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**The Investigation of E-Business Engagement by SMEs with
reference to Strategic Networks and Aggregation: the Dairy
Farming Industry**

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The Investigation of E-Business Engagement by SMEs with reference to Strategic Networks and Aggregation: the Dairy Farming Industry.

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Abstract

The lack of anticipated engagement in e-business by small to medium sized enterprises (SMEs), who are an important contributor to economic activity, is of increasing concern to governments and service providers alike. This paper explores the use of a conceptual framework which includes theoretical contributions from ICT adoption by SMEs, strategic networks and inter-organisational systems and e-business models literatures in an industry specific context, in this case the UK dairy farming industry. Current levels of e-business engagement are considered together with evidence of aggregation and the role of intermediaries by the use of quantitative (survey) and qualitative (case study) methods. The example of the organic industry is investigated within the conceptual framework resulting in critical comment and validation in order to provide the basis for future multiple case investigations.

Keywords: e-business, SMEs, ICT adoption, I-ONs, aggregation, networks.

Introduction

This completed research paper sets out a conceptual framework against which one initial case study based on an aggregation in the dairy farming industry is considered. An aggregation means a grouping of enterprises engaged in similar or interdependent commercial activities. The research will form part of a wider comparison across additional industry sectors in order to deepen our understanding of the engagement of SMEs in e-business. E-Business is defined as the use of electronic communication networks to transact, process and collaborate in business markets. SMEs are defined as organisations of up to 250 employees and play an important part in any economy with 3.7 million in the UK generating 55% employment and 51% turnover (SBS 2002).

Before the Internet electronic interactions were based on proprietary networks, such as EDI protocols, and were mainly the province of larger companies primarily for reasons of cost. However, the advent of the Internet offered relatively low cost access to network infrastructure, which appeared to be particularly promising for smaller enterprises (Kalakota and Whinston 1996). This has been acknowledged by both international agencies and national governments. For example in the UK the Government has set three clear targets for the engagement of SMEs in e-business by the year 2002 (DTI 2001). The first was to ensure the connectivity of 1.5 million SMEs. This has already been exceeded and totalled 1.9 million by mid 2001. In contrast the second target of 1 million SMEs trading online has not been met with just 540,000 trading by 2002. A business is defined as trading online if it is engaging in both ordering and paying online with either customers or suppliers. A recent international benchmarking study highlighted the 'stalling or in some cases declining, willingness of businesses to trade online' (Booz Allen Hamilton 2002:116) 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 'e-adoption ladder' with each stage representing increased complexity. For this third target, presumably 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). SMEs in other leading economies exhibit similar traits, namely that with increasing complexity of e-business applications SMEs are proving slow to engage beyond elementary services (DTI 2001, EC 2002, Poon and Swatman 1999).

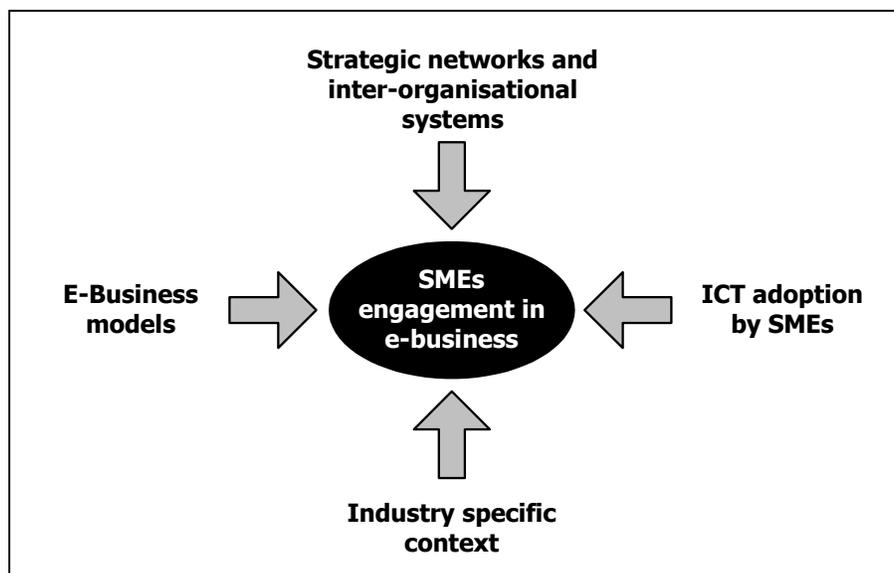
From a government policy perspective the behaviour of SMEs is of fundamental concern in that their lack of engagement could have important economic and societal implications. From a theory perspective the issues are significant and suggest that our understanding of SME behaviour and in particular their adoption of information and communications technologies (ICT) is too limited. To date, the majority of the research on ICT adoption (e.g. Cragg and King 1995, Iacovou et al 1995) has tended to focus on the technical or organisational factors underpinning adoption. However, the emerging pattern of SME practices and behaviours in the context of e-business suggest that the additional dimensions of application complexity, network relationships and industry specific context need to be incorporated into the theoretical perspectives.

The remainder of the paper comprises four sections, firstly the theory supporting the conceptual framework, secondly the methodology applied, thirdly the case narrative and finally the analysis and conclusions.

Conceptual framework

Three principal theory domains are relevant to the conceptual framework, namely: (1) ICT adoption by SME (2) strategic networks and inter-organisational systems, and (3) the emerging e-business models literature. A fourth non-theoretical dimension of the framework is the UK dairy farming specific context, Figure 1. Each is discussed briefly below.

Figure 1. Overall conceptual framework (Source: authors)



ICT adoption by SMEs

Studies on the adoption of ICT by SMEs are relatively recent but research antecedents are well established. Rogers' work (1962, 1995) on the diffusion of innovations, whilst neither IT nor SME focused, has been particularly influential. This work has been extended into the area of information systems by including: inter-organisational networks (Swan et al 1998); complex ICT (Newell et al 2000); the role of intermediaries (Swan and Newell 1995); e-business (Kendal et al 2001). Importantly

other work, however, has tried to develop better understanding of adoption in the specific context of IT and SMEs. Three strands of work can be identified, namely: strategic logic (Raymond 1985); complex processes of evaluation (Cragg and King 1993, Iacovou et al 1995); organisational stance (Southern and Tilley 2000).

Strategic networks, aggregation and inter-organisational systems

Particularly relevant here is the perspective of networks to help understand firm behaviour. Key areas include the delineation of the network, trust and the benefits and tensions of network collaboration and competition. This latter issue has been commented upon by Hamel and Prahalad (1994) and Jarillo (1988). Research has focused on network structure and embeddedness (Shaw and Conway, 2000) and the governance of networks (Johannisson 1998) with more recent work considering SMEs and networks and their contribution to promoting enterprise (Blundel and Smith 2001) and the role of ICT in SMEs networks. In particular the conceptual framework has been informed by micro-levels ties (Ebers 1997) including: resource flows through activity links (Dubois and Hakansson 1997); mutual expectation with trust (Ring 1997, Child and Faulkner 1998); information flows supported by catalysts be they actors (Lipparini and Sobrero 1997) or inter-organisational systems (Holland and Lockett 1997). The dimensions of strategy are included within the framework to specifically capture motivations (Child and Faulkner 1998), strategic perspectives (Jarillo 1993) and contingencies (Ebers 1997), which might facilitate the formation of aggregations, Table 1.

Table 1. Conceptual framework of aggregation dimensions (Source: authors)

Dimension	Sub-dimension	Authors
Micro-level ties	Resource flows	Ebers 1997; Dubois and Hakansson 1997; Ring 1997; Child and Faulkner 1998; Lipparini and Sobrero 1997; Holland and Lockett 1997
	Mutual trust	
	Information flows	
Governance	Intellectual property rights	Shaw and Conway, 2000; Johannisson 1998; Blundel and Smith 2001
	Co-ordination mechanism	
	Nature of transaction	
	Cost of networking	
Strategic	Motivation	Child and Faulkner 1998; Jarillo 1993; Ebers 1997
	Perspectives	
	Contingencies	
Diffusion of innovation	Change agent	Rogers 1962, 1995; Swan et al 1998; Newell et al 2000; Swan and Newell 1995; Kendal et al 2001
	Critical mass	
	Intermediaries	

E-Business models

This emergent literature includes insights into alternative business models and changing industry structures as a result of Internet technologies (Earle and Keen 2000, Kalakota and Robinson 2000, Tapscott et al 2000, Timmers 2000, Lockett and Brown 2001). When examining the uptake of e-business approaches amongst SMEs the concepts of collaboration, interdependence, power and trust will also provide important contributions. 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, remained unspecified. However the concept of aggregation addressed through new intermediaries is increasingly being recognised by many authors, including: aggregations (Mazzi 2001); B2B e-market maker (Kalakota & Robinson 2000); eClusters

(Brown and Lockett 2001); value-adding intermediaries (Earle & Keen 2000) and are linked closely with this research.

Industry specific context

Clearly different industries exhibit different internal competitive structures and modes of doing business. This reported research centres on the UK dairy farming industry which is characterised by its dependency on SMEs who provide 84% of employment and generate 75% of turnover, significantly higher than SMEs generally (SBS 2002).

Methodology

The primary aims of the wider research are to investigate the emergence of and potential for SME aggregation in facilitating SME e-business engagement. The conceptualisations of the eTrust Platform and a taxonomy of SME offline aggregations, Figures 2 and 3, were used help to shape the investigative process and research both theoretically and practically by assisting in the selection of data sources. This led to the following research indicative questions: What is the current position for SMEs with reference to e-business engagement?; What evidence is there of aggregations and what is their relevance to e-business engagement?; What are the potential roles for intermediaries in facilitating SME e-business engagement?

Figure 2. eTrust Platform (Lockett & Brown 2000)

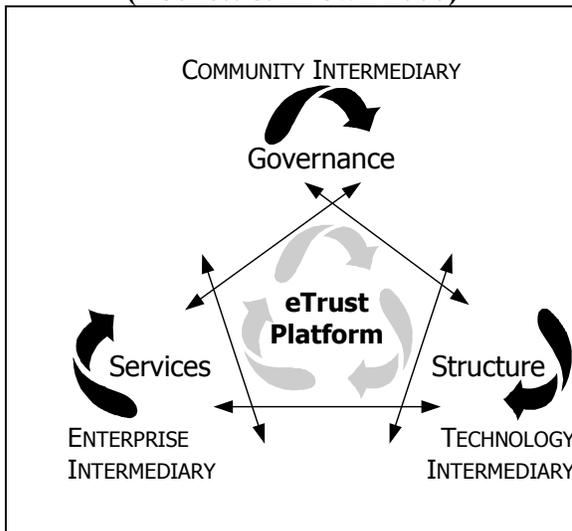


Figure 3. Taxonomy of offline aggregations (Lockett & Brown 2001)

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

The first question was met by a review of quantitative secondary studies regarding the adoption of e-business by SMEs. The two subsequent questions were explored by both quantitative (survey) and qualitative (case study) methods. The research was planned and carried out as three stages – sampling, data collection and analysis. Each is discussed briefly below using the dairy farming industry as the specific example.

Sampling

Potential aggregations were identified from the roles within the eTrust Platform conceptualisation and the taxonomy of SME offline aggregations. This led to the identification of a specific (network)

aggregation in the dairy industry using an online dairy management application (DMA) to assist in the management of nutrition and yields in dairy herds in the UK. The application service provider (ASP) and trusted third parties (TTP) were approached in order to gain access. 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. Two samples for quantitative survey were derived as follows: users – after negotiating with trusted third party, an agricultural college, access was given to the manager of an online dairy management ASP. Subsequently details of 15 users were provided; non-users – 125 dairy farmers were selected alphabetically from www.yell.co.uk online directory for Lancashire. The selection of non-users was independent of other participants.

Data Collection

Qualitative field investigations were carried out during 2001 and 2002. Interview data collection took the form of semi-structured interviews with mostly senior managers in relevant organisations. Semi-structured interviews covered: the context for e-business engagement and SMEs; the evidence and nature of aggregation, including governance and relevance of taxonomy; intermediary roles and actors; provider business models, including strategy, structure, processes, revenues, legal issues and technology. Interviews lasted between 60 and 90 minutes with interview notes being taken and combined with other supporting data to form case notes. Two quantitative surveys were conducted between January and May 2002 as follows: users – a jointly agreed letter of introduction was sent to 15 dairy farmers together with a questionnaire and a stamped address reply envelope. One email reminder was sent. No dairy farmer wished to complete the questionnaire by telephone interview. 8 valid responses were received.; non-users – a letter of introduction was sent to 125 dairy farmer together with a questionnaire and a stamped address reply envelope resulting in 27 valid responses being received. This limited number of responses provides illustrative rather than statistically defensible findings, however this data will be combined with three additional cases in order to provide an appropriate sample for future statistical analysis.

Analysis and Method

Qualitative data analysis was undertaken in parallel to the data collection. The unit of analysis was the aggregation. The overall method of data collection and analysis was rooted in the concept of embedded case design as suggested by Yin (1989). This necessitated a methodical, systematic approach to the multiple site investigations. Specifically the authors attempted to identify matching patterns (Yin, 1989:106) across and within the sample groupings in order to produce defensible research findings. Valid survey responses were included to illustrate key differences or similarities.

Profile of dairy farming case and narrative

This case centres on a dairy farming aggregation consisting primarily of trusted third parties (TTP), application service provider (ASP) and SME dairy farmers. The case is discussed within a conceptual framework derived selected literature on strategic networks, aggregation and inter-organisational systems.

Aggregation: Industry context

This case centres on the dairy farming industry aggregation consisting of SME dairy farmers. The case narrative comprises three elements, namely: the service provider, two trusted third parties and survey of users and non-users. The agricultural sector, of which dairy farmers are a part, is SME rich in that

statistically 100% of the enterprises have less than 250 employees (SBS 2002). The dairy industry has been affected by many structural changes in the past two decades. These include changes to the European Union's common agricultural policy and the fragmentation of the supply chain dominated by one single national governmental body, the milk marketing board, into large separate buying groups, large supermarket chains and food manufacturers. These structural changes have tended to reduce the margin of milk producers. In addition foot and mouth disease affected many regions in the year prior to the quantitative study.

Aggregation: formation

The dairy farming aggregation was formed from dairy farmers using an online dairy management application provided by an application service provider (ASP), which was a trading division of an agricultural college. The agricultural college was known to and trusted by all users prior using the online application. The service provider was not known by all users prior to using the online application but was closely associated with the agricultural college.

Actors: ASP – dairy management application provider (DMP)

Based on interviews with manager, and secondary data sources, such as web sites and documentation. The DMP application was been developed by a trading division of an agricultural college (AC). It offered an internet-based fully integrated dairy costings, quota management and information system for the dairy industry. Subscribers had access to AC research information and dairy costings. The application provided the following features: topical, technical and research notes; discussion forum, access AC dairy specialists; milk manager; benchmarking; quota milk manager; milk manager notes; cattle tracing scheme. The DMP application was a fully interactive milk costing system, operated by screen based input sheets to record physical and financial information about the dairy herd. The system recorded milk produced, milk sold, changes in cow numbers, feed used and other dairy expenses. DMP offered various options within application but the annual cost is around £200. On farm dairy consultancy was also available from AC at an average additional cost. It was the first dairy management system to be made available over the Internet with all physical and financial information being entered via a web browser. Reports could be produced and printed locally. All data entered was securely stored and remained confidential. The application was originally developed as a PC based application with data entered centrally from postal data sheets completed manually by dairy farmers. The manager stated that significantly more functionality was available with the online application, which could be provided economically by an ASP delivery model. The manager recognised the importance of a central database which could provide additional information regarding the dairy industry. Even though DMP was a division of AC it operated on a separate basis and worked with other service providers to deliver the online application.

Actors: TTP - agricultural college (AC)

Based on interviews with manager, and secondary data sources, such as web sites and documentation. AC was an innovative, knowledge-based organisation, which supported the development of rural industries and communities through specialist research and development resources including education and training provision, and expert services from farm advisors. AC's work was wide ranging but there was a particular emphasis on agriculture and related sciences, rural business development and management, food chain quality and safety, and rural resource and environmental management. It attempted to provide a mechanism for the transfer of knowledge and ideas, which emerge, both from its own research and development activities and from other expert sources. It was well regarded and trusted

within the farming communities to which it provided support and services. AC Dairy Services offered impartial advice on all aspects of dairy husbandry and management to dairy farmers. AC's independent expertise was backed by active research programmes and on-going trial work at AC run units. Through locally based dairy advisers AC dairy services covered all aspects of milk production from calf rearing through to the point of sale when the milk leaves the farm. AC promoted the use of the online application provided by DMP by using seminar and workshops at which both AC and DMP personnel presented.

Actors: TTP - confectionery manufacturer (CM)

Based on interviews with UK e-procurement and purchasing managers, and secondary data sources, such as web sites and documentation. CM was a large international food company with products serving many sectors, including confectionery. CM's first e-procurement priority was indirect expenditure purchased through both purchasing cards and e-procurement. The CM managers described their e-business strategy as a 'toe in the water' approach. CM had not yet decided whether to use its own e-marketplace or third party providers for purchasing from SMEs suppliers, partly due to uncertainty in service provision. CM was a founding member a consumer packaged goods industry consortium-lead e-marketplace. This e-marketplace had five elements, namely: tender, catalogue tools, supply, intelligence and fulfilment. There were clear benefits to larger suppliers and CM in using this e-marketplace but the managers acknowledged that it was difficult for SMEs to see the benefits. In the view of the CM managers the responsibility for cataloguing products needed, for cost and practical reasons, to be with SME suppliers. CM were considering recommending a third party e-marketplace through which they would buy indirect supplies from in order to reduce their risks and costs for smaller suppliers. The difficulties facing SME suppliers were the costs of updating different catalogues for different suppliers and the risk of choosing the wrong third party e-marketplace. For cost reasons CM stated it was not possible to use SME's own website to integrate into CM's internal e-procurement system and that education would be critical to reassuring SME suppliers that their products would not be devalued by using e-marketplaces. CM considered using a vendor independent service provider to manage and integrate the cataloguing activity. CM recognised it could have an important role in encouraging SME suppliers to use e-marketplaces but had not decided on a mechanism to achieve this. CM considered SMEs to be an important part of their business. In addition CM also had over 10,000 suppliers of direct goods including 1,000 farmers of whom 99% supplied CM exclusively. Demand for milk was higher than supply. There was an ongoing project considering the provision of an online dairy management application to reduce the administration and internal costs for dairy farmers. This project could provide positive benefits to dairy farmers and make them more loyal to CM. One possible business model being considered was for CM to fund the development costs and application usage fees, resulting in little or no cost to dairy farmers. It was too early in the project to say whether its use would be mandatory but CM had a history of working in partnership with smaller suppliers and were trusted by their dairy suppliers.

Survey

Illustrative findings from the survey of users of the online dairy management application and non-users within the wider aggregation are extracted in Table 2.

Table 2. Comparison (extract) between users and non-users. (Source: authors)

		Users	Non-users	df/ critical value at 0.05	t-test
Do you consider yourself to be part of a business network?	Yes	5	6		
	No	1	16		
How would you describe your attitude to e-business?					
	Positive	1	3		
	Mainly Positive	5	11		
	Neither	2	10		
	Mainly Negative	0	1		
	Negative	0	2	18	
	<i>Standard Deviation</i>	<i>0.641</i>	<i>1.013</i>	<i>1.734</i>	<i>1.441</i>
How would you describe your knowledge of e-business?					
	Good	1	1		
	Fairly Good	2	5		
	Neither	3	6		
	Fairly Poor	2	9		
	Poor	0	6	13	
	<i>Standard Deviation</i>	<i>1.035</i>	<i>1.156</i>	<i>1.771</i>	<i>1.794</i>
E-Business allows you to do same activities more efficiently?					
	Agree	1	4		
	Tend to Agree	6	7		
	Neither	1	11		
	Tend to Disagree	0	3		
	Disagree	0	0	21	
	<i>Standard Deviation</i>	<i>0.535</i>	<i>0.918</i>	<i>1.721</i>	<i>1.973</i>
E-Business allows you to develop new ways of doing business?					
	Agree	3	4		
	Tend to Agree	5	12		
	Neither	0	8		
	Tend to Disagree	0	1		
	Disagree	0	0	18	
	<i>Standard Deviation</i>	<i>0.518</i>	<i>0.779</i>	<i>1.734</i>	<i>2.559</i>
What has helped or encouraged you to use e-business applications (enablers)?					
Sales & Marketing	Important	3	2		
	Fairly Important	1	7		
	Neither	4	11		
	Fairly Unimportant	2	4		
	Unimportant	3	11	19	
	<i>Standard Deviation</i>	<i>1.498</i>	<i>1.290</i>	<i>1.729</i>	<i>0.750</i>
Operational	Important	8	7		
	Fairly Important	11	5		
	Neither	10	12		
	Fairly Unimportant	1	4		
	Unimportant	4	4	60	
	<i>Standard Deviation</i>	<i>1.237</i>	<i>1.289</i>	<i>1.671</i>	<i>0.998</i>

		Users	Non-users	df/ critical value at 0.05	t-test
Innovation	Important	8	5		
	Fairly Important	0	8		
	Neither	5	11		
	Fairly Unimportant	0	1		
	Unimportant	1	6	25	
	<i>Standard Deviation</i>	<i>1.301</i>	<i>1.319</i>	<i>1.708</i>	1.994
External	Important	2	2		
	Fairly Important	5	4		
	Neither	11	17		
	Fairly Unimportant	3	2		
	Unimportant	4	5	55	
	<i>Standard Deviation</i>	<i>0.961</i>	<i>1.074</i>	<i>1.673</i>	1.953
What is discouraging you from further use of e-business applications (barriers)?					
Security	Agree	4	21		
	Slightly Agree	12	8		
	Neither	5	3		
	Slightly Disagree	0	2		
	Disagree	0	4	55	
	<i>Standard Deviation</i>	<i>0.669</i>	<i>1.355</i>	<i>1.673</i>	0.380
Cost & Benefits	Agree	3	13		
	Slightly Agree	5	9		
	Neither	16	6		
	Slightly Disagree	7	4		
	Disagree	4	4	65	
	<i>Standard Deviation</i>	<i>1.078</i>	<i>1.376</i>	<i>1.669</i>	2.571
Infrastructure & Services	Agree	3	14		
	Slightly Agree	10	8		
	Neither	10	16		
	Slightly Disagree	4	5		
	Disagree	2	8	70	
	<i>Standard Deviation</i>	<i>1.066</i>	<i>1.390</i>	<i>1.667</i>	0.066
Information & Education	Agree	3	14		
	Slightly Agree	4	19		
	Neither	7	3		
	Slightly Disagree	6	8		
	Disagree	4	2	40	
	<i>Standard Deviation</i>	<i>1.274</i>	<i>1.196</i>	<i>1.684</i>	2.952

Conceptual framework comparison

In this section, and the final conclusions, the research outcomes are considered within the conceptual framework, especially the concept of strategic networks (aggregations), and in the qualitative case material. The survey data, which is obviously more limited is used for a general point of comparison.

Aggregation dimensions: micro-level ties

Resource flows through activity links: A shared information asset was created as part of the interactions between AC, DMP and users, whilst existing resources appeared unaffected. This was a potentially valuable resource for the AC, DMP and users.

Mutual expectation with resilient trust: Prior to using the application trusted relationships existed between AC and dairy farmers built up over previous interactions. The introduction of the DMP enhanced these existing relationships and adoption could in part be attributed to this resilient trust established over a long period.

Information flows supported by catalysts: The roles played by the online application, firms and individuals in facilitating and shaping the formation of a specific aggregation was evident in this case. There was strong evidence of a facilitation role of AC in promoting the use of the application.

Aggregation dimensions: governance

Intellectual property rights: The value of the new shared information asset was acknowledged by both DMP and AC and formed part of their business strategies. The farmer's interests appeared to be focussed on their dairy herd management needs rather than more generic uses of this information.

Co-ordinations mechanism: There was a service level agreement between DMP and farmers.

Aggregation dimensions: economic

Nature of transaction with value activity: The application increased the structure of the information component of the transactions between the DMP and farmers. In doing so it increased the perceived value both for the DMP and farmers.

Cost of networking: The users had to the bare any internal cost associated with Internet connectivity and a modest annual rental charge.

Aggregation dimensions: strategic

Motivation: The farmers believed that they would achieve: increased cost controls and access to leading research on herd management. SA and DMP were committed to supporting the user community and providing research information in a financially viable way.

Perspectives: The AC and DMP both identified important long-term benefits from developing and offering the application and their decision can be considered as strategic in matter. The users were less concerned with the wider opportunities emergent from the using the application but could identity benefits to their businesses.

Contingencies: At an institutional level SA played an important and central role in the formation of the aggregation having existing trusted relationships. At a relational level it can be seen that existing relationships between the participants inferred trust in the decision of farmers to use DMP.

Aggregation dimensions: diffusion of innovation

Change agent: The AC, through its farm advisors, played an important role in the recruitment of farmers.

Critical mass: The use, by AC and DMP, of previously identified methods for increasing adoption of interactive innovation were identified. AC and DMP: supported users by training and promoted the benefits thus shaping the users perceptions; initially deployed the application to existing offline users thus addressing intact subgroups and were considering developing relationships with other trusted third parties in different geographical regions.

Intermediaries: The role of AC in promoting engagement by farmers was critical as they were trusted by farmers and able to recommend the application through their farmer advisors. The role of DMP was fundamental to the formation of the specific aggregation with their provision of online dairy management application being a prerequisite.

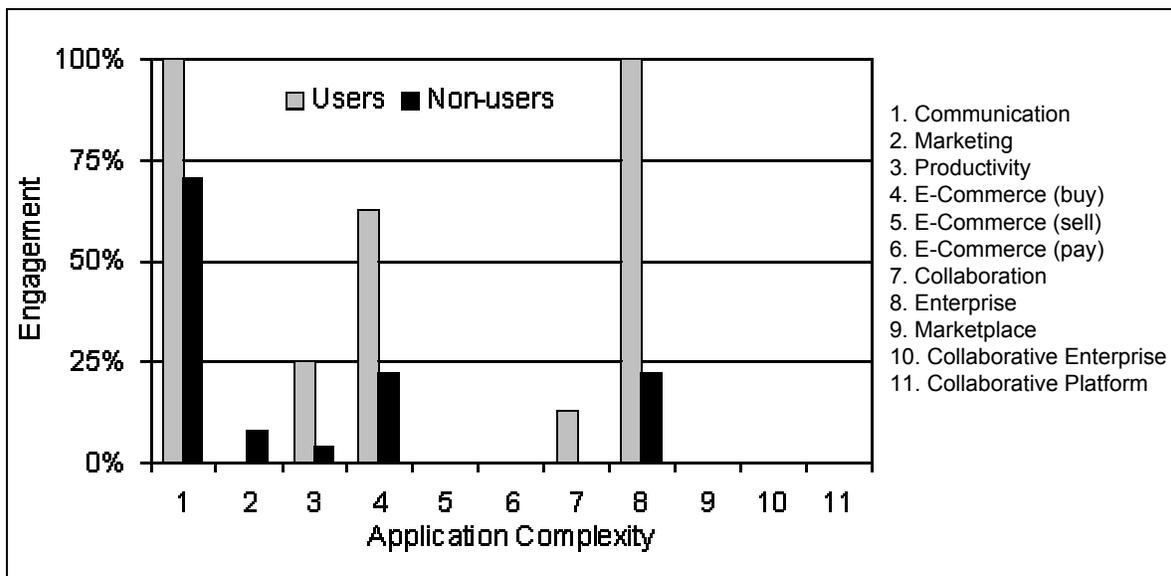
Conclusions

This case highlights the importance of the relationship, in this case exclusive, between the dairy application service provider (DMP) and the trusted third party (AC), a research and educational organisation, in developing an aggregation specific application for the dairy industry. The service provider initiated the application development however subsequently both the trusted third party and users became involved. Because of the closeness in the relationship between the DMP and AC it was difficult for the users to distinguish between the two entities. The dairy management application supported the business needs of dairy farmers by providing herd management and access to relevant research information, which nearly all users confirmed was of importance to their businesses. Users of the application were much more likely to consider themselves part of a business network. Interestingly confectionery manufacture, a large milk purchaser, was considering supporting its milk suppliers by providing a hosted dairy management application. The service level agreement was largely between the user and the service provider. Farmers paid a modest fee, directly to the service provider, for using the application and had high levels of trust for the service provider. Some of users had previously used a non internet-based application provided by the trusted third party and had migrated to the significantly enhanced hosted application. Users had high levels of ICT usage compared to non-users, who had very low levels of awareness of hosted aggregation specific applications. All users trusted the service provider. Users could be characterised as feeling part of a business network, having a positive attitude to e-business together with reasonable knowledge and experience of e-business. They largely agreed that e-business improved efficiency and enabled new ways of business. Users were more engaged in e-business regardless of application complexity than non-users, Figure 4. They were less concerned with barriers of cost and benefits, and information and education. They were more likely to identify innovation and external influences as drivers to adoption than non-users.

The specific aggregation exhibited many characteristics associated with I-ONs in particular at a micro-level the resource flows through activity links of the shared information asset, evidence of mutual expectation with resilient trust and information flows supported by the catalyst role of trusted third parties, inter-organisational information systems and individuals. Governance mechanisms were not

formalised for intellectual property right of the information repository but an service level agreement was in place between DMP and users. The economic effects of the applications were an increase in the structure of the information component and there was a perceived gain greater than internal and external costs. At a strategic level participants were motivated by longer term objectives, multiple perspectives converged on engagement in the application and there was institutional and relational level support for engagement. The emergence of the online application, its role in facilitating the formation of online networks and creating new value is not fully supported within the I-ON literature. This case also identified the creation of an information repository, which could be exploited by AC and DMP as an emergent property of the aggregation. There were characteristics associated with the diffusion of networks evident by a change agent, critical mass building and intermediaries. The role of the online application addressing business needs within the specific aggregation provides a possible additional factor for diffusion of interactive innovations.

Figure 4. E-Business engagement by producers. (Source: authors)



The conceptual framework proved to be a robust theoretical instrument for both shaping the investigation and structuring the research findings. However it did not anticipate the emergent property of the data accumulation from the specific aggregation and its potential subsequent economic and motivational value. The online dairy application plays an important role in engaging SMEs in higher complexity e-business applications. This is in direct contrast to recent studies, which assume linear adoption. Clearly further cases will need to be analysed in order to identify similarities across other aggregations but the research does indicate the potential importance of hosted applications that address business needs of a specific aggregation supported by trusted third parties in engaging SMEs in e-business. Practitioner communities, such as application service providers, will need to consider how the appreciation of the activities and business needs of SMEs influences the development of online applications. Simply to provide existing functionality in an online environment would not appear to be sufficient to guarantee high levels of engagement.

References

Blundel, R., and Smith, D. Business Networks Report, Small Business Service, UK, 2001.

Booz Allen Hamilton International e-Economy Benchmarking: The World's Most Effective Policies for the e-Economy, IAP, UK, November 2002.

Brown, D.H., and Lockett, N. "Engaging SMEs in E-Business: The Role of Intermediaries within eClusters," *EM: Electronic Markets*, (11:1), 2001, pp. 52-58.

Child, J., and Faulkner, D. *Strategies of Co-operation: Managing Alliances, Networks, and Joint Ventures*, Oxford University Press, Oxford, UK, 1998.

Cragg, P., and King, M. "Small Firm Computing: Motivators and Inhibitors," *MIS Quarterly*, March 1993, pp. 47-60.

DTI "Business in the Information Age – International Benchmarking Study," Department of Trade and Industry, 5340 UK, 2001.

Dubois, A., and Hakansson, H. "Relationships as Activity Links," in *The Formation of Inter-Organizational Networks* (Ebers, M. Ed), Oxford University Press, Oxford, UK, 1997.

Earle, N., and Keen, P. *From .com to .profit: Inventing Business Models that Deliver Value and Profit*, Jossey-Bass, San Francisco, CA, 2000.

Ebers, M. *The Formation of Inter-Organisational Networks*, Oxford University Press, Oxford, UK, 1997.

EC. "Benchmarking National and Regional E Business Policies – Stage 1 – Synthesis report 7," February 2002. European Commission.

Hamel, G., and Prahalad, C.K. *Competing for the Future*, Harvard Business School Press, MA, 1994.

Holland, C., and Lockett, G. "Mixed Mode Operation of Electronic Markets and Hierarchies," in *The Formation of Inter-Organizational Networks* (Ebers, M. Ed). Oxford University Press, UK, 1997.

Iacovou, C., Benbasset, I., and Dexter, A. "EDI and Small Organisations: Adoption and Impact of Technology," *MIS Quarterly*, (19:4), 1995, pp. 47-60.

Jarillo, J. *Strategic Networks: Creating the Boundless Organisation*. Butterworth Heinemann, Oxford, UK, 1993.

Johannisson, B. "Personal Networks in Emerging Knowledge-based Firms: Spatial and Functional Patterns," *Entrepreneurship and Regional Development*, (10:4), 1998, pp. 297-312.

Kalakota, R., and Robinson, M. *E-Business 2.0: Roadmap for Success*, Addison Wesley, NJ, 2000.

Kalakota, R., and Whinston, A. *Frontiers of Electronic Commerce*. Addison Wesley, MA, 1996.

Kendall, J., Tung, L., Chua, K., Ng, C., and Tan, S. "Receptivity of Singapore's SMEs to Electronic Commerce Adoption," *Journal of Strategic Information Systems*, (10:3), 2001.

Lipparini, A., and Sobrero, M. "Co-ordinating Multi-Firm Innovative Process: Entrepreneur as Catalyst in Small-Firm Networks," in *The Formation of Inter-Organizational Networks* (Ebers, M. Ed). Oxford University Press, UK 1997.

Lockett, N., and Brown, D. H. "A Framework for the Engagement of SMEs in E-Business," in *proceedings of the Americas Conference on Information Systems*, Boston, MA, 2001, pp. 656-662.

Lockett, N., and Brown, D. H. "eClusters and the Role of Intermediaries in enabling Digital Enterprise Communities of SMEs," in *proceedings of the Americas Conference on Information Systems*, Long Beach, CA, 2000, pp. 746-749.

Mazzi, P. "Small Business eBusiness: Bringing SMEs Online," at the IDC European eCommerce Forum 2001, International Data Corporation, 2001.

- Lockett and Brown Investigation of E-Business Engagement by SME: Dairy Farming Industry
- Newell, S., Swan, J., and Galliers, R. "A Knowledge-focused perspective on the diffusion and adoption of complex information technologies: the BPR example," *Information Systems Journal* (10), 2000, pp. 239-259.
- Poon, S., and Swatmann, P. "An Exploratory Study of Small Business Internet Commerce Issues," *Journal of Information and Management*, (35:1), 1999, pp. 9-18.
- Raymond, L. "Organizational characteristics and MIS success in the context of small business," *MIS Quarterly*, March 1985, pp. 37-52.
- Ring, P. "Processes Facilitating Reliance on Trust in Inter-Organizational Networks," in *The Formation of Inter-Organizational Networks* (Ebers, M. Ed). Oxford University Press, UK, 1997.
- Rodgers, E. *Diffusion of Innovations*. 1st and 4th Ed, Free Press, NY, 1962, 1995.
- SBS. www.sbs.gov.uk/statistics, accessed 05 September 2002.
- Shaw, E., and Conway, S. "Networking and the Small Firm," in *Enterprise and Small Business: Principles, Practice and Policy*. (Carter, R.S., and D. Jones-Evans. Eds.) Pearson Education, UK, 2000.
- Southern, A., and Tilley, F. "Small Firms and Information & Communication Technologies: (ICTs): Toward a Typology of ICT Usage," *New Technology Work & Employment*, (15:2), 2000.
- Swan, J., and Newell, S. The Role of Professional Associations in Technology Diffusion, *Organization Studies*, (16:5), 1995, pp. 847-874.
- Swan, J., Newall, S., and Robertson, M. "Inter-Organizational Networks and Diffusion of Information Technology: Developing a Framework", in *Information Systems Innovation and Diffusion: Issues and Directions*. (Larsen, T., and McGuire, E. Eds.) Idea Group Publishing, UK, 1998.
- Timmers, P. *Electronic Commerce: Strategies and Models for Business to Business Trading*, John Wiley & Sons, Chichester, UK, 2000
- Yin, R. *Case Study Research: Design and Methods*. Sage Publications, CA, 1989.