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Aggregation and the Role of Trusted Third Parties in SME E-Business

Engagement: A Regional Policy Issue.

Dr Nigel Lockett and Prof. David H Brown

ABSTRACT

It is against the background of low engagement by SMEs in e-business that this paper seeks to highlight the potential importance of aggregation and of the role of trusted third parties in facilitating higher levels of involvement. The paper is based on an ongoing SME e-business research programme and reports on some recent research on SMEs that were using high complexity e-business applications and explores the extent to which the research findings could address the core concern of low engagement. This qualitative case study based research includes analysis of data collected from 13 community intermediaries, acting as trusted third parties. It concludes that the role of community intermediaries appears to be central to the adoption of critical e-aggregation applications provided by service providers. For policymakers, this important role of critical e-aggregation applications in facilitating e-business engagement by SMEs has emerged as part of this research but there is limited evidence of policy initiatives that reflect this.

Keywords: E-Business, aggregation, ICT adoption, intermediaries.

INTRODUCTION

Governments in many leading economies, including the UK, have established national policies to encourage small to medium-sized enterprises' (SMEs) adoption of information and

communication technologies (ICT), especially in e-business, and have set benchmarked targets to monitor their progress. Recent research, within the authoritative Department of Trade and Industry (DTI) series of International Benchmarking Studies, suggests that this adoption is proving more problematic than anticipated:

“the government target of having 1 million small businesses trading online by 2002 will be missed the study has found a slowdown in the uptake of ICT, and for micro and small businesses there has been a clear reverse” (DTI, 2002: 6).

And even more recently:

“the trend of smaller businesses “clicking off” is unmistakable. It is particularly marked in the UK, and has been sustained for the last three years.... smaller businesses face a real hurdle in moving beyond simple e-commerce to becoming true ‘e-businesses’.... smaller businesses, more than any, need someone to help them exploit the technology, but no one’s set up to do it” (DTI, 2003: 10,14).

It is against this background of the low engagement by SMEs in e-business, and of a worsening ‘digital divide’ between large and small firms, that this paper seeks to highlight the potential importance of aggregation and of the role of trusted third parties (TTPs) in facilitating higher levels of involvement. E-Business is widely defined as the use of inter-organisational electronic networks to transact, process and collaborate in business markets and hence it incorporates e-commerce. Within this definition there is a broad spectrum of applications from simple e-mail and web pages to the more complex applications of customer and supplier integration, which are collaborative in nature. It is the latter higher complexity applications that have the potential to provide major economic and competitive benefits yet in 2003 UK SMEs were typically four times less likely than larger firms to be engaged in these collaborative applications (DTI, 2003).

This digital divide, which is evident in the widely differing rates of e-business adoption, has crucial theoretical and policy implications. For theory our current understanding of ICT adoption by SMEs is largely characterised by the single firm as the unit of analysis and by a user perspective. Less well understood theoretically is the impact on adoption of other factors including: the ‘provider’ perspective; the significance of ‘application complexity’; the role of aggregation; and not least the behaviour of SMEs within networks such as supply chains. For policy the central belief that the Internet access *per se* would be the key to increasing adoption for all firms has been shown to be inadequate. Over 90% of UK businesses now have access to the Internet but there appears to be no corresponding increase in their use of the more complex e-business applications. Indeed, in 2003 UK businesses saw an average of 14 percent of sales value transacted online, down from 19 percent in 2002 (DTI, 2003: 21).

Within a regional context there are implications arising from this lower than anticipated engagement of SMEs in e-business. The North West has more than 350,000 companies of which over 99.8% are SMEs and together they generate 60% of employment and 56% of turnover. This is significantly higher than the UK as a whole, being 55% and 51% respectively (SBS, 2004). Large companies are also evident in the North West with over three-quarters of the UK’s largest 100 companies being based in the region. One of the North West Development Agency’s (NWDA) strategic aims is to promote a comprehensive broadband infrastructure throughout the region and encourage its maximum use by all firms, large and small (NWDA, 2004). Clearly, this will need to include a strategy for encouraging the engagement by SMEs in e-business, but their behaviour to date suggests that this will prove problematic. For regional policy makers, like the

NWDA, a deeper understanding of SMEs' e-business adoption is a prerequisite for more effective policy initiatives aimed at achieving higher levels of engagement.

The paper is based on an ongoing SME e-business research programme and reports on some recent research on SMEs that were using high complexity e-business applications (e.g. ordering and paying online), and explores the extent to which the research findings could address the core concern of low engagement discussed above. These SMEs were atypical - they were part of an aggregation, were using business applications 'hosted' by a service provider and were supported to some degree by a trusted third party (TTP). The research suggests, however, that their experiences, albeit in the minority, have the potential to usefully inform regional policy, especially in respect of the role of TTPs. Following this introduction the presentation and interpretation of the research is structured into three further parts. In part two the broad literature and theory relevant to the adoption of e-business is reviewed. From this literature an interpretive framework is constructed which informs both the data collection and the subsequent interpretation. Part three details the methodology and in particular the empirical design. Finally, part four presents the research findings and the interpretation of these in the specific context of regional policy.

LITERATURE REVIEW

The reality of practice challenges our theoretical understanding of both the adoption by SMEs of e-business, and the emergence of aggregations as a meaningful development within the context of adoption. Here aggregation is defined as any grouping of enterprises where there is evidence of inter-organisational relationships that go beyond simple transactions. These aggregations can range from local retail traders campaigning for improvements to their local infrastructure to the highly developed supplier-based networks of the aerospace industry. 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 are those theories relevant to our understanding of the adoption of ICT by SMEs, including technology transfer and technology diffusion. The second strand relates to the concept of aggregation and to the theory of interorganisational networks as an organisational form. The latter provides the wider context within which the third strand of theory dealing with the emergent e-business model literature is discussed. The review concludes with a distillation of key elements from these three literature strands as a basis for interpreting the data.

ICT adoption by SMEs

The broad antecedents for a theoretical appreciation of ICT adoption by SMEs are studies of technology transfer and of the diffusion of innovations respectively. Technology transfer can be seen as largely purposeful and is characterised by planning and deliberate actions. In contrast innovation through diffusion is seen more as a natural process. In reality both mechanisms of technology transfer and diffusion are likely to coexist. This distinction, highlighted by Chakrabati and Rubenstein (1976) in their study of interorganisational technology transfer, is helpful since regional policy will need to delineate the areas of intervention for facilitating e-business engagement, whilst recognising that other mechanisms will be at play.

Although studies on the adoption of e-commerce by SMEs are relatively recent research antecedents are well established. Rogers' (1995) work on the diffusion of innovations, whilst initially neither ICT 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). The 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

compatibility, complexity, observability, relative advantage and trialability. In particular Rogers highlights the important roles of change agents (intermediaries) in influencing innovation decisions, including developing a need, establishing communication, diagnosing problems, creating an intent to change and then action. Theoretically the role of the intermediary as a means of facilitating the diffusion of complex ICT has been observed by a number of other authors, most notably Swan and Newell, (1995) and Newall et al. (1998; 2000).

Within the specific domain of ICT adoption by SMEs recent studies utilising Rogers' model of innovation include Kendall et al. (2001) and Mehrtens et al. (2001). These two studies provide support for the applicability of the model when related to e-business engagement by SMEs. Many other authors have contributed to this domain and three themes of work can be identified, which although overlapping can usefully be separated, namely technological, strategic and organisational. All three strands can be interpreted within the long established technology-push and need-pull models of technology innovation adoption in IS (Zmud, 1984; Chau and Tam, 2000). These models typically identify 'push' factors such as Government initiatives or technological drivers, and 'pull' factors such as organisational crises or opportunities.

The first literature theme, and arguably the most prolific, is the technological theme that views 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 and King, 1993; Dandridge and Levenburg, 2000; Walczch et al. 2000; Mehrtens et al. 2001; Windrum and Berranger, 2003). 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 the critical factors in

adoption. Since EDI is a complex application (although not necessarily Internet-based) these findings may be particularly relevant to the adoption of similar higher complexity e-business applications. More recently Lohrke et al. (2006) highlight the benefits of reducing an SME's transaction costs.

The second theme is that which emphasises the strategic logic in the decision to adopt ICT (Blili and Raymond, 1993; Kowtha and Choon, 2001; Sadowski et al. 2002; Daniel et al. 2002). In this context SMEs can be both victims and beneficiaries depending on their degree of proactivity. Blili and Raymond (1993) showed that IS planning was increasingly critical for SMEs as technology became more central to their products and processes, and they concluded that IS planning needed to be integrated with business strategy. Hagmann and McCahon (1993), however, concluded that in reality few SMEs plan their adoption of IS and that the limited planning that was evident was focused on operational improvements and was not concerned with competitiveness. The notion of strategic information systems planning in SMEs is further developed in Levy and Powell (2000) and Levy et al. (2001). This strand of research has resulted in frameworks, such as Levy's 'focus domination model', to help position and integrate ICT investments – some of which could be e-business applications. A model of the strategic use of IS by SMEs was proposed by Levy and Powell (2000) consisting of three interdependent factors, namely strategic content, business context and business process.

The third theme 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 (Blackburn and McClure, 1998; Fuller and Southern, 1999; Poon and Swatman, 1999; Southern and Tilley, 2000; Quayle,

2002). 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” (Southern and Tilley, 1999: 152). In the context of the adoption of increasingly complex e-business applications this view appears highly pertinent. Indeed, this explicit organisational stance is a necessary one in the application of ‘technology-push/need-pull’ models, since the analysis of social factors can identify the antecedents that need to be satisfied before the initial decision to adopt by SMEs can be made.

Inter-organisational networks and aggregation

Since the medium and higher complexity e-business applications are essentially collaborative in nature the theoretical perspective of organisational networks is particularly relevant for explaining firm behaviour. Although ‘networks’ have always existed the recognition of networks as a distinct organisational form, amenable to analysis and theoretical development, is more recent (Granovetter, 1985; Miles and Snow, 1986; Thorelli, 1986; Provan and Milwood, 1995). As products have become increasingly modular and knowledge distributed across many organisations firms have recognised an increasing requirement to collaborate with other firms both formally and informally (Baldwin and Clark, 2000). Consequently, the locus of innovation and adoption is no longer the individual or the firm but increasingly the network in which a firm is embedded (Powell et al. 1996; Ebers, 1997; Furtardo, 1997; Jarillo, 1998; Nooteboom, 2000). The importance of the strength of ties in the supplier network for productivity has also been demonstrated (Perez and Sanchez, 2002), and the standards necessary for a technology to function across different markets depend increasingly on networks of firms (Munir, 2002). For smaller firms the ability to gain access to new technologies is one of the principle reasons for engagement in networks (Grandori

and Soda, 1995), and cross-industry networks have been shown to play an important role in the diffusion of complex technologies (Erickson and Jacoby, 2003). These theoretical developments have been complemented by other advances on many different fronts: strategy, competition and collaboration (Doz and Hamel, 1998); network structure and embeddedness (Granovetter, 1985; Shaw and Conway, 2000); trust and governance (Johannisson, 1986; Ring and Van de Ven, 1994); classification and evaluation (Cravens et al. 1996; Sydow and Windeler, 1998); innovation (Pittaway et al. 2004). All the preceding theoretical contributions, however, were developed outside of the specific context of e-business; nevertheless they provide many of the antecedents for the emerging concepts within e-business networks.

The idea of business aggregations is well understood. These emerging, stable, non-equity based collaborative arrangements have become increasingly important as a means of reducing cost (Contractor and Lorange, 1998; Zajac and Oslan, 1993), or to increase revenue (Contractor and Lorange, 1998), or to mitigate risk in response to economic factors (Ebers, 1997). Such aggregations have generally been termed strategic networks and Jarillo's definition has been widely adopted:

“Strategic networks are long-term purposeful arrangements among distinct but related for profit organisations that allow those firms in them to gain or sustain competitive advantage vis-à-vis their competitors outside the network” (Jarillo, 1988:32).

Even within the above definition there are many possible manifestations of the network form and many ways of classifying them. In short all interorganisational networks (IONs) are aggregations, but not all aggregations are networks. This presents potential difficulties in comparing ION research. Grandori and Soda (1995) differentiate networks by the extent to which the links between organisations are formalised and networks are termed bureaucratic, social or proprietary.

A further classification from Cravens et al. (1996) links the type of network relationship (from short-term transactional to long-term collaborative) with the degree of unpredictability, and hence risk, in the environment. In the context of SMEs Brown and Lockett's (2004) classification of aggregations draws particularly on Grandori and Soda (1995), and links the degree of structure (informal to formal) to the degree of integration (independent to integrated).

E-Business models

The final strand of theory is the emergent e-business model literature, which includes insights into alternative business models and changing industry structures as a result of Internet-based technologies. A number of authors have offered broad conceptualisations of e-business models (Amit and Zott, 2000; Timmers, 2000; Hamel, 2000; Alt and Zimmermann, 2001; Afuah and Tucci, 2001; Weill and Vitale, 2001). Other authors have developed models specific to particular situations. Examples include: Business-to-Business (B2B) vertical supply chains (Kalokota and Robinson, 2000) and value adding intermediaries (Earle and Keen, 2000).

The need to encourage SME engagement in e-business has been readily acknowledged by industry and government but just how this was to be achieved, particularly with the more complex e-business application areas, remains unspecified. When examining the uptake of e-business amongst SMEs the theoretical concepts of collaborative networks, interdependence, power and trust provide important contributions. For example, whether owner-managers use adversarial or collaborative approaches to purchasing relationships may impact on their adoption of ICT (Cox and Hines, 1997). Similarly, the scope for intermediaries to play a crucial role in the support and provision of SME-orientated e-business applications has been noted and is central to this research (Currie and Seltsikas, 2001; Mazzi, 2001; Currie, 2002). In the specific context of application

service provider (ASP) models and SMEs several critical and reflective analyses have recently emerged (Kern et al. 2002; Desai and Currie, 2003; Susarla et al. 2003). In the main all the above contributions reinforce the general significance of intermediaries as trusted third party facilitators of IT diffusion as noted by Swan and Newall (1995) and Newell et al (1998; 2000), cited earlier, and the emergence of networks of e-entrepreneurs as noted by Matlay and Westhead (2005). A further conceptualisation by Brown and Lockett (2001) distinguished between three kinds of intermediary, namely technology provider, service provider and community facilitator. Together these three provide the framework, or 'trust platform', within which e-business engagement by SMEs can be effectively facilitated.

Literature synthesis and an interpretive framework

The purpose of this literature review has been to present previous contributions on the engagement of SMEs in e-business in a way that helps position this research both theoretically and practically. In terms of informing both the research design, especially the data set and its subsequent interpretation, three concepts are central to the research and are derived from the above literature. They are: (i) the types of aggregation that SMEs can be associated with (ii) the nature and role of the intermediaries, and (iii) the dimensions and characteristics of aggregation. Both individually, and in combination, these concepts are relevant to understanding SMEs' disposition to engage in e-business. For all three concepts the authors' models derived within the research programme have been utilised. In the case of concept (iii) – the dimensions and characteristics of aggregation – the model is a direct synthesis of the broader key literature reviewed previously. The three concepts, which comprise the overall interpretive frame, are described below.

(i) Types of aggregation

Within the broad concept of aggregation the taxonomy in Figure 1 locates ‘networks’ as one form of strong or complex aggregation, which can be contrasted with other weaker, or simpler aggregation forms – a distinction which can be useful when considering the nature of an SME’s engagement in an aggregation and the role of any intermediaries. The taxonomy is suitable for both online and offline aggregations and comprises four types:

- Limited - any relationships are loose and participants are independent, characterised by little or no aggregation. Intermediaries
- 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.
- Network - represents a more highly developed form of co-operation, which exhibits both relatively high structure and integration. In the literature these networks are often implicitly described from a large business perspective.

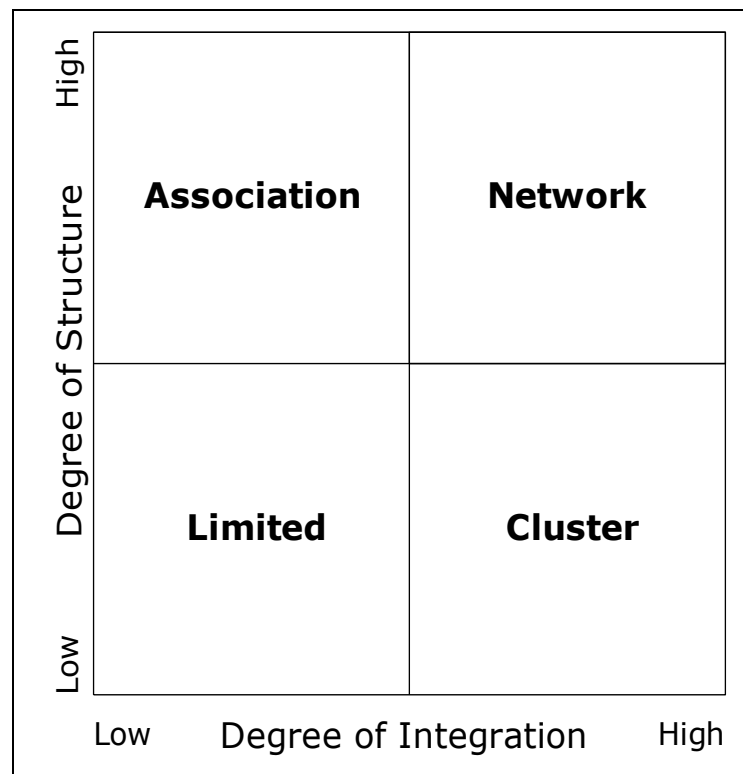


Figure 1. Taxonomy of aggregations for SMEs (Brown and Lockett 2004)

(ii) Nature and role of intermediaries

This is shown in Figure 2 and attempts to conceptualise the role of intermediaries in the digital economy. The model summarises the relationships between multiple SMEs and the intermediaries necessary for online aggregations of SMEs to function. There are three kinds of intermediary. The role of the technology intermediary is to provide the ICT platform on which services can be provided and could include hardware, security and communications. The role of the enterprise intermediary is to provide the services including applications software, hosting and consultancy. The technology and enterprise intermediaries can be considered as generic. In reality these functions could be provided by one or more organisations. The community intermediary, however, is specific to a particular aggregation. It has a critical role in gaining the commitment of potential participants to enter the e-aggregation and can be considered as a trusted third party. It is the community intermediary, providing a broad governance function, which is a distinguishing

characteristic of the eTrust Platform conceptualisation. A trade association would be an example of a potential community intermediary.

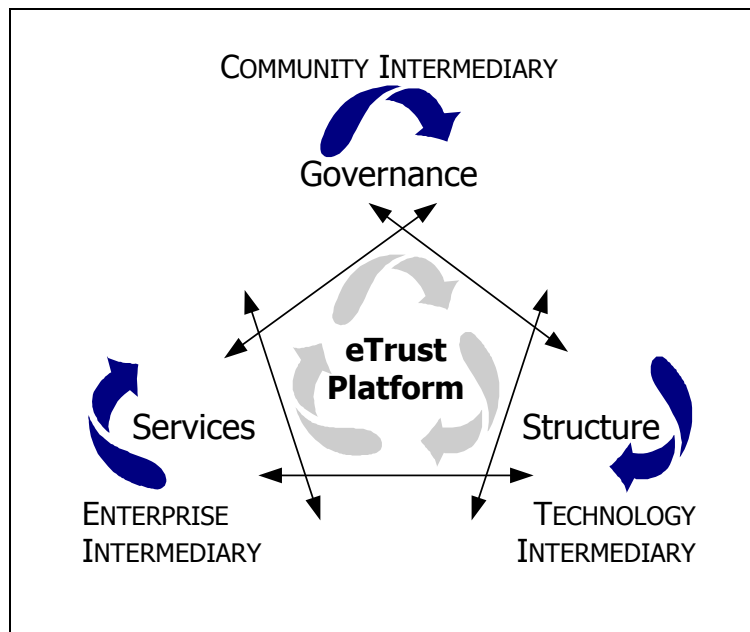


Figure 2. eTrust Platform (developed from Brown and Lockett 2001)

(iii) Dimensions and characteristics of aggregation

The concept of ‘aggregations of SMEs’ as a promising institutional arrangement to facilitate e-business engagement is central to the research. In order to use this concept, however, it is necessary to identify the dimensions and characteristics of aggregation. Table 1 seeks to do this by drawing directly from the cited literature, synthesising it and producing a template for use later.

Dimension	Key characteristics
Micro-level ties	
Resource flows	Evidence of activity links - support for access to shared resources as a means of mitigating uncertainties.
Mutual expectation	Evidence of resilient trust - strong existing social or experiential support the formation of resilient trust.
Information flows	Evidence of catalysts - IOS acting as brokers to enable cost-effective exploitation of informational synergies.
Economic	
Nature of transactions	Evidence of value activity - repeat or ad hoc.
Cost of networking	Evidence of internal and external costs - balancing of costs versus benefits. Impact of IOS and functionality.
Strategic	
Motivation	Evidence of scope and scale - cost savings through economies of scale by joint marketing or production.
Perspective	Evidence of intended and emergent strategy - awareness of actors of the strategic implications and opportunities.
Contingencies	Evidence of institutional and relational relationships - instigation of network from environmental conditions or from existing social linkages between actors.
Governance	
Distribution of property rights	Evidence of governance of property rights - contractual agreements govern the behaviour of actors.
Co-ordination mechanism	Evidence of governance of behaviour - relates to the rules of conduct and informal allocation of resources and responsibilities among actors.
Diffusion of innovation	
Change agent	Actors who influence others to encourage adoption of innovation by establishing relevance of innovation and facilitating communication.
Critical mass	Adoption of interactive innovations. Critical mass occurs when enough users have adopted the innovation for further adoption to be self-sustaining.
Intermediaries	Actors who specifically participate with service providers to promote adoption.

Table 1. Template for the dimensions of aggregation

The conceptualisations of the aggregation taxonomy (Figure 1) and the role of intermediaries (Figure 2), together with the analysis of aggregation dimensions (Table 1), provide a basis for the data collection and interpretation. This is discussed further in the next part, which provides an overview of the research methodology.

RESEARCH METHODOLOGY

The overall method of data collection and analysis was rooted in the concept of embedded case design as suggested by Yin (1994). This was appropriate given the novel, contemporary and phenomenological nature of the enquiry. As a general observation the fact that the established base of e-facilitated SME aggregations was very small meant that populating the sample frame was difficult and required each potential data source to be carefully explored. This resulted in the selection of 13 data sources detailed in the next section.

Selection of cases

In this research an aggregation of SMEs constitutes a case. The selection of cases was informed by the conceptualisations of the aggregation taxonomy and the nature and role of intermediaries, Figures 1 and 2 respectively. The aim was to identify cases in which there were trusted third parties, also known as community intermediaries. Within these cases a further distinction was sought between those that were committed to using a shared business application, and those that were not. A shared application is an application provided by a service provider, which engages a significant number of SMEs by addressing an important, *or critical*, shared business concern. In this context such applications can be termed critical e-aggregation applications, and the aggregation itself an e-aggregation. The role of the community intermediary in e-aggregations was an active one in the promotion and support of the application. In contrast in those aggregations in which there were no-users of shared applications, referred to as non e-aggregations, the community intermediary's role was passive with regard to the use of business systems applications. Although this distinction was recognised in the empirical research design it was not always possible to know in advance the user pattern within the aggregations and this added to the difficulty of sampling referred to above.

Description	Size	Aggregation type served
1. Newspaper trade association (NTA)	SME	Association
2. Laboratory supplies trade association (LTA)	SME	Association
3. Motor manufacturing trade association (MTA)	SME	Association
4. Company directors association (CDA)	SME	Association
5. Knowledge worker trade association (KTA)	SME	Association
6. Agricultural (dairy) college (AC)	Large	Cluster
7. Construction media company (CMC)	SME	Cluster
8. Organic certifying body (OCB)	SME	Cluster
9. Oil and gas industry organisation (OGO)	SME	Cluster
10. Media and broadcasting company (MBC)	Large	Network
11. Confectionery Manufacturer (CM)	Large	Network
12. Supermarket (construction) Lead Client (SLC)	Large	Network
13. Area business organisation (ABO)	SME	Limited

Table 2. Community intermediary data sources

A total of 36 potential organisations were identified from literature and Internet searches and these were approached in order to identify senior managers and negotiate access. A total of 13 community intermediaries, acting as TTPs, agreed to participate and between them they cover all the aggregation types identified in Figure 1. The community intermediaries are detailed in Table 2. Although the majority of the intermediaries are themselves SMEs in four instances a large company on behalf of the SMEs is undertaking the role of trusted third party. The final selection of cases, grouped according to the aggregation taxonomy and including their status in terms of e-aggregation application usage, is shown in Figure 3.

Degree of Structure	High	Association Knowledge workers Newspaper trade association Company directors Laboratories suppliers Motor manufacturers	Network Supermarket (construction) lead client Confectionery manufacturer Media & broadcasting company
	Low	Limited Area business organisation	Cluster Agricultural (dairy) college Organic certification body Construction media company Oil & gas industry organisation
		Low	High
		Degree of Integration	

**Figure 3. Final selected cases by aggregation type
(e-aggregations in bold)**

Data collection

Identification of suitable data sources was undertaken in 2000 and 2002, with the field investigations carried out between 2001 and 2003. Interview data collection took the form of semi-structured interviews with mostly senior managers in the organisations shown in Table 2. 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. The interviewees' views and experiences of working within an aggregation were captured through the use of the template (see Table 1). Most interviews were conducted on the participant's premises and lasted between 60 and

90 minutes. In many cases multiple interviews were conducted over a period of 18 months. Interview 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 websites, were collected in order to supplement interview data and achieve a triangulation of data sources.

Method and initial analysis

Data analysis was undertaken in parallel to data collection. This necessitated a methodical, systematic approach to the multiple site investigations. Specifically, explanation building, which is a type of pattern matching, was used across and within the sample groupings in order to produce defensible research findings. In this technique the goal is to build a structured narrative about each case. Yin comments that because “such narratives cannot be precise, the better case studies are the ones in which the explanations have reflected some theoretically significant propositions” (Yin, 1994: 110). In this research the declared in advance interpretive framework, especially the focus on the potential importance of aggregation and the role of intermediaries, proved valuable in preventing drift in what were complicated research situations.

The outcomes of the case interviews are presented in Table 3, which links the dimensions of aggregation with the different aggregation types.

Dimensions \ Aggregation type	Network			Cluster				Association				Limited	
(bold if in e-aggregation case)	SLC	MBC	CM	AC	OCB	CMC	OGO	CDA	KTA	LTA	NTA	MTA	ABO
E-Aggregation application	yes	no	no	yes	yes	no	no	yes	yes	no	yes	no	no
Micro-level ties													
Resources flows (activity links, asset specificity)	yes	limited	limited	yes	yes	limited	limited	yes	yes	limited	yes	no	no
Mutual expectation (resilient trust)	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Information flow (catalysts)	IOS	IOS	IOS	IOS	IOS	limited	limited	IOS	IOS	limited	IOS	limited	limited
Economics													
Nature of transaction (value activity)	repeat	repeat	repeat	repeat	repeat	ad hoc	ad hoc	repeat	repeat	ad hoc	repeat	ad hoc	ad hoc
Cost of networking (impact of ICT, functionality)	new	exist	exist	new	new	limited	limited	new	new	limited	new	limited	limited
Strategic													
Motivation (scope, scale)	high	med	med	high	high	med	low	high	high	med	high	med	low
Perspective (intended, emergent)	intend	intend	intend	intend	intend	intend	intend	intend	intend	intend	intend	intend	intend
Contingencies (institutional, relational)	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Governance													
Distribution of property rights (contractual agreements)	yes	yes	yes	yes	yes	limited	limited	yes	yes	limited	yes	limited	limited
Co-ordination mechanism (allocation of resources)	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Diffusion of innovation													
Change agent	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Critical mass (interactive innovations)	yes	limited	limited	yes	yes	limited	limited	yes	yes	limited	yes	limited	limited
Intermediaries (existing, new)	ASP	limited	limited	ASP	ASP	limited	no	ASP	ASP	limited	ASP	limited	no

Table 3. Trusted third party relationships to SME e-business engagement (e-aggregations in bold)

For each aggregation case the views, characteristics and activities of the community intermediary, acting as the trusted third party, are presented against the five aggregation dimensions and the sub characteristics from the original aggregation template (see Table 1). Of particular interest is the comparison between those TTPs associated with an e-aggregation (indicated by bold type in Table 3), and those that were associated with none e-aggregations. The two aggregation types are discussed, contrasted and summarised below.

Firstly *micro-level ties*: All e-aggregation trusted third parties (TTPs) displayed evidence of strong activity links supporting resource flows; non e-aggregation TTPs had limited or no similar activity links. All e-aggregation TTPs had inter-organisational information systems (IOS), which acted as a catalyst supporting information flows of many kinds; non e-aggregation TTPs had limited flows, except for the ‘network’ category, which also had inter-organisational systems in

place. All TTPs evidenced resilient trust allowing mutual expectations to be set and hence facilitated strong network formation.

Secondly *economics*: All e-aggregation trusted third parties (TTPs) had repeated value transactions; non e-aggregation TTPs had ad hoc transactions, except for the ‘network’ category, which also benefited from repeat business. All e-aggregation TTPs provided new functionality and the value was either actually or perceived by users to be greater than the cost of engagement.

Thirdly *strategic*: All e-aggregation TTPs are associated with high levels of scope and scale in relation to e-business engagement; non e-aggregation TTPs were associated with lower levels of e-business engagement. All TTPs had evidence of an intended strategy to support e-business engagement by SMEs and there were significant institutional and relational contingencies.

Fourthly *governance*: Whilst all trusted third parties (TTPs) had evidence of co-ordination mechanisms only e-aggregation TTPs and the ‘network’ category of TTP had evidence of contractual agreements supporting the distribution of property rights.

Finally *diffusion of innovations*: All TTPs had characteristics of change agents but only e-aggregation TTPs showed significant evidence of critical mass building, and used intermediaries (ASPs) extensively.

KEY FINDINGS

In relation to trusted third parties (TTPs) the above comparisons, and the wider case data, have given rise to three key findings namely (i) the importance of critical e-aggregation applications;

(ii) the potential for TTPs in facilitating SME e-business engagement; (iii) evidence of increased structure and integration.

(i) Importance of critical e-aggregation applications

All 13 community intermediaries confirmed the importance of SME-focused applications that attempted to address particular needs of SMEs within aggregations. In the five aggregations where a critical e-aggregation application was present, namely construction (SLA), dairy (AC), knowledge workers (KTA), newspaper media (KTA) and organic (OCB), the interaction between the community intermediary as the TTP and the enterprise intermediary as the provider of the e-application was stated to be pivotal factor in achieving the engagement of users. This collaboration between the two intermediaries – community and enterprise - helped to identify both the initial business needs of the SMEs within the aggregation, and any subsequent desirable modifications to the e-aggregation applications. Early examples of critical e-aggregation applications developed in this collaborative way were confirmed through the interviews including:

- Project management - for the construction industry
- Dairy herd management - for dairy farmers.
- Community management - for knowledge-based workers.
- Advertising artwork management - for artwork agencies in regional newspapers
- Field management - for the organic farming industry

In the main these critical e-aggregation applications were relatively new and in the early stages of development but already they appeared 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, small artwork agencies, had registered”. The community intermediaries reported that some service providers of critical e-

aggregation applications took the lead and developed the applications without a guaranteed market for the product. These service providers had identified community intermediaries early in the application's development and sought to establish collaborative arrangements that mitigated the risk.

All critical e-aggregation applications could be characterised as offering new functionality that was valued by aggregation members, was developed by interaction with community intermediaries and used a 'one-to-many' business model. On this basis these e-aggregation applications can be seen as 'critical' both in terms of functionality and perceived importance. The innovative nature of these 'critical e-aggregation applications' was the single most important factor reported by the trusted third parties (TTPs) for using the application. Critical e-aggregation applications, however, also brought both challenges and benefits to TTPs. For example in the field management application organic farmers (users) could use the online application provided by the enterprise intermediary to record crop history and yields. This enabled farmers to comply more easily with the certification requirements of the industry and helped to reduce fraud by providing a pan-European digitally certified audit trail. Larger users paid for this hosted critical e-application directly to the enterprise intermediary, but a reduced certification fee levied by one of the regulatory bodies, acting as community intermediary, in part offset this. This encouraged members to use this regulatory body but in turn required the regulator to develop new competencies, such as managing technical service level agreements. This was the new challenge to the regulator acting as the community intermediary. In the case of the project management application SME sub-contractors (users) benefited, at no financial cost, from using the critical e-application to access the project plan and better manage their own workload. It also gave access to other contract opportunities. In return, however, they were obligated to train their staff and use the shared

application for all aspects of the supermarket contract, irrespective of any other internal systems in place. The supermarket lead client, acting as a TTP, funded the critical e-application service fees on the basis of increased transparency, standardisation and shorter construction times.

(ii) Potential roles for TTPs in facilitating SME e-business engagement

In this empirical research all 13 data sources confirmed the importance of trust within the formation and development of SME aggregations engaged in e-business. There was recognition by many community 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 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 TTPs 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 want 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 as a trusted third party (TTP) had foreseen the possibility that of this new role or that it could have significant strategic implications.

The trusted third parties (TTPs) in e-aggregation exhibited several characteristics. Firstly, they deliberately worked with service providers (enterprise intermediaries) to appreciate the business needs within the aggregation and develop the e-business applications to meet these needs. Secondly, they were aware of the accumulation of valuable information about the aggregation resulting from interaction with the e-business application. Thirdly, they participated in activities that attempted to increase e-business application engagement of SMEs in the aggregation. These activities included (i) shaping users' perceptions, (ii) identifying and introducing the innovation to sub-groups within the aggregations, (iii) promoting (targeting) it to and through key actors, and (iv) providing incentives to early adopters.

These critical mass building activities by TTPs was evident, to a greater or lesser extent, in all five of the e-aggregations. For example, in the organic aggregation the certifying body sent a mailing to all producers promoting the benefits of the e-business application, and in the dairy case the agricultural college promoted the e-business application by seminars and through its farm advisors, thus shaping users' perceptions. Similarly in the construction case the lead client introduced the e-business application on a project-by-project basis. In the knowledge worker case the trade association encouraged highly active and knowledgeable members to act as moderators to focused web-based discussion forums, thus targeting key actors. Finally, in the organic case the certifying body offered a reduced first year inspection fee to users of the e-business application, thus providing incentives to early adopters.

In addition to the contribution made by the community intermediaries to the development of specific applications and to facilitating access to SMEs they had two further roles that derived directly from their TTP status. Firstly, as negotiators of the service fees charged either directly to

users or themselves. Secondly, they acted as negotiators for the service level agreement 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 project management application to be used by the designated network of contractors and sub-contactors. In nearly all instances the community intermediary indicated that SMEs appeared to rely heavily on them as TTPs to approve and hold the service level agreement with the service provider. Considering the importance of these 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 level agreements for complex e-business applications.

(iii) Evidence of increased structure and integration

There was evidence that critical e-aggregation applications increased both the degree of structure and integration within the aggregation. This observation indicates that the impact of critical e-aggregation applications could be of strategic importance as it changes the very nature of these inter-organisational networks. These complex e-business applications appeared to change the nature of the relationships within the aggregation. Firstly, regarding structure, which was defined as rules or regulations imposed on SMEs in an aggregation, all critical e-aggregation applications increased the degree of structure by standardising the format of information in order to facilitate information exchange. Secondly, the degree of integration was increased, to a greater or lesser extent, by the use of these critical e-aggregation applications. In the case of the construction aggregation it supported increased integration of project and specification management and in the dairy aggregation it allowed for comparison of nutritional information. In the case of the

knowledge worker aggregation it enabled collective action, establishing new contracting relationships, and in the media aggregation it enabled the transfer of artwork to regional newspapers. Significantly, the general effect of the critical e-aggregation applications was to move the inter-organisational networks towards the 'network' type (see Figure 4).

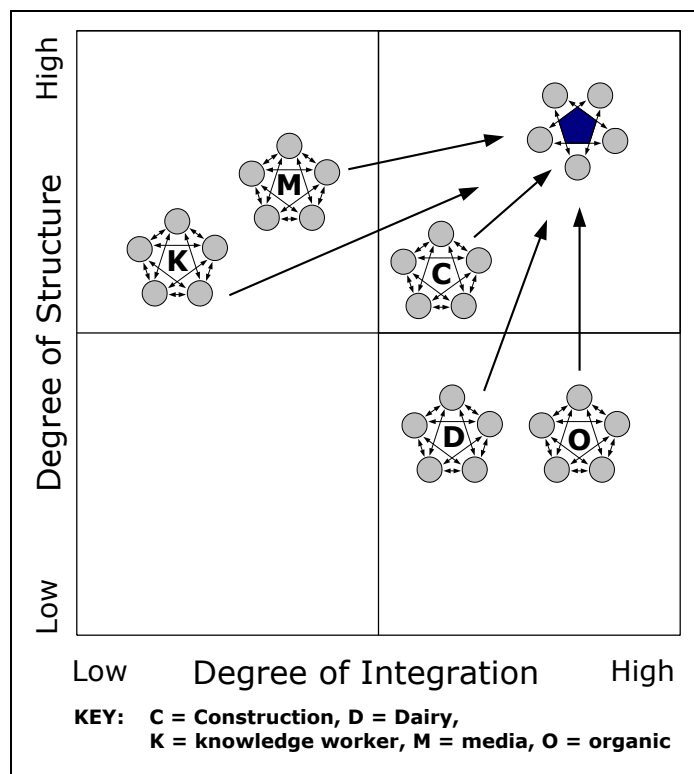


Figure 4. Impact of e-aggregation application in aggregations

CONCLUSIONS

In conclusion the role of community intermediaries, acting as trusted third parties (TTPs), appears to be central to the adoption of critical e-aggregation applications provided by service providers acting as enterprise intermediaries. Importantly, and for the first time, the research has demonstrated in Table 3 that community intermediaries associated with critical e-aggregation applications are more effective as TTPs and bring economic benefits to SMEs in these inter-organisational networks. The increase in repeat business and the benefits of information sharing are manifestations of this. In terms of their role the TTPs in e-aggregations have developed new

activities that are genuinely strategic such as fee and service level agreement negotiation, helping to identify the business needs within an aggregation and working with the enterprise intermediary to develop e-business applications. Importantly there was strong and compelling evidence that trusted third parties (TTPs) used existing relationships based on mutual trust to facilitate these roles. This appeared particularly important because of the confusion felt by SMEs due to the rapidly changing technological environment and emergence of new unknown intermediaries.

Theoretically, this specific research reinforces the Swan and Newell (1995) and Swan et al (1998; 2000) findings about the importance of intermediaries, in their case professional associations, in the role of innovation diffusion. Our research suggests that Swan and Newell's work is relevant to other kinds of community intermediaries. The research reported here adds to their work by emphasising the active technology transfer role of the TTPs Chakrabati and Rubenstein (1976) and by its explicit SME focus. Perhaps the most significant role these e-aggregation community intermediaries play is using their existing trusted relationships to encourage adoption by SMEs. In turn this grouping, or critical mass, of SMEs provides the basis for a 'one to many' business model for both the delivery and marketing of e-business applications. This is an economic perspective and embodies an explicit provider view: it contrasts with the user perspective of much of ICT adoption literature cited earlier (e.g. Lefebvre et al. 1991; Cragg and King, 1993; Walczch et al. 2000; Mehrtens et al. 2001; Windrum and Berranger, 2003). This balance is important since the argument running through this research is that increasing SME engagement in e-business is more likely through aggregations and through critical e-aggregation applications that can be delivered economically – this is the provider view.

In terms of theory relating to the network types this research adds to the classification literature especially that of Grandori and Soda (1995) and Cravens et al (1996) in two ways. Firstly, by introducing and demonstrating the usefulness of the aggregation taxonomy as an aid to comparison. Secondly, providing evidence that critical e-aggregation applications can increase the degree of structure and integration within an inter-organisational network, thus migrating the aggregation towards the 'network' type. This emphasises the dynamic, rather than fixed nature, of an SME's position within an aggregation.

For policymakers, the important role of critical e-aggregation applications in facilitating e-business engagement by SMEs has emerged as part of this research. There was little evidence of national or regional agencies having identified this as one possible method of achieving their stated objectives of increasing e-business engagement by SMEs. The one notable exception was the Information Technology Online (ITOL) program by the Australian government acting as a catalyst by funding projects to existing aggregations dominated by SMEs and offered strong supporting evidence of emergence of e-aggregation applications, identified in this paper (NOIE 2004). There have been 10 rounds of funding since 1996 resulting in the selection of over 100 collaborative e-business projects, which encourage the adoption of e-business solutions by SMEs, across a broad range of industry sectors and geographic regions.

In the North West of England there is an opportunity to explicitly support existing relationships within business markets by working with TTPs to facilitate the engagement of SMEs in advanced collaborative e-business applications. The region is particularly well placed to benefit because of the large manufacturing activity requiring efficient and effective supply chains that include large numbers of SMEs. As highlighted by this paper trusted third parties which exist at both national

and regional levels, such as trade associations, professional bodies, lead company or cluster supporting bodies, can facilitate SME e-business engagement by promoting and supporting the formation of e-aggregations. The resultant economic impact of these facilitated e-aggregations on the regional and national economies requires more research. The work reported here, however, suggests that potentially e-aggregations will have a major strategic impact as a result of the increased integration and structure in business networks that follows their introduction. Regional policymakers have the potential to motivate local trusted third parties to support the engagement of SMEs in a global infrastructure – the Internet. This research highlights that rather than being made superfluous by this global communications network the local and regional TTPs can play a critical role in promoting and facilitating e-business engagement by SMEs.

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