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The Strategic Impact of Vertical Application Service Providers: An SME Perspective

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ABSTRACT

Against a background of the low engagement of small to medium-sized enterprises (SMEs) in e-business this paper investigates the strategic impact of e-aggregation applications, provided by emerging vertical application service providers (VSP), and defined as 'an e-business application, promoted by a trusted third party, which engages a significant number of SMEs by addressing an important shared business concern within an aggregation'. By conducting quantitative surveys of four aggregations of SMEs using these applications (users) and comparing these results with similar enterprises who are not (non-users) the research shows that such applications can facilitate the e-business engagement by SMEs.

Keywords

E-Business, ICT, Adoption, SMEs, ASP.

INTRODUCTION

This completed research paper seeks to contribute to the understanding of the engagement in e-business by SMEs and in particular the strategic impact of complex e-business applications provided by the emerging vertical application service providers (VSP). Such applications, known as e-aggregation applications, can be defined as 'an e-business application, promoted by a trusted third party, which engages a significant number of SMEs by addressing an important shared business concern within an aggregation' (Brown & Lockett 2004).

SMEs are highly heterogeneous and typically represent over 99 percent, by number, of businesses in an economy. They contribute significant proportions of employment and turnover in the European and US economies. In the US there are over 25 million small businesses (less than 100 employees) representing 99 percent of enterprises, who provide 53 percent of employment and generate 47 percent of turnover (SBA 2003). Unsurprisingly in the context of the 'information society' governments see the adoption of information and communication technologies (ICT) by SMEs as crucial since the vast majority of new jobs, some 80 percent in Europe during the 1990s (CORDIS 2003), are generated by this sector. As an example in the UK the government has established policies to encourage the adoption of ICT by all enterprises and has set benchmarked targets to monitor progress. Recent studies suggest that this adoption is proving more difficult then anticipated.

> "the government target of having 1 million businesses trading online by 2002 *will be missed*…. the study has found a slowdown in the uptake of ICTs, and for micro and small businesses there has been a *clear reverse*….for larger firms, this slowdown reflects the high proportion of businesses already using ICTs. For micro and small businesses the slowdown is *less easy to explain*." (DTI 2003: 6).

To begin to understand the issues involved in e-business adoption we need to classify e-business applications, as there are significant differences between e-mail and e-marketplace applications both in terms of complexity and added value. The introduction of the EC (2003) E-Business Watch synthesis report used data collected in 2002 and represented an important move towards tracking e-business engagement across 15 industry sectors and over a range of e-business throughout all EU member states. The report concluded that *access* to ICT was no longer a barrier to e-business uptake with connectivity at 84% for small businesses. It stated "the use of e-mail and the www has become nearly ubiquitous in the business world" (EC 2003: 7). However this indicates an oversimplification evidenced by the tendency to equate e-business with e-mail and web access. A proposed classification for e-business adoption based on application complexity is shown in Table 1. Using this classification the most recently available survey data (EC2002; DTI 2002) was analysed to show the level of e-business engagement by SMEs in terms of application complexity, Figure 1.

Proposed classification	Examples	Complexity
Communication	E-Mail, web access	Very Low
Marketing	Website	Low
Productivity	Microsoft Office, intranet	Low
E-Commerce	Buying & selling online	Medium
Collaborative	Extranet	Medium
Enterprise	Financials, SFA, vertical applications	High
Marketplace	E-Marketplaces	High
Collaborative enterprise	SCM, CRM	Very High
Collaborative platform	Emerging platforms	Very High

Table 1. Classification of e-business application complexity (after Gillian et al 1999)

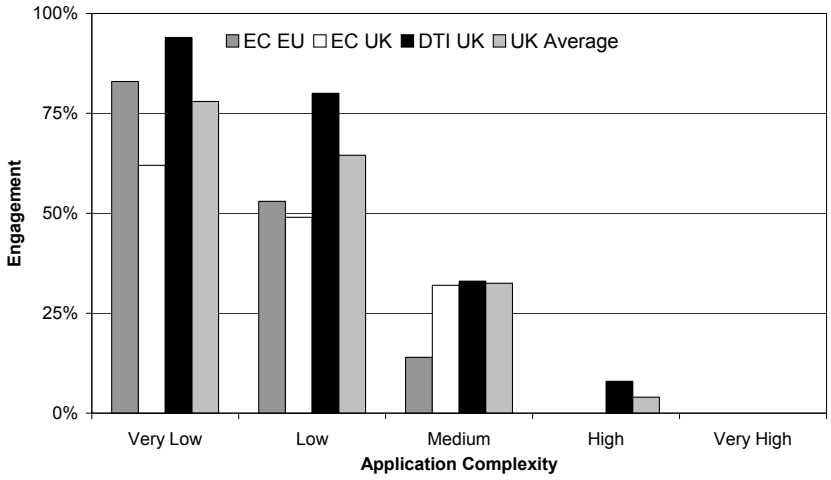

Figure 1. SMEs e-business engagement (updated from Lockett & Brown 2001)

In summary Figure 1 suggests that most SMEs appear comfortable with e-mail and web access (lower complexity, about 80%), are tentative with the use of the Internet for online buying and selling (medium complexity, about 30%), but have little or no engagement in the high or very high complexity applications, such as e-marketplaces, supply chains or inter-organszational collaborative networks (less than 10%). This is despite the early promise of ASPs facilitating such access to complex applications. Hence the trend in Figure 1 is not merely surprising in terms of the early expectations of engagement, but raises the important question of what this relative lack of engagement will mean not only for SMEs but also the larger organizations that have significant numbers of SMEs in their supplier networks.

It is against this background that this paper explores the evidence of the adoption or non-adoption of the higher complexity applications by SMEs. The paper is structured into four further parts: part 2 provides an overview of the literature framework; part 3 describes the methodology; part 4 presents the findings; and finally part 5 draws some conclusions with a view to informing both the theory and practice of e-business adoption.

LITERATURE REVIEW

The recent and rapid emergence of e-business applications has been primarily as a result of the availability of a low cost, ubiquitous electronic communication network, the Internet. Telecommunication, technology and service companies have emerged or evolved to provide a range of e-business services. Typically these are known as ASPs and defined as:

> "(providing) a contractual service offering to deploy, host, manage and rent access to an application from a centrally managed facility, responsible for either directly or indirectly providing all the specific activities and expertise aimed at managing a software application or set of applications." (Gillian *et al.* 1999).

However ASPs form part of the wider service provider (xSP) sector, which includes, storage service providers (SSP), content service providers (CSP), wireless ASPs (WASP) and others. ASPNews (2003) provided a directory of 1,720 companies involved in service provision and highlighted 235 vertical market ASPs, defined as providing support to a specific industry, which constituted 15 percent of the total number of companies involved in service provision. Desai and Currie's (2003) longitudinal research of 424 ASPs concludes similarly that 12 percent are vertical application service providers (VSP) with the remaining being classified as horizontal ASPs. This paper focuses on these minority VSPs and their role in engaging SMEs in industry specific higher complexity e-business applications, rather than the more dominant horizontal ASPs capable of offering services across multiple industries.

Given this context two areas of literature are explored. The first is the area of inter-organisational networks since higher complexity e-business applications are inter-organisational by definition, and for SMEs the only realistic route to such applications is via ASPs. The second area is that of ICT adoption by SMEs and is central to the paper.

Inter-organisational Networks (IONs)

Of particular interest in this paper is how the concept of aggregations of enterprises, be they online or offline groupings in a specific industry, use or might use e-business applications and how these applications are provided. Business groupings or aggregations is not a new concept with many businesses being fully aware of the importance of relationships within their industry, supply chain or trade association.

Particularly useful here is the perspective of networks to help understand firm behaviour, where networks are one of three institutional ways of organizing in business markets including markets and firms. 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 (1993). 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. The concept of a business aggregations is well understood and can encompass many forms of relationship, from local retail traders campaigning for improvements to their local infrastructure to the highly developed supplier-based networks of the motor manufacturing industry. Such aggregations are now characterised by IONs, which develop either to reduce costs (Zajac and Oslen 1993) or to increase revenue (Contractor and Lorange 1998) directly or indirectly or to mitigate risk in response to economic factors (Ebers, 1997). These emerging, stable, non-equity based collaborative arrangements have become increasingly important and have generally been termed strategic networks (Ebers, 1997). At the core of Jarillo's rationale for these networks is increased competitiveness through specialization, focus and size. This research takes strategic networks to be a type of ION. Other authors have in turn emphasized the change in market structures, the move to long-term focus and different firm behaviours as important factors in the formation of IONs (Powell, 1987; Oliver, 1990; Ebers 1997). There are many possible manifestations of the network form and many ways of classifying them. Grandori and Soda (1995) differentiate networks by the extent to which the links between organizations are formalized and networks are termed bureaucratic, social or proprietary. Aldrich and Glinow (1992) classify networks into personal and social networks and provide a basis for understanding the role of network as a broker within a set of relationships. In the context of SMEs the proposed taxonomy of aggregations links the degree of structure (informal to formal) to the degree of integration (independent to integrated), Figure 2. Within the broad concept of aggregation this taxonomy locates 'networks' as one form of strong or complex aggregation which can be contrasted with other weaker or simpler aggregation forms – a distinction which can be useful when considering the nature of an SME's engagement in an aggregation and the role of any intermediaries. Whilst online aggregation, at SME or industry level, was seen as a way of engaging the SMEs, consideration needs to be given to existing offline aggregations or groupings. SMEs operate in business markets comprising relationships within their supply chain or industry sector, which can range from simple to complex in nature. The degree of structure (informal to formal) and degree of integration (independent to integrated) provides a taxonomy 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 range from local business groups to more sophisticated organisations (Cambridge Network 2003)
- *Association* - including trade associations and professional 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.

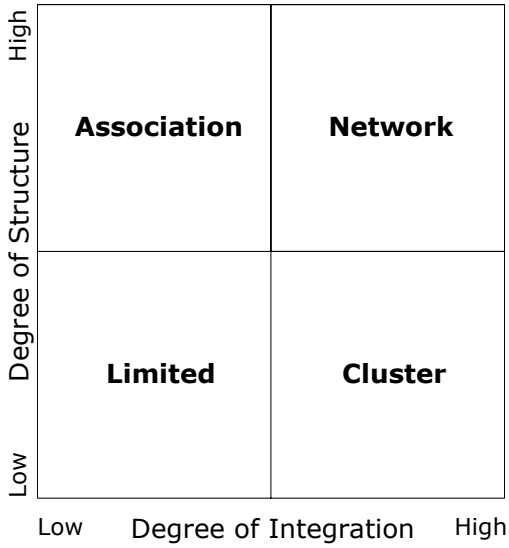

Figure 2. Taxonomy of aggregations for SMEs (Brown and Lockett 2004)

ICT adoption by SMEs

Many authors have tried to develop an understanding of adoption in the specific context of IT and SMEs. Three strands of work can be identified, which although overlapping can usefully be separated, namely strategic, technological and organisational. The first is that which emphasises the strategic logic in the decision to adopt information systems (IS) (Blili and Raymond 1993; Sadowski *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 by SMEs became more critical as technology became more central to their products and processes and concluded that IS planning needed to be integrated with business strategy. The notion of strategic information systems planning in SMEs is further developed in Levy and Powell (2000). This strand of research has resulted in frameworks, such as the 'focus domination model', to help position and integrate IS investments – one of which could be e-business applications. Within the latter the analysis of business activities and their strategic use of IS was considered by using, in part, the McFarlan's 'strategic grid' (1984), consisting of factory, support, strategic and turnaround. Levy and Powell (2000: 259) found that IS were predominantly located in support (63%) and to a lesser extent in factory (28%) and strategic (11%) with no evidence of turnaround. They concluded that the use of strategic IS by SMEs "is firmly directed at improving the operation with limited appreciation of the value of strategic information". A second technological strand, and arguably the most prolific, has seen adoption as an outcome of a complex process of evaluation, frequently informal, by SMEs of multiple factors both external and internal. These factors are frequently cast as enablers or barriers to adoption (Cragg and King 1993; Thong and Yap 1995; Mehrtens *et al.* 2001; Stansfield and Grant 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 (but not necessarily Internet-based) these findings may be particularly relevant in the adoption of similar higher complexity e-business applications. The third strand is that which takes an explicit organisational stance, and frequently that of the owner-manager and the social parameters within which the firm operates. As such the approach counters the strategic or technological emphasis of the first two strands (Blackburn and McClure 1998; Dierchx and Stroeken 1999; Fuller and Southern 1999; Southern and Tilley 2000; Hussin *et al.* 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" (2000: 152). In the context of the adoption of increasingly complex e-business applications this view appears highly pertinent. Much research on the adoption of ICT by SMEs has tended to assume progressive adoption (DTI 1999; Willcocks *et al.* 2000; Rao *et al.* 2003). Interestingly non-linear ICT adoption models for SMEs have emerged, including Dixon *et al.* (2002) who concluded "the typical linear model of ICT adoption may be inappropriate".

METHODOLOGY

The research required access to adopters and non-adopters of the higher complexity e-aggregation applications – hereafter termed users and non-users. For the former five VSPs were approached resulting in permission being obtained in four cases. Having established this co-operation quantitative questionnaire based survey research was undertaken in four specific industry sectors. Non-user samples from within the same four industry sectors were identified and a survey was conducted using a modified questionnaire. In order to support comparison it was important that the user and non-user samples were independent of each other. Details of the survey sample are summarised in Table 2. For the user survey because the absolute number of users is small populating the sample frame was governed by what was available, rather than some empirical ideal. Comparative analysis between the two sample groups, namely users of e-aggregation applications and non-users within the wider aggregation, was undertaken at a combined level i.e. all four specific industry sectors together. This was a deliberate part of the empirical research design necessitated by the low number of e-aggregation application users available. The quantitative survey sought data of two kinds. Firstly, data on the factors which enabled or inhibited the adoption of high complexity e-business applications and secondly, data on the complexity of their current e-business applications. Although the quantitative survey detailed in this paper was the main empirical research instrument qualitative interviews with representatives of the four sectors was carried out to provide further context and interpretation.

Aggregation	Users (*application*)	Non-users
Construction (Network)	Details of 15 SME users of a *project management* application were provided by an account manager. A jointly agreed letter of introduction was sent to each contractor. These contractors were then telephoned. 10 valid responses were received.	125 building contractors were alphabetically selected from an online directory for NW England. A letter of introduction was sent to each. 18 valid responses were received.
Dairy (Cluster)	Details of 15 SME users of a *herd management* application were provided by an ASP account manager. A jointly agreed letter of introduction was sent to each dairy farmer together with a questionnaire. 8 valid responses were received.	125 dairy farmers were alphabetically selected from an online directory for NW England. A letter of introduction was sent to each. 27 valid responses were received.
Knowledge worker (Association)	Access users of a *community management* application was negotiated with the chief executive and marketing manager. A jointly agreed request was e-mailed to members requesting completion of an online questionnaire. 19 valid responses were received.	125 accountants; solicitors; financial advisors; and surveyors were alphabetically selected an online directory for NW England. A letter of introduction was sent to each. 21 valid responses were received.
Organic (Cluster)	The manager of the *organic field management* ASP was interviewed and subsequently provided details of 6 SME users in the UK. These producers were e-mailed a jointly agreed statement and questionnaire requesting a telephone interview. 5 valid responses were received.	125 organic producers were selected alphabetically from an online directory for England. A letter of introduction was sent to each producer. 38 valid responses were received.
Total	43 valid responses	104 valid responses

Table 2. Selection and data collection for survey research.

The sum of the four surveys for each sample group were combined in order to enable statistically significant differences to be highlighted. In both independent samples the number of responses was greater than 30 (being 43 for users and 104 for non-users) and the independent parametric t-test could be applied.

The following hypotheses were developed:

The null hypothesis H_0 is: the values for the user and non-user groups are equal.

The alternative hypothesis H_1 is: the values for user and non-user groups are not equal.

FINDINGS AND DISCUSSION

Comparison between the two sample groups in terms of the factors facilitating or inhibiting adoption was undertaken at a combined level and is shown in Table 3. The analysis of current e-business applications is shown in Figure 3.

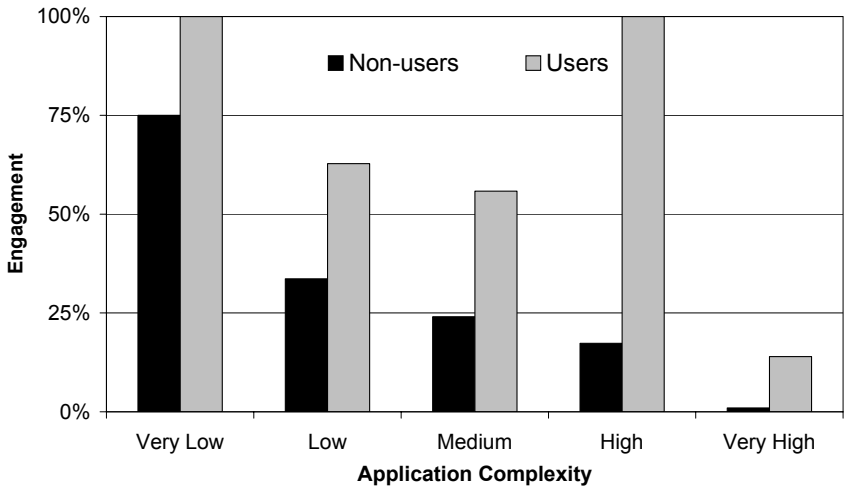

Figure 3. E-Business engagement by SMEs

* indicates a significant difference (greater that 0.05 or 5%)		df	Critical Value % 5.0%, 2.5%, 1.0%	t-test
1. Characteristics of SMEs				
Attitude to e-business	*	100	1.660, 1.984, 2.364	4.260
Knowledge & experience of e-business	*	85	1.663, 1.988, 2.371	3.403
E-Business allows you to do same activities more efficiently?	*	100	1.660, 1.984, 2.364	4.855
E-Business allows you to develop new ways of doing business?	*	95	1.661, 1.985, 2.366	2.285
2. Enablers				
Sales & Marketing	*	100	1.660, 1.984, 2.364	1.864
Operational		100	1.660, 1.984, 2.364	0.466
Innovation	*	100	1.660, 1.984, 2.364	4.642
External		100	1.660, 1.984, 2.364	0.564
3. Barriers				
Security		100	1.660, 1.984, 2.364	1.193
Cost & Benefits	*	100	1.660, 1.984, 2.364	5.130
Infrastructure & Services		100	1.660, 1.984, 2.364	0.711
Information & Education	*	100	1.660, 1.984, 2.364	3.870

Table 3. Statistically significant differences between users and non-users.

For the factor analysis in Table 3 in order to accept or reject the null hypothesis the significance level, degrees of freedom (df) and one-tail tests were calculated. For there to be a significant difference the null hypothesis was rejected if the critical value is less than 0.05 or 5 percent and therefore the alternative hypothesis is accepted. The survey results are presented in three categories:- (1) the meta-level characteristics of the SMEs, (2) the factors or 'Enablers' that are likely to influence adoption and (3) the factors or 'Barriers' likely to inhibit adoption. This grouping of the enablers and barriers to e-business engagement by SMEs assisted in comparisons with secondary data.

In terms of the meta-level analysis all four of the measured characteristics were significantly different between users and non-users of the e-aggregation complex business applications. In short the users were more positive about e-business

generally (not just about their own e-aggregation applications), more knowledgeable and more experienced than non-users. Users are significantly more likely to agree that e-business allows the same activities to be done more efficiently and allows new ways of doing business to develop. Regarding the analysis of enablers or drivers for e-business engagement a clear distinction emerged. Users are significantly more influenced by sales and marketing factors and innovation opportunities than non-users, whereas for the operational and external drivers to e-business engagement (such as supply chain pressures) there is no difference between the two groups. This finding is surprising since for large companies the attraction of operational savings, which translate directly into increased profitability, has been a very important factor in their adoption of e-technologies and for many service providers the assumption has been that SMEs would follow. This assumption was confirmed by the qualitative interviews. Finally from Table 3 the data relating to the barriers to the adoption of e-business also exhibits differences between users and non-users. Users are less likely to see costs and education as barriers and this could be anticipated. However in terms of security and infrastructure issues both are acknowledged as barriers and there is no difference between the attitudes of the two groups.

Turning to Figure 3, which measured the e-business engagement across the whole spectrum of complexity, there are significantly higher levels of e-business engagement by users of e-aggregation applications in the four aggregations surveyed compared with non-users. This is true at all levels of complexity. Self evidently all users had Internet connectivity and were engaged in complex e-aggregation applications compared to non-users being 75% and 17% respectively. Importantly however users had significantly higher levels of engagement in low (63%), medium (56%) and very high (14%) complexity applications compared to non-users being 34%, 24% and 1% respectively. In particular the difference at medium application complexity was over twofold (24% to 56%) compared with non-users. The survey of users of e-aggregation applications strongly indicates that the adoption of e-business was not linear indicating that factors other than application complexity influenced the adoption decision.

The final measurement concerned the perception by the surveyed SMEs of their involvement in a wider business network. All firms operate within networks of suppliers and customers but the users in this survey were significantly more likely to consider themselves part of a business network (66%) than non-users (35%) – the users were more network aware. Clearly aggregation has the potential to play an important role in the engagement of SMEs in e-business either by reinforcing existing relationships and creating new ones or simply as a mechanism for facilitating economic service provision of complex e-business applications.

In terms of comparisons with secondary data it is only possible to compare the engagement of SMEs in e-business (Fig 1) with the non-users of e-aggregation applications in our sample. There is little difference which is reassuring and suggests that the four aggregations selected in this survey (Table 2) are not untypical of SMEs generally

CONCLUSIONS

In conclusion both the secondary studies and the non-user survey indicate high levels of connectivity and usage of very low complexity applications, such as e-mail and web browsers, amongst SMEs in the UK and Europe. One recent study concluded that SME connectivity was static or declining (Oftel 2003) and another that connectivity was no longer a barrier to e-business engagement (EC 2003). This suggests that most SMEs appeared comfortable with e-mail and web access (lower complexity). However as application complexity increased levels of engagement declined significantly indicating that SMEs are tentative with the use of the internet for online buying and selling (medium complexity), but had little or no engagement in the high or very high complexity applications, such as e-marketplaces, supply chains or inter- organisational collaborative networks. In direct contrast to these studies and the non-user survey there was evidence of SMEs engaged in complex e-business applications, most noticeably in e-aggregation applications, and that these users had significantly higher levels of engagement in other e-business applications. It was not possible to conclude either way if this difference was due to the use of the e-aggregation application or that users had a higher usage of ICT previously. However in our qualitative discussions both behaviours were confirmed in all aggregation types (Fig 2). One conclusion that can be drawn is that engagement in an e-aggregation arrangement, which provides access to an aggregation specific complex application, has been a positive experience – users do not withdraw from, or lessen, their commitment to e-business applications of all complexities. Clearly there are messages from this research for VSPs both in terms of the factors that most interest SMEs and the positive impact of industry specific applications. However the absolute numbers of SMEs engaging in complex e-business applications remains very small and much more work is required to better understand the motivations of SMEs and the factor conditions that would accelerate adoption. This early work has highlighted the potential of e-aggregation applications in facilitating SMEs engagement in higher complexity e-business applications and makes an important contribution to our understanding of adoption behaviour of small firms in the context of inter-organisational networks.

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