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**Innovations affecting SMEs and E-Business with reference
to Strategic Networks, Aggregation & Intermediaries**

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Abstract

Against a background of the low engagement of SMEs in e-business this paper investigates the emergence of innovative critical e-aggregation 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 the research shows that such applications can facilitate the engagement of SMEs in e-business. There are three key findings, namely: the emergence of aggregation specific e-business applications; the emergence of collaboratively based 'one to many' service provider business models; and the importance of trusted third parties in facilitating the adoption of higher complexity e-business applications by SMEs. Significantly this work combines both user and provider perspectives in order to provide a rich contribution to the already considerable literature on SMEs and ICT. The findings will be relevant to academic researchers, service providers and policymakers assisting them in understanding some of the complex issues affecting the engagement of SMEs in e-business.

Keywords: SMEs, e-business, ICT adoption, innovation, networks.

Introduction

The purpose of this short 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 and to do so in a way that informs both theory and practice. 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 briefly positions the research theoretically. 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 electronic communication networks to transact, processes and collaborate in business markets' it incorporates e-commerce. This paper adopts the EU and UK convention that defines an SME as 'any business, which has less than 250 employees'. The economic importance of such enterprises is widely recognised, in the UK alone there are 3.7 million SMEs generating 55 percent employment and 51 percent of the economy (SBS 2003). With such an important role in the creation of national wealth it isn't surprising that governments pay attention to those

factors, such as the emerging technology of e-business, which could affect this sector's performance. Internet offered relatively low cost access to network infrastructure, which appeared to be particularly promising for SMEs (Kalakota and Whinston 1996). This has been readily acknowledged by the UK Government, which set three clear targets for the engagement of SMEs in e-business for the year 2002 (DTI 2002):

- The first was to ensure the connectivity of 1.5 million SMEs. This target has already been exceeded and totalled 1.9 million by mid 2001.
- In contrast the second target of 1 million SMEs trading online was not met with just 490,000 trading in 2002. A recent international benchmarking study highlighted the 'stalling or in some cases declining, willingness of businesses to trade online' (Booz Allen Hamilton 2002: p116) and noted that this was particularly evident in small businesses and the UK.
- 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 linear increases in complexity.

For this third target the Government has not tried to measure engagement in complex applications beyond 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 email and Web hosting services (DTI 2002). This failure of SMEs to engage in higher complexity e-business applications was unexpected by academics, service providers and policy makers alike. Its was anticipated that large organisation's 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 evidence emerging that this is occurring but it is clearly not widespread (Booz Allen Hamilton 2002). A taxonomy of complexity which goes beyond the UK Government classification suggested above is shown in Table 1. Using this classification, and the recent survey data, the author has analysed e-business engagement by SMEs in terms of application complexity and this is shown in Fig. 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 & 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	Very High

Fig. 1. SMEs E-Business Engagement (DTI 2002; EC 2002)
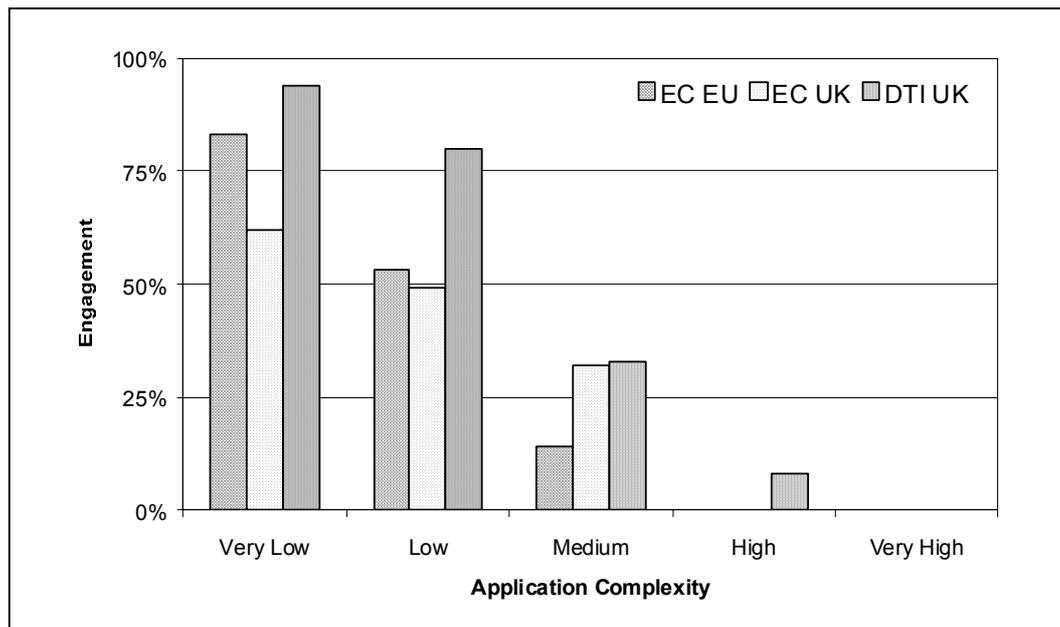
In summary, the analysis in Fig. 1, suggests that most SMEs, in the UK and EU, appear comfortable with email and Web access (low complexity), are tentative with the use of the Internet for online buying and selling (medium complexity), but have little or no engagement in higher complexity applications, 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. The trend in Fig. 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. 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 higher complexity e-business applications. In the next part the research is briefly positioned theoretically.

Theoretical Frameworks

The broad research setting for this work is the relative lack of engagement of SMEs in e-business and the area of concern is the extent to which critical applications 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.

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, whilst 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 1995:313). 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. Other work, however, has tried to develop a better understanding of adoption in the specific context of IT and SMEs (e.g. Cragg and King 1993; Iacovou et al., 1995). Three strands of work can be identified, which although overlapping can be separated, namely strategic, technological and organisational.

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 the recognition of networks as a distinct organisational form is more recent (Jarillo 1988; Snow et al 1992). This theoretical development has advanced on many different fronts: strategy, competition and collaboration (Doz 1996, Doz and Hamel 1998); network structure and embeddedness (Granovetter 1985; Shaw and Conway 2000); trust and governance (Ring and Van de Ven 1994; Johannisson 1986); classification and evaluation (Cravens et al., 1996, Sydow and Windeler 1998). Although these theoretical insights into networks have developed outside of a specific e-business context they provide many of the antecedents for the later emerging concepts of e-business networks. The four types of aggregation are shown in Fig. 2.

Fig. 2. eTrust Platform (Brown & Lockett 2001)
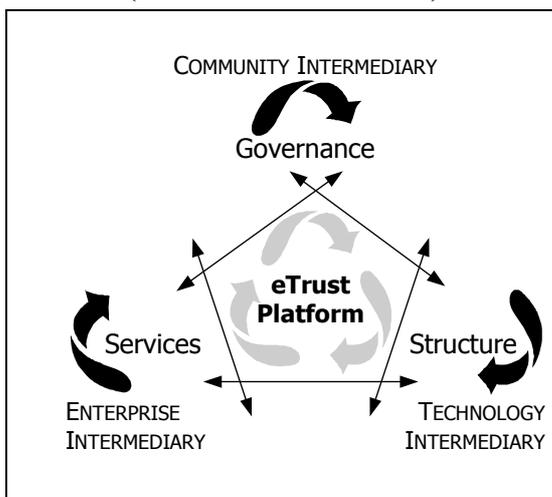
Fig. 3.Taxonony of Offline Aggregations (Lockett & Brown 2001)
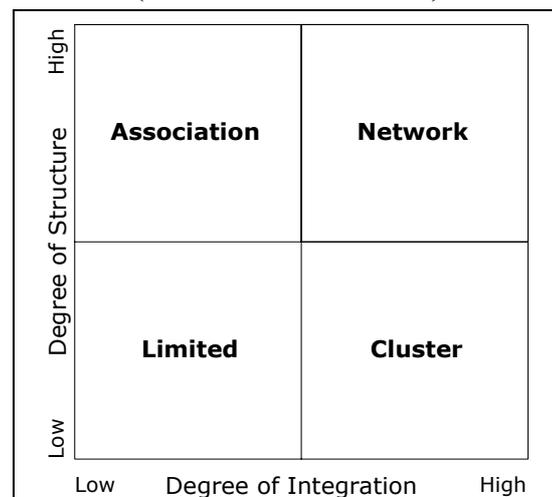
Aggregation and E-Business Models

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 inter-organisational systems (IOS), which has led in turn to new aggregation or networked based business models. The concept of aggregation and the addressing of online 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). 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). Whilst Timmers and Tapscott have produced useful overall taxonomies other authors have developed models specific to particular applications. For example vertical supply chains (Kalakota and Robinson 2000), value adding intermediaries facilitating collaborative and community based enterprise (Earle and Keen 2000) and the scope for ASPs to serve 'natural' marketplaces of SMEs with SME orientated applications has been noted (Mazzi 2001). 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. 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, Fig. 3. The notion here is that aggregated SMEs constitute a digital enterprise community enabled by one or more intermediaries. 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 Swan and Newall (1995); Swan et al., (1998) and Newall et al., (2000). However, the setting for these authors' works was not SME specific and was not concerned with the economic viability of provision.

Research Approach

The qualitative and quantitative research was planned and carried out as two stages.

Sampling

To address the issues outlined in the area of concern a sample frame was derived from the two earlier conceptualisations – the Taxonomy of SME Aggregations, Fig. 2 and the eTrust Platform, Fig. 3. 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. Some 18 organisations agreed to participate and are categorised by intermediary and aggregation types, in addition three expert sources where selected to provide an additional independent perspective. This gave a total of 21 data sources. This first wave of qualitative interviews let to eight quantitative surveys of users of aggregation specific applications and non-users within the wider industry.

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. The interviews showed considerable internal consistency, suggesting that the sample numbers were representative. Data analysis was undertaken in parallel to the data collection. Specifically the author 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. Quantitative surveys were undertaken during 2002 resulting in 43 and 104 completed

responses from user and non-users respectively. These were analysed to identify statistically significant differences.

Research Findings

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

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. Early examples of aggregation specific e-business applications developed in this collaborative way and confirmed through the interviews include:

- Field management application – for the organic farming industry
- Advertising artwork management application – for artwork agencies
- Community management application – for knowledge based workers
- Project management application – 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 when 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 adverting 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 SMEs. 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 'one to many' business model. 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. In contrast the three horizontal enterprise intermediaries offered applications to SMEs that aimed to meet standard business functions, such as accounting and materials handling. 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 ASP and SMEs, within a network or cluster, and facilitated by a community intermediary is evidenced in this research and is very recent. 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.

Theme 3: Importance of trusted third parties

In terms of the eTrust Platform conceptualisation the community, enterprise and technical intermediaries are all '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 online intermediaries addressing aggregations added to the confusion 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 business association, could be important in recruiting SMEs to online 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. 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 within the aggregations. Clearly the role of trusted third parties, particularly the community intermediary, goes beyond simply negotiating fees and SLAs with service providers.

Theme 4: Significantly higher levels of e-business engagement

There were significant differences between non-users and users levels of engagement in e-business, Fig. 4. Self evidently all users had internet connectivity and engaged in a high complexity aggregation specific applications compared to non-users being 75% and 17% respectively. Importantly however users had significantly higher levels of engagement in low (63%), medium (56%) and very high (14%) complexity applications compared to non-users being 34%, 24% and 1% respectively. In particular the difference at medium application complexity was over twofold (24% to 56%) compared with non-users.

Fig. 4. SMEs E-Business Engagement for Users and Non-users
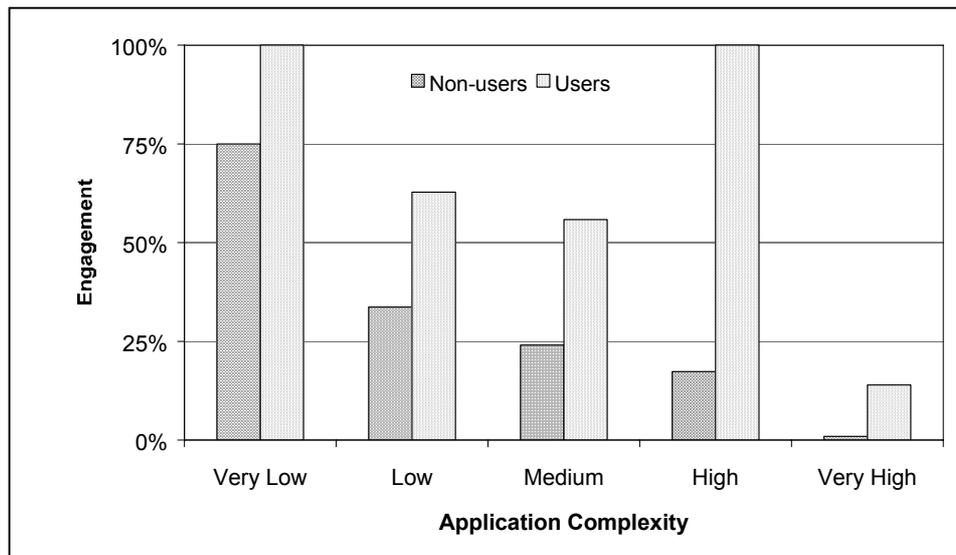
There were several statistically significant differences between users of aggregation specific e-applications and non-users in the wider industry, namely:

- Users have a more positive attitude to and a better knowledge & experience of e-business.
- Users are more likely to agree that e-business allows the same activities to be done more efficiently and allows for developing new ways of doing business.
- Users are more influenced by sales & marketing and innovation are drivers to ICT adoption.
- Users are less inhibited by cost & benefits and information & education as barriers to adoption. Importantly these resulted in means less that 3.0 indicating they were not perceived as barriers.

Conclusion

This empirically based research set out to learn more about the engagement of SMEs in e-business and to relate this to previous research in the area of ICT adoption. Of particular interest was the roles of critical applications and intermediaries in the engagement process. In the world of practice the context for this work was the low, and unexpected, engagement by SMEs in e-business. Given the above aims the research findings appear helpful. Firstly the study establishes the importance of the aggregation specific e-business applications or 'critical e-aggregation 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 higher complexity 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. Thirdly it highlights to enterprise service providers the crucial role of the trusted third party in sponsoring or promoting applications to aggregations of SMEs. Finally the research shows that users of aggregation specific e-applications have significantly higher levels of engagement in e-business applications, regardless of application complexity, than non-users in the wider industry. There are also important differences in the attitude to the drivers and barriers to e-business engagement between users and non-users.

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 policymakers of the potential of engaging SMEs as aggregations, as opposed to individual organisations, for the express purpose of adopting e-business practices. 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 and horizontal applications. For SMEs whilst it may be economic to provide higher complexity e-business applications on a 'one to many' basis, the cost of marketing and supporting on a 'one to one' basis would appear 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. 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 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. 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?

Acknowledgements

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