasises the strategic logic in the decision to adopt (Blili & Raymond, 1993; Ballantine *et al.*, 1998). In this context, SMEs can be both victims and beneficiaries depending on their degree of proactivity. The notion of strategic information systems planning in SMEs is further developed in Levy and Powell (2000), Levy *et al.* (2001). This strand of research has resulted in frameworks, such as Levy's 'focus domination model', to help position and integrate IT investments – one of which could be e-business applications.

A second technological strand, and arguably the most prolific, has seen adoption as an outcome of a complex process of evaluation, frequently informal, by SMEs of multiple factors both external and internal. These factors are frequently cast as enablers or barriers to adoption (Lefebvre *et al.*, 1991; Cragg & King, 1993; Thong & Yap, 1995; Poon, 2000; Walczuch *et al.*, 2000; Mehrtens *et al.*, 2001; Hussin *et al.*, 2002). Iacovou *et al.* (1995) focused on the single technology of EDI and identified perceived benefits, organisational readiness (resources) and external pressures (competitive and non-competitive) as critical factors in adoption. Since EDI is a complex application (but not necessarily Internet based), these findings may be particularly relevant in the adoption of similar complex e-business applications.

The third organisational strand is that which takes an explicit organisational stance and frequently that of the owner manager and the social parameters within which the firm operates. As such the approach counters the strategic or technological emphasis of the first two strands (Dierckx & Stroeken, 1999; Fuller & Southern, 1999; Southern & Tilley, 2000). An important observation of Southern and Tilley is that: 'when small firms use IT

complex relations unfold. It is by no means a simple linear development whereby observers can expect an incremental build up of knowledge and expertise on ICT to be established within the firm' (2000, p 152). In the context of the adoption of increasingly complex e-business applications this view appears highly pertinent.

Throughout the above strands of literature three characteristics prevail, namely, (i) the unit of analysis is the single firm, (ii) the perspective adopted is that of the user and (iii) the dimension of application complexity as a key variable is absent. In their original context these characteristics are reasonable, but they are also limiting. For example, the notion that once a firm has decided to adopt an IT application that obtaining the application is non-problematic. In the case of complex applications, such as integrated e-business, this assumption may be unwise. From a provider perspective, the issue of user readiness (technical and financial) together with the on-going support and maintenance issues may signal an uneconomic contract and mitigate against initial supply. Hence, by adopting a provider perspective, and by exploring the potential of small firm aggregations, this research seeks to develop the above work.

Aggregation and networks

In the realm of firm behaviour, the emergence of network theory has been an important development alongside our understanding of markets and hierarchies (Thorelli, 1986; Powell, 1990). Although 'networks' have always existed, for example the on-going relationships within a vertical supply chain, the recognition of networks as a distinct organisational form, amenable to analysis and theoretical development is more recent (Miles & Snow, 1986; Jarillo, 1988; Axelsson & Easton, 1992; Snow *et al.*, 1992; Sydow, 1992; Grandori & Soda, 1995; Provan & Milwood, 1995). This theoretical development has advanced on many different fronts: strategy, competition and collaboration (Doz, 1996; Doz & Hamel, 1998); network structure and embeddedness (Granovetter, 1985; Shaw & Conway, 2000); trust and governance (Johannisson, 1986; Ring & Van de Ven, 1994); and classification and evaluation (Cravens *et al.*, 1996; Sydow & Windeler, 1998). Although these theoretical insights into networks have developed outside of a specific e-business context (i.e. off-line) they provide many of the antecedents for the later emerging concepts of e-business networks (i.e. on-line).

The Sydow and Windelers views on interorganisational networks (IONs), or in their specific case interfirm networks, are particularly insightful (1998, pp 266–277). They have identified three characteristics that define and distinguish this organisational form: (i) a special kind of network relationship that exhibits a degree of social embeddedness resembling intraorganisational relations; (ii) a certain degree of reflexivity arising from the property of the network to become the object of signifying, organising and legitimating action by the firms; and (iii) a logic of exchange that combines cooperative and competitive elements, autonomy and

dependence, trust and control. Of these, the second characteristic is the least obvious but is potentially very significant. Within an interfirm network ‘managers are (then) more likely to consciously consider processes in restructuring endeavours which cut across organisational boundaries’ (1998, 267).

Even within the above definition, there are many possible manifestations of the network form and many ways of classifying them. Grandori & Soda (1995) differentiate networks by the extent to which the links between organisations are formalised and networks are termed bureaucratic, social or proprietary. Aldrich & Glinow (1992) classify networks into personal and social networks and provide a basis for understanding the role of network as a broker within a set of relationships. A further classification from Cravens *et al.* (1996) links the type of network relationship (from short term, transactional to long term, collaborative) to the degree of unpredictability, and hence risk, in the environment. In the context of SMEs, a classification drawing on the above, particularly Grandori and Soda, and links the degree of structure (informal to formal) to the degree of integration (independent to integrated), is shown in Figure 2. Within the broad concept of aggregation this taxonomy locates ‘networks’ as one form of strong or complex aggregation, which can be contrasted with other weaker or simpler aggregation forms – a distinction that can be useful when considering the nature of an SME’s engagement in an aggregation and the role of any intermediaries.

- *Limited*: Any relationships are loose and participants are independent, characterised by little or no aggregation. Intermediaries range from Chambers of Commerce, or local business groups, to more sophisticated

Degree of Structure	High	Association	Network
	Low	Limited	Cluster
		Low	High
		Degree of Integration	

Figure 2 Taxonomy of aggregations for SMEs.

organisations such as the Cambridge Network (Cambridge Network, 2001).

- *Association*: Including trade associations, guilds, professional and registering bodies, where reputation is enhanced by membership and structure is high, but businesses remain largely independent.
- *Cluster*: Forming part of an identifiable business market, business cluster or economic cluster (Porter, 1998), where SMEs are increasingly dependent on complex linkages within a sector, but structure is low. A recent study in the UK highlighted 154 business clusters classifying them by stage of development, cluster depth, employment dynamics and significance (DTI, 2001b).
- *Network*: Represents a more highly developed form of cooperation, which exhibits both relatively high structure and integration. (In the literature, networks are often implicitly described from a large business perspective.)

In relation to the above, it is important to note that for SMEs the *activity* of networking is central to business creation, development and growth (Shaw & Conway, 2000) and is likely to feature as a process in *all* of the above categories.

Aggregation and e-business models

The Internet has spawned many new business models. Of special relevance to this research, however, has been the potential of internet technologies to facilitate the development of new and economic interorganisational systems (IOS), which has led in turn to new aggregation or networked-based business models. The concept of aggregation and the addressing of on-line aggregations through new intermediaries is increasingly being recognised as an important development. A number of authors have attempted to categorise the field based on increasing functionality, innovation, integration and value. Timmers (2000) has proposed a broad classification based on functional integration and degree of innovation from e-shop to value chain integrator. Tapscott differentiates by control and value and identifies five distinct types of business web, where a business web is an ‘elaborate network of suppliers, distributors, service providers, and customers that conduct business communications and transactions on the Internet in order to produce value for end-customers and for one another’ (Tapscott *et al.*, 2000). While Timmers and Tapscott have produced useful overall taxonomies, other authors have developed models specific to particular applications. Examples include: Business to Business (B2B) vertical supply chains (Kalakota & Robinson, 2000) and Value Adding Intermediaries facilitating collaborative and community-based enterprise (Earle & Keen, 2000). In the particular context of SMEs, the scope for ASPs to serve ‘natural’ market places of SMEs with SME-orientated applications has been noted (Mazzi, 2001).

Translating the above theoretical interest in the potential of aggregations and of new intermediaries to help engage SMEs in e-business is in its early stages, but there are already commercial examples (Currie & Seltsikas, 2001). The commercial intermediaries, detailed in Table 2, are attempting to aggregate SMEs and in selected cases to engage them in higher complexity e-business applications detailed in Table 1. All these intermediaries offer services across industries and are in essence horizontal ASPs.

Currently, it is also possible for SMEs to access high complexity vertical applications like B2B e-marketplaces through two other routes. The first is through vertical industry intermediaries (BizProLink, 2002; VertMarkets, 2002) and the second is through industry-specific e-marketplaces (Achilles, 2002; Covisint, 2002). The Covisint exchange is an intermediary that has emerged from within the motor industry as a means of improving supply efficiencies; BuildOnline is an example of a similar UK development in the construction industry (BuildOnline, 2002). Both these industries are characterised by large numbers of SMEs in their supply chain systems. However, despite the emergence of these horizontal and vertical intermediaries it remains the case that engagement by SMEs is low.

In the above examples, the role of the intermediary is pivotal to the notion of aggregating SMEs for with this aggregation comes the potential for engaging SMEs in the more complex e-business applications on an economically viable basis. Both in the literature and in practice, the common manifestation of the intermediary is as a software host providing access to multiple enterprises on a rental, purchase or transaction basis. The model underpinning this arrangement is essentially a one-to-one variety, that is, an intermediary has a single contract for supply and support to a single customer, and this is repeated, with variations as is necessary, for many customers. As was suggested earlier in this paper such a model is resource rich and access is therefore limited. However, in the specific context of the aggregation of SMEs a more comprehensive conceptualisation of intermediary roles has been proposed, which defines the relationships between multiple SMEs and intermediaries and may provide a basis for the economic engagement of SMEs. The concept is that of the eTrust Platform, Figure 3.

The notion here is that aggregated SMEs constitute a digital enterprise community enabled by one or more intermediaries. (This concept is a developed from an earlier model – see Brown & Lockett, 2001).

Three types of intermediary are defined: Technology Intermediary, supporting the hosting and communications; Enterprise Intermediary, providing the consultancy and application services; and Community Intermediary, concerned with the governance role for the aggregation. Clearly, one intermediary could fulfil all roles but this may not be either feasible or desirable. Theoretically, the role of the intermediary as a means of facilitating the diffusion of complex information technologies has been observed by a number of authors, most notably by Swan & Newell (1995), Swan *et al.* (1998) and Newell *et al.* (2000). In these particular instances, it was the professional associations that assisted in this way. In terms of the above conceptualisation, these associations were fulfilling elements of both the enterprise and community intermediary roles. However, the setting for these authors' works was not SME specific and was not concerned with the economic viability of provision.

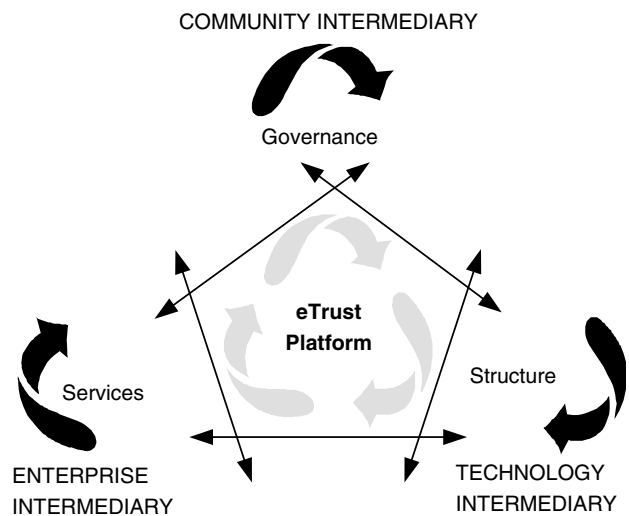


Figure 3 eTrust Platform – conceptualisation of roles required to provide e-business services to online SME aggregations (developed from Brown & Lockett, 2001).

Table 2 Commercial intermediaries and SME-specific portals

Region	Example	Access to higher complexity applications
US	AllBusiness (NCBI, 2002)	Yes – on-line accounting
	bCentral (Microsoft, 2002)	Yes – web collaboration
	NetBusiness (Netscape, 2002),	No
	Yahoo Small Business (Yahoo, 2002),	No
Canada	BellZinc (Bell, 2002)	No
	UK	BT Openworld (BT, 2002),
	ClearlyBusiness (Freeserve, 2002)	Yes – on-line data backup
Europe	BusinessEurope (BusinessEurope, 2002)	Yes – e-marketplace

Research approach

The overall research schema follows Checkland’s generic model of research, the FMA framework (Figure 4) where A is the application area, M is the methodology and F is the interpretive framework (Checkland, 1985).

In this case:

- A is the need to better understand, both theoretically and practically, the engagement of SMEs in e-business from a provider perspective. Of particular interest is (i) the potential of aggregation-specific e-business applications and (ii) the potential roles for intermediaries in facilitating this engagement.
- M is an empirical-based approach, largely qualitative but using quantitative data where appropriate to supplement interview data and triangulate the sources.
- F is the theoretical framework that guides both the detailed empirical work and the subsequent interpretation. The main elements of this are IT adoption by SMEs, the concept of networks as a distinct organisational form and aggregation-based e-business models.

The research outcome is the learning derived from A and F.

The qualitative research was planned and carried out as two stages – sampling and data collection/analysis. Each is discussed briefly below.

Sampling

To address the issues outlined in the application area A, the sample frame was derived from the two earlier conceptualisations – the eTrust Platform (Figure 3) and the taxonomy of SME aggregations (Figure 2). The eTrust Platform model identifies two important intermediary types. The first is the ‘community intermediary’, which represents or governs the aggregation. The second is the ‘enterprise intermediary’, which delivers the services or applications. Together, these two intermediaries represent the provider perspective and constitute the data sources. (The third intermediary is the technology intermediary, which lies outside of this research and

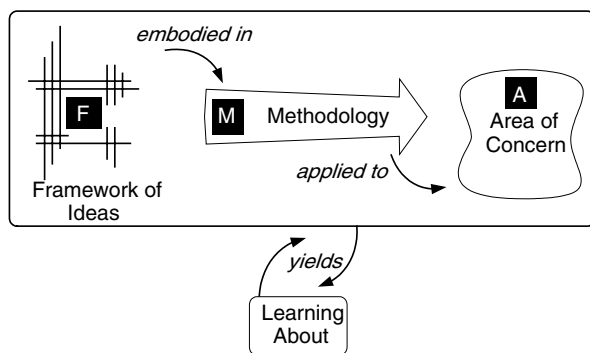


Figure 4 Research model (Checkland, 1985).

which for users is largely invisible.) The Taxonomy of SME aggregations identifies the four aggregation types – associated, limited, cluster and networks. Combing these models provided a sample frame in which intermediaries, either enterprise or community, could be associated with different aggregation types. In the case of the enterprise intermediaries, a further subdivision into horizontal and vertical providers was possible. A key issue in the research was the fact that the established base of e-facilitated SME aggregations was very small and hence populating the sample frame was governed by what was available, rather than some empirical ideal. A total of 36 potential organisations were identified from literature and Internet searches and were approached, in order to identify senior managers and negotiate access. Some 18 organisations agreed to participate and are categorised by intermediary and aggregation types (Tables 3 and 4); in addition three expert sources were selected to provide an additional independent perspective (Table 5). This gave a total of 21 data sources.

Data collection and analysis method

Identification of suitable data sources was undertaken in 2001 with the field investigations carried out in 2001 and 2002. Interview data collection took the form of semi-structured interviews with mostly senior managers in the 21 organisations shown in Tables 3–5. The semi-structured interviews covered: the context for e-business engagement and SMEs, including special factors and personal experience; the evidence and nature of aggregation, including governance, intermediary roles and actual or future actors; provider business models, including strategy, structure, processes, revenues, legal issues and technology. (A template for the interviews is provided in Appendix A.) Most interviews were conducted on the participant’s premises and lasted between 60 and 90 min. These semi-structured interviews formed the main data source and required careful negotiation in order to gain access. Notes were taken during the interview and subsequently written up as field notes. The template

Table 3 Community intermediaries

Business description	Size	Aggregation type served
Newspaper Trade Association (Aggregation A)	SME	Association
Laboratory Supplies Trade Association	SME	Association
Motor Manufacturing Trade Association	SME	Association
Company Directors Association	SME	Association
Knowledge Worker Association (Aggregation B)	SME	Association
Organic Industry Organisation (Aggregation C)	SME	Cluster
Oil & Gas Industry Organisation	SME	Cluster
Media & Broadcasting Company	Large	Network
Food Processing Company	Large	Network
Area Business Organisation	SME	Limited

Table 4 Enterprise intermediaries

Business description	Size	Provider type	Aggregation type served
Advertising Artwork Management ASP (Aggregation A)	SME	Vertical	Association
Community Knowledge Management ASP (Aggregation B)	SME	Vertical	Association
Organic Field Management ASP (Aggregation C)	SME	Vertical	Cluster
Data Management ASP	SME	Vertical	Network
Construction Project Management ASP	SME	Vertical	Network
E-Business Applications ASP	SME	Horizontal	NA
E-Business Applications Provider	Large	Horizontal	NA
E-Business Applications Provider	Large	Horizontal	NA

Table 5 Independent sources

Business description	Size	Sector
Business Representation Expert	Individual	Government
Trade Association Body	SME	Associations
Information Services Expert	SME	Construction

Note: In aggregations A,B,C (Tables 3 and 4) both community and enterprise intermediaries were interviewed.

provide guidance and structure to the interview and filed note with quotations used to supplement key concerns or views. Field notes were taken and combined with other supporting data to form case notes. The interviews showed considerable internal consistency, suggesting that the sample numbers were representative. Where possible additional data, marketing material, technical briefs and web sites were collected in order to supplement interview data and achieve a triangulation of data sources.

Data analysis was undertaken in parallel to the data collection. The units of analysis for the service providers were the intermediary types both separately and combined. Specifically, the authors attempted to identify matching patterns across and within the sample frame that were then grouped in order to produce key themes that provided a basis for the research findings.

Research findings

Three key findings have resulted from this qualitative research in terms of the potential for e-business engagement by SMEs. In the main these views are collated, balanced and presented in this section with the significance of these different findings for both practice and theory discussed in the conclusion to the paper.

Before discussing these key findings, three examples of e-applications classified as a high complexity vertical (Table 1) used by aggregations are summarised. Firstly, a web-based advertising artwork management application, which enabled advertising agencies (SMEs) to submit artwork to regional newspapers through a single web-based portal. This application provided new functionality

to advertising agencies, which reduced the complexity and cost of dealing with regional newspapers and its development was both funded and orchestrated by members of a newspaper trade association. Secondly, a web-based community management application, which enabled the 18,000 members (SMEs) of the knowledge-based workers association to interact both with each other and their association. This application was developed specifically to process large volumes of communications and support the management of a 'virtual' trade association. And finally web-based field management application for European organic industry. This enabled organic producers and growers manage field crop production and certification by providing a certified 'audit' trail that used digital certificates authenticated by several national bodies. The three key themes have emerged from this research.

Theme 1: emergence of aggregation-specific e-business applications

All ten community intermediaries and the five vertical enterprise intermediaries confirmed the importance of SME-focused applications that attempted to address particular needs of SMEs within aggregations. In the three aggregations where both types of intermediary types were interviewed, namely organic, newspaper and knowledge workers, the interaction between the community intermediary and vertical service provider was stated to be a very important factor in achieving the engagement of users. This continuous interaction between the two intermediary types helped to identify business needs and the resultant modifications to the specific applications in order to benefit the users. The manager of one e-application provider stated that 'working with them (the trade association) has been critical to us developing an application that meets the users needs. It has given use a competitive advantage and an better product'. Early examples of aggregation-specific e-business applications developed in this collaborative way and confirmed through the interviews include:

- Advertising Artwork Management – for artwork agencies in regional newspapers.
- Community Management – for knowledge based workers.
- Field Management – for the organic farming industry.
- Project Management – for the construction industry.

In the main these aggregation-specific e-business applications are relatively new and in the early stages of development, but already they appear to be successful measured by the level of uptake. For example, the artwork management application provider reported that the recruitment of users had been exponential and that more than 60 percent of potential users, all small artwork agencies, had registered.

All five of the vertical service providers supplying aggregation-specific e-applications had identified what they believed to be an unmet business need of SMEs in a specific business market. Three of the five providers interviewed took the lead and developed the aggregation-specific e-applications without a guaranteed market for the product. However, they had identified community intermediaries early in the application's development and sought to establish collaborative arrangements that mitigated the risk. The three remaining vertical service providers developed the applications in response to the business needs identified by the community intermediary, but even here there was no guarantee of adoption by the aggregation of SMEs. This depended on the perceived effectiveness of the application, which could vary within the aggregation, and on cost.

In all these cases, the aggregation-specific e-applications could be characterised as offering new functionality that was valued by aggregation members, that was developed by interaction with community intermediaries and that used a business model based on a one to many engagement. The innovative nature of the specific applications was the critical factor that determined the level of interest shown in the application by the aggregation members. For example, the advertising artwork management application enabled advertising agencies (users) to submit artwork and copy on-line to many independent regional newspapers. This saved time for the agency but also made it significantly easier to use regional papers to advertise client's products and services. There was no direct charge levied on the agency by the vertical service provider. All costs were met by the trade association out of conventional membership fees. In the field management, application organic farmers (users) could use the on-line application to record crop history and yields enabling them to more easily comply with the certification requirements of the industry. This was a very attractive but complex e-business application. Users paid for the services directly to the service provider, but this was in part off-set by a reduced certification fee via the regulatory body acting as a community intermediary. In contrast, the three horizontal enterprise intermediaries offered applications to SMEs that aimed to meet standard

business functions, such as accounts and material control. Although these could be customised to meet local needs, the providers were explicitly not attempting to produce innovative applications requiring deep industry knowledge.

Theme 2: emergence of collaboration based a 'one to many' business models

All five vertical service providers offered applications in a hosted environment on a 'one to many' basis and deliberately developed a 'one to many' marketing model. All five also emphasised that the intermediaries best placed to promote the application were those who had existing relationships within the aggregation. Only one vertical service provider charged users directly with all others charging the community intermediaries. The latter approach both reinforced the 'one to many' marketing model and enabled community intermediaries to develop their own charging mechanism to 'members'. This explicit interaction between the application provider and SMEs, within a network or cluster, and facilitated by a community intermediary is evidenced in this research and is very recent.

There is limited secondary evidence of application providers attempting to address SMEs through intermediaries. E-business applications designed for SME markets are increasingly offered through affiliate agreements such as the small business initiative (Oracle, 2002) and through value-added resellers (VARs) such as Netstore (Netstore, 2002). However, in both these instances there is no attempt to develop innovative SME aggregation-specific applications. This model of engaging SMEs through VAR networks has served the enterprise software industry well in the context of standard applications; however, there is little evidence, to date, of its effectiveness in implementing e-business applications. This view was strongly reinforced by the independent sources interviewed in this work.

Again in contrast, the three horizontal intermediaries were committed to engaging SMEs on a 'one to one' basis even if subsequently they were hosted and supported on a shared 'one to many' basis. In all cases, the payment model was direct between provider and SME user. The business manager for one large e-business application provider admitted that 'whilst we have some customers with only three users, it reality isn't economic for us target customers with less than 20 users with hosted solutions.' Interestingly, the manager indicated that 20 users was also the point at which resident or in-house systems became viable. This view resulted in a review of the business case for this large e-business application provider in promoting hosted solutions for horizontal to SMEs. Inherently, this business model is more expensive and the evidence from the research was that the horizontal providers were focusing on larger SMEs and divisions of large enterprises on economic grounds.

Theme 3: importance of trusted third parties

In this research, all 21 data sources confirmed the importance of trust within the formation and development of SME aggregations engaged in e-business. Some of the community intermediaries noted that the emergence of new and unknown on-line intermediaries addressing aggregations added to the confusion that many SMEs felt regarding e-business. There was recognition by many community and enterprise intermediaries that existing trusted offline relationships, be they a lead company in a business network or a trade association, could be important in recruiting SMEs to on-line services. Trade associations, in particular, identified a new role for themselves as a sponsor or facilitator, rather than a direct provider of e-business services. In their view, this situation derived from the SMEs' view of them as 'trusted' parties that could be relied on to act in their interests. One general secretary of a trade association stated that 'our members are finding it increasingly difficult to know which provider (e-marketplace) to use and are wanting us to endorse products. We are organising a special event at our next general meeting to discuss this with members'. 'I cannot see how it could be cost effective for us to develop our own (e-marketplace).' This new role was genuinely emergent – not one of the trade associations had foreseen the possibility that this new role could have very significant strategic implications. Not surprisingly all vertical service providers specifically identified the role of the community intermediary as being important in the recruitment of users to their applications based on their trusted relationship with the aggregations. The nature of this relationship varied from simple provision as in the case of the advertising artwork service provider to active joint initiatives as in the case of the field management application.

In addition to the contribution made by the community intermediaries to the development of specific applications and to facilitating access to the SMEs, they can have two further roles that derive directly from their trusted third-party status. Firstly, as negotiators for the service fees charged either directly to users, or more commonly, to the community intermediary (i.e. themselves) who then recovers the fees using a variety of mechanisms from the aggregation members, or is off-set by other benefits. Secondly, they act as negotiators for the service-level agreement (SLA) with the service providers. For example, the lead client of a construction consortium for new retail stores negotiated and paid the service provider fees for the new e-business applications to be used by the designated network of contractors and subcontractors. Similarly, the newspaper trade association paid the service fees for advertising agencies submitting artwork via the new e-business application. In each of these cases, the perceived or actual benefits of more effective project management and the ease of use resulting in increased advertising, respectively, were sufficient to provide the services with no direct charge to users. In all instances, both the community and

enterprise intermediaries indicated that the SMEs appeared to rely heavily on the community intermediaries as the trusted third party to approve and hold the SLA with the service provider. Considering the importance of these service agreements in the context of hosted applications, this implies a high level of trust on the part of the users, but also for many of them an indication of their dependence. This opinion was expressed by many of the interviewees based on the reality that large numbers of SMEs did not have the competence or confidence to negotiate service agreements for complex e-business applications.

Clearly, the role of trusted third parties, particularly the community intermediary, goes beyond simply negotiating fees and SLAs with service providers. They hold unique positions within business sectors often gained over many years and across many aspects of trading relationships. This study highlights their importance in the engagement of SMEs in e-business applications.

Conclusion

This empirically based research set out to learn more about the engagement of SMEs in e-business from a provider perspective and to relate this to previous research in the area of ICT adoption. Of particular interest to us were the role of critical applications (since these have been shown to be significant in the adoption of complex applications by large enterprises) and the role of intermediaries in the engagement process (since the move to e-business has created new kinds of intermediaries, particularly service providers). In the world of practice the context for this work was the low, and unexpected, engagement by SMEs in e-business, beyond simple e-mail or web catalogues. In terms of previous research the concern was that in the main ICT adoption has been viewed, either explicitly or implicitly, from the user perspective. As we indicated earlier the unstated assumption here being that the provider issues were non-problematic.

Given the above aims our research findings appear helpful. Firstly, the study establishes the importance of the critical aggregation-specific e-applications, defined as 'an e-business application, promoted by a trusted third party, which engages a significant number of SMEs by addressing an important shared business concern within an aggregation' as a way of encouraging SMEs to engage in the more complex e-business applications. Secondly, it confirms the potential for addressing SMEs as aggregations as a highly efficacious method for the marketing and provision of shared services. Finally, it highlights to enterprise service providers the crucial role of the trusted third party in sponsoring or promoting specific e-business applications to aggregations of SMEs. Indeed, the research shows that this role works best when both the enterprise and community intermediaries are aware of each other's respective contribution and a working relationship is established.

These findings are of significance for both policy and practice. The paper started with an appreciation of the low engagement by SMEs in the more complex e-business applications. At present, there is no recognition by UK policy makers (as far as the authors could establish) of the mechanism of engaging SMEs as aggregations, as opposed to individual organisations, for the express purpose of adopting e-business practices. Current policy is couched in terms of targets for e-business adoption by SMEs with little about the means for achieving this (DTI, 2001a). Arising from the research, and in particular the recognition of the role of the community intermediary in facilitating and legitimising the adoption of e-business applications, here are implications for policy. An example would be the scope for encouraging and incentivising traditional trade associations to explore their potential as community intermediaries.

In terms of practice the findings are unequivocal with respect to how the service providers are organised. In the context of large enterprises, the 'one to one' marketing business model is viable for both vertical (i.e. sector-specific applications) and horizontal (i.e. generic business applications). Enterprise resource planning (ERP), from either a specialist or generic provider, serves as a good example. In this instance, the implementation of this complex application will generate further demands of financial and human capital as the requirements of customisation, integration and ongoing support are recognised, and these demands can normally be met by large enterprises. In the setting of SMEs while it is economic to provide higher e-business applications on a 'one to many' basis the cost of marketing and supporting on a 'one-to-one' basis appears to be larger than the potential return. This is clearly not the case for lower complexity applications such as e-mail. It would be possible to conclude that as awareness by SMEs of the advantages of higher complexity e-business applications increases so too will adoption rates, but as we shown earlier in Figure 1 this is not born out by the statistics. The clear evidence from all of the enterprise service providers interviewed is that the aggregation model is likely to be the most viable means of engaging SMEs. By confirming this provider perspective, the research adds to our understanding of the likely mechanisms for engaging SMEs in complex e-business applications that are both desirable and economically feasible.

In terms of theory, even before any empirical data were interpreted, the research has confirmed the usefulness of the eTrust platform conceptualisation (Figure 3) as a means of framing the discussion with the different types of organisation involved. Previously, a number of authors (e.g. Tapscott *et al.*, 2000; Earle & Keen, 2000) have provided models of the revised relationships that can follow from the introduction of e-business technologies, and many of these models identify the new intermediaries, such as application service providers, that would be needed. (The e-marketplace is a classic example of a new interorganisational arrangement, and e-bay a classic

example of a new intermediary to facilitate that arrangement.) However, there are no specific conceptualisations of the role of intermediaries in the context of shared applications by aggregations. The usefulness of such a conceptualisation was proven many times in the research process. None of the 21 organisations interviewed had thought about their role other than in terms of their everyday identities as an application service provider, lead contractor or trade association, etc. The ability to discuss their situation in terms of their role as an enterprise or community intermediary was welcomed. It contributed to the sense-making of specific situations and to the wider problem of generalising experience.

From the interpretation of the empirical data, summarised earlier in the three themes, there are significant theoretical observations. At the crux of the research is a concern to better understand e-business adoption by SMEs. The seminal work of Rogers on innovation diffusion, especially the later variant (1995), although not SME focussed, is highly relevant. This took a provider perspective and sought to explain adoption in terms of diffusion networks, critical mass and specific factors including complexity. This research suggests that Rogers' innovation model is helpful for understanding SMEs, but complements Rogers by offering a mechanism whereby a critical mass can be achieved, namely facilitation through trusted third parties.

In relation to other work on ICT adoption specific to SMEs (e.g. Blili & Raymond, 1993; Cragg & King, 1993; Fuller & Southern, 1999; Levy & Powell, 2000; Hussin *et al.*, 2002; Poon, 2000) the emphasis is on such factors as strategic logic, implementation enablers and organisation-specific factors – all viewed from a user perspective. This work has been influential but application complexity *per se* is not singled out. In this research, however, the findings emphasise that, *in the experience of the providers*, perceived application complexity is crucial to SMEs and that these organisations would not proceed to adopt without substantial support. By including complexity as a key variable, it highlights the need for a more profound understanding of what complexity actually means in the context of ICT adoption by SMEs.

The research findings in respect of aggregation as a means of helping SMEs develop their e-business capability can be reflected on theoretically in several ways. In terms of the rationale for network formation there have been significant contributions (e.g. from Miles & Snow, 1986; Thorelli, 1986; Oliver, 1990; Powell, 1990; Glaister & Buckley, 1996). Drawing on earlier literature Cravens *et al.* (1996) have usefully discussed the rationale for network formation in terms of organisation adaptation to the environment, management imperatives for the rationalisation of resources and competing in rapidly changing environments, including the acquisition of technology. This research echoes the importance of these factors for both SMEs and the application providers. From the provider perspective, the aggregation of SMEs offers a realistic means of understanding, addressing and

providing appropriate applications on an economic basis. In this sense the aggregation becomes in Sydow and Windelers' terms 'an object of action framing. In addition to the single firm the network also becomes an object of signifying, organising and legitimising (1998, p 267). In this specific context, the enterprise intermediary is able to subsume the behaviour of individual SMEs within the wider network practices. Similarly, the community intermediary is able to act on behalf of the aggregation in matters of negotiation relating to service costs and service levels, but at the same time can act internally within the aggregation in respect of the governance of individual firm behaviour.

For the individual SME, the question of whether or not to adopt e-business applications specific to their sector is too simplistic. In reality, such applications would generally not be available from providers for the reasons previously given. It is the actual, or likely, existence of an 'organised' aggregation (i.e. a network, association or cluster in terms of the conceptualisation given in this paper) that underwrites the providers' interest. Once formed then the question for individual SMEs about a range of factors such as common interests, resource efficiencies and stability governs whether to participate in the network. Their decision is hugely helped by the mitigation of risk that involvement in a collaborative arrangement offers (Contractor & Lorange, 1988). Overall, although the theory frameworks and models for inter-organisational networks were developed before Internet technologies, this research confirms the broad relevance of these concepts for interpreting the behaviour of electronically mediated collaborative relationships.

Finally, there are some observations on the theory of e-business models and in particular intermediaries. The value of conceptualising the different roles in the form of the eTrust Platform has already been highlighted. In the small but growing literature on e-business models (e.g. Earle & Keen, 2000; Tapscott *et al.*, 2000; Timmers, 2000) there is considerable emphasis on the opportunities for disintermediation and reintermediation (i.e. the removal of intermediaries and the creation of new intermediaries, respectively – see Chaffey (2002, pp 37–45) for recent examples). However, this research highlights the importance of *existing relationships* in business markets. This is graphically the case with the community intermediaries. It is their relationship with SMEs that provides the basis for a meaningful interaction between the potential providers of specific e-applications and the aggregations of SMEs. At the core of this relationship is trust but in the

context of the eTrust platform this is complex. In terms of the relationship between the community intermediary and the SME, the research findings in Theme 3 suggests that the trusted relationship is based on confidence in another's goodwill. However, the relationship between the community and enterprise intermediary is based on a business risk view, as a result of the community intermediary's involvement in the negotiation of service levels and costs (these two useful perspectives are identified and discussed further in Ring & Van de Ven, 1994). The Swan & Newell (1995) work, although not specific to SMEs, highlights the importance of the professional associations in the diffusion of complex technologies in terms of a knowledge-focused perspective – they are 'boundary spanners' in the Trushman & Scanlan (1981) terminology. Newell *et al.* (2000), however, identified the problem when the intermediary (in their case a professional association) becomes an uncritical passive purveyor of 'black box' technologies to the users on behalf of the technology provider. In our work, the community intermediary was more likely to be active through its negotiating role and hence more aware of potential limitations of the technology. In general, this research suggests that the findings of Swan and Newell could be generalised to other community intermediaries, such as trade associations.

In terms of further research, the need for more work on the conceptualisation of the adoption process by SMEs of advanced information technologies, such as e-business, is clear. In particular, the areas of application complexity and how users perceive this, the significance of users within aggregations and the roles of trusted third parties warrant consideration. Such work would advance our theoretical understanding of adoption from both the provider and user perspectives. Moving beyond adoption to evaluation there is no significant work on the impact on SMEs of e-business applications. Do they affect the productivity and profitability of adopters, or do they provide an environment that supports innovation?

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Appendix A

Template for semi-structured interviews: Provider Perspective

- (1) What is your understanding of the current position for SMEs with reference to e-business engagement?
 - (a) Is the application complexity scale relevant to your situation?
 - (b) How does the current secondary data relate to your situation?
 - (c) Are there any special factors to consider?
 - (d) What is your personal experience of adopters/non-adopters? (Strategic logic; other rationales).
- (2) What evidence is there of aggregations of SMEs and what is their nature and role both currently and as a result of e-business developments?
 - (a) What evidence is there of aggregations of SMEs, including governance bodies in your sector?
 - (b) Is the taxonomy of aggregations relevant to your sector?
 - (c) What is their nature and role?
 - (i) Currently.
 - (ii) As a result of e-business developments.
 - (d) Is the taxonomy relevant to identifying reasons for or results of e-business engagement?
- (3) What are the potential roles and mechanisms for intermediaries in facilitating SME e-business engagement?
 - (a) Relevance of Trust Platform model to your situation?
 - (b) Identification and detail of own role (Enterprise; Community)?
 - (c) What are own and other actors roles and mechanisms for facilitating SME e-business engagement?
 - (d) Any additional actors or role?
- (4) What are the possible business models from a provider perspective?
 - (a) Mission: high-level understanding of overall vision, strategic goals and value proposition (product).
 - (b) Structure: actors & roles that constitute the business community, governance and focus on industry, customer & product. (marketing strategy & potential benefits for actors).
 - (c) Processes: more detailed view (product service and information flows).
 - (d) Revenues: sources of revenue (gross and net) and investment.
 - (e) Legal Issues: Influences all aspects of business model.
 - (f) Technology: Both enabler and constraint – influences all aspects of business model.