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THE ADOPTION OF CONSORTIUM B2B E-MARKETPLACES: AN EXPLORATORY STUDY

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ABSTRACT

Despite the considerable number of electronic B2B marketplaces formed and the benefits cited as arising from their use, many have gone out of business. This exploratory study seeks to provide a qualitative exposition of the specific factors influencing the adoption of consortium-owned B2B e-marketplaces. The study is based upon case studies of twelve companies trading through three different consortium B2B e-marketplaces. Twenty-six specific factors are identified and their impact on adoption is discussed. The identification of a significant number of factors specific to this domain provides real meaning and depth to those interested in the future of e-marketplaces. In particular, the factors identified provide those that operate such e-marketplaces with a detailed and actionable understanding of the issues they should address in order to survive, and provide users or potential users of consortium marketplaces with a practical framework with which to assess individual marketplaces. The factors can also form the basis of future studies of other types of marketplaces and of quantitative studies of adoption.

KEYWORDS: electronic marketplaces, B2B e-commerce, adoption, diffusion of innovation, case studies

THE ADOPTION OF CONSORTIUM B2B E-MARKETPLACES: AN EXPLORATORY STUDY

INTRODUCTION

Business to business (B2B) electronic marketplaces, or e-marketplaces, have been in existence for over a decade, in which time they have been used to trade a wide range of goods. The development of the Internet caused heightened interest in this type of inter-organisational system (Kaplan and Sawhney, 2000), and the number of new e-marketplaces grew rapidly in 1999 and 2000. By 2001, Laseter et al. (2001) identified 2,233 e-marketplaces. This contrasts starkly with the 750 active e-marketplaces registered on the directory of trade organisation eMarket Services in mid 2006. Many early e-marketplaces failed, high-profile casualties including Chemdex, MetalSpectrum, GoFish and E-Chemicals (Miller, 2001; Karpinski, 2001). More recently even the best-known marketplace, Covisint, has experienced difficulties (Arbin and Essler, 2005), having evolved from a collaborative venture established by leading automotive companies such as Ford, GM and Daimler-Chrysler, to one that by 2006 was independent of the automotive industry (in terms of its ownership) and that offered services to healthcare companies.

These failures seem to be mirrored in relatively low levels of adoption, though quantitative data is patchy. Research by the European Commission (2004) found that across multiple industries, on average 11% of organisations used electronic marketplaces for at least part of their trading. The sectors with the highest level of adoption were transport and equipment, with 32% and 28% of organisations adopting respectively. Textiles and healthcare were the lowest with 4% and 5% adoption rates. A number of specific marketplaces are thriving, however: for example, SupplyOn, an e-marketplace in the automotive sector, became profitable in 2003 with revenues of 18 million Euros; and in early 2005, Exostar, an e-marketplace in the aerospace industry, was supporting over 20,000 companies and conducting over 700,000 transactions every month, after making its first operating profit in 2003.

There has been much speculation as to why adoption of e-marketplaces has seemed relatively slow. Wise and Morrison (2000) attributed the “sparse transaction volumes” and “low levels of revenue” to the emphasis in e-marketplace functionality on competitive bidding and on helping buyers find

new suppliers. They believed that this caused marketplaces to fail to attract sellers, leading to low levels of transactions, and thus of revenue. Other authors have cited insufficiently developed standards (Albrecht et al., 2005); the characteristics of the particular vertical market (Yadav and Varadarajan, 2005); and a lack of trust between buyers and suppliers (Ratnasingam and Pavlou, 2005). There has been little systematic study, though, of this mismatch between early expectations and the experience to date. This leaves researchers and practitioners alike unsure as to how important the e-marketplace will become to business-to-business relationships, and unclear on how they can evaluate whether a given marketplace will flourish.

This paper therefore reports on an exploratory qualitative study that identifies factors influencing the adoption of B2B e-marketplaces. Our focus is on consortium marketplaces as these have been hypothesised as most likely to be sustainable (Devine et al., 2001). Our method involves twenty-five interviews with twelve organisations that trade through three B2B e-marketplaces as well as with managers within the marketplace organisations themselves. We start with five variable groups derived from the work of Rogers (2003) and others which have been found to influence adoption across a wide range of innovations. We identify twenty-six sub-factors of these five variable groups that give specific meaning and depth to the variable groups within this domain. We also report on the extent to which these sub-factors influence adoption within the sample, and discuss some of the respects in which they appear to interact. This identification of the sub-factors specific to this domain may assist those that operate consortium e-marketplaces through a detailed and actionable understanding of the issues they should address in order to survive. Similarly, it provides users or potential users of such marketplaces with a practical framework with which to assess individual marketplaces and could form the basis of similar studies of other types of B2B e-marketplaces.

The paper begins with a concise literature review on e-marketplaces and on diffusion of innovation theory. After reporting the method and specific sub-factors identified by the study, a broader discussion of how the cases undertaken relate to extant literature and the additional insights that this provides for the adoption of e-marketplaces is presented. Finally, implications for researchers and practitioners are drawn.

E-MARKETPLACES: DEFINITIONS, CATEGORISATIONS AND ADOPTION

In this section we will present a definition of e-marketplaces that appears to be gaining acceptance in the literature, discuss classifications of e-marketplaces and consider the impact of the use of e-marketplaces on organisations relative to other forms of trading.

It will often require a number of years for the definition of a new phenomenon to be generally accepted by those involved in the domain. Consistent with this, various definitions of e-marketplaces have been proposed, many of which have required revision as the technology on which the marketplaces are based and the services they offer have evolved (e.g. Bakos, 1991; Strader and Shaw, 1997). We adopt as our working definition that of Howard et al. (2006 p.53), who suggest that consensus may be building around a definition taken directly from earlier studies in this domain as follows: *'web-based systems that link multiple businesses together for the purposes of trading or collaboration'*.

Le (2005) provides a comprehensive set of e-marketplace classifications. One basis of classification he includes and which is frequently referred to in the domain is the number of owners and their role in the marketplace (Krammer et al., 2001; Karpinski, 2001). Three classes of marketplace ownership are commonly identified. Firstly, third party or public marketplaces are owned and operated by one or more independent third parties. Partsbase is an example of this type of marketplace, helping its 16,000 users in the global aerospace and defence industry to source airline parts. Secondly, consortium marketplaces are formed by a collaboration of firms that also participate in the marketplace either as buyers or suppliers (Devine et al., 2001). An example is Elemica in the chemical industry. Founded by twenty-two industry participants, it offers services in the area of transport management, supply chain planning and procurement. Thirdly, a private marketplace is an electronic network formed by a single company to trade with its customers, its suppliers or both (Hoffman et al., 2002). VW Group Supply provides an example, being established as a private marketplace for Volkswagen to integrate with its suppliers, facilitating inter-organisational processes in the areas of procurement, supply chain management and quality management. It has been suggested that the ownership model of an electronic marketplace will impact its ability to attract users and hence its sustainability (Ordanini et al., 2004; Milliou and Petrakis, 2004). Consortium marketplaces were identified as most likely to be sustainable (Devine et al., 2001), as the founders can introduce their own customers and suppliers to the marketplace, helping the marketplace establish a viable level of transactions – a ready source of buyers and

suppliers not available to third party marketplaces. Additionally, and in contrast to a private marketplace, a consortium marketplace by definition is open to a number of buyers and suppliers in the industry, if not all, increasing the likelihood of participation and use. Whilst some consortium marketplaces despite these favourable characteristics have not proved sustainable (Arbin and Essler, 2005), consortium marketplaces have tended to fare better than the other ownership models (Le, 2005).

Another means of categorising e-marketplaces is on the basis on functionality. Some authors extend the view of e-marketplaces beyond the core procurement process to areas such as collaborative project management (Dai and Kauffman, 2002), design collaboration (Grieger, 2004) and supply chain planning (Rudberg et al., 2002).

We now turn to issues that are likely to influence the adoption and continued use of e-marketplaces. In a theoretical study, Ratnasingam et al. (2005) identify antecedents to the adoption of e-marketplaces in a given industry as: ease of IT connectivity, widely adopted IT standards, acceptable security levels and uniform product descriptions. These are all technical in nature. The study of e-marketplace adoption in the cotton industry by O'Reilly and Finnegan (2005) suggests that these technical aspects are complemented by economic and social factors. In particular, they find that e-marketplace adoption is dependent upon organisational fit, 'value added' and trust. An ownership and governance structure that engenders trust is also identified as important in attracting a critical mass of users by Gengatharen and Standing (2005) in their study of the adoption of regional e-marketplaces by SMEs.

In their study of e-marketplaces in the automotive sector, Howard et al. (2006) identify a number of barriers to the adoption of e-marketplaces - factors that are likely to dissuade organisations from taking the initial decision to adopt a marketplace. These include at the industry level, the competitive nature of the industry and supplier resistance, and at the firm level, legacy IT systems and limited e-leadership skills. These barriers are consistent with Arbin and Essler's (2005) study of the e-marketplace Covisint, which found it had *'several problems: lack of incentives for suppliers to join, lack of participating organisations on the suppliers' side and an overall inability to balance the interests of and objectives of the actors involved'*.

Howard et al.'s (2006) study also provides evidence of the benefits that have been realised by organisations using e-marketplaces which, if well communicated, might provide strong incentives for other organisations to adopt. These include reductions in transaction costs, improved planning and improved audit of capability. In addition to these benefits, which were largely expected, the participating organisations also reported a number of unexpected benefits, including the ability to develop standard processes with trading partners and, in certain cases, improved supplier communication. However some disbenefits, such as poor return on capital from e-marketplace investments and the possibility of buyer-supplier mistrust, were also identified.

Extant studies, which have tended to be undertaken in the context of a single industry, therefore suggest that there is a complex mixture of antecedents to adoption, barriers and benefits. An appropriate theoretical basis for combining these in order to understand what causes an e-marketplace to be adopted is to view the e-marketplace as an innovation, and therefore to ground the study in the literature on how innovations spread or diffuse, which we turn to now.

THE DIFFUSION OF INNOVATIONS

Zaltman (1973) defines an innovation as being “*any idea, practice or material artefact perceived to be new by the relevant unit of adoption*”, and Kanter (1985) as “*the generation, acceptance and implementation of new ideas, processes, products or services*”. Innovation has been the subject of a vast number of academic studies. These have focused on topics such as the factors that determine the success of innovation projects (Cooper, 1980; Cooper and Kleinschmidt, 1987), types of innovation (Clarke and Staunton, 1993; Damanpour, 1990), innovative environments and cultures (Ekvall, 1983; Cooper, 1980), and the role of leadership (Peters and Waterman, 1982). The key theme in the innovation literature of interest here, though, is the study of factors affecting the adoption or diffusion of an innovation. Rogers (2003) defines the diffusion of innovation as: “*the process by which an innovation is communicated through certain channels over time among the members of a social system*”.

Based on studies ranging from farming practices to the spread of religions, Rogers (2003 p221) describes a generic set of five variable groups affecting adoption. These are: the perceived attributes of the innovation, the type of innovation decision, the communication channels used, the nature of the social system and the extent of change agents' promotion systems. Whilst Rogers's (1995) work on the attributes of innovations that influence diffusion is well known and has formed the basis of

numerous studies, the other four variable groups have not been widely explored. Our review of academic papers across all areas of management published since the 2003 edition of Rogers's book (Rogers, 2003) identified 32 papers using Rogers's diffusion of innovation as the basis of their studies. Of these only one, Cheng et al. (2004)'s study of online gaming in Taiwan, explored the four variable groups that Rogers identifies in addition to the attributes of the innovation. Whilst the consumer focus of Cheng et al.'s study makes it difficult to translate their findings to the B2B domain, it is interesting to note that they confirmed the influence of communication channels, promotion systems and the nature of the social system. This study therefore represents to our knowledge one of the earlier studies to make use of what we term Rogers's wider diffusion of innovation framework.

Given the continuing focus in current research on the attributes of the innovation, then, it is worth considering this particular aspect of diffusion further. Rogers divides the attributes of the innovation into five broad factors: relative advantage, compatibility, complexity, trialability and observability (see Table 1). Rogers (2003) observes that the relative importance of these factors may vary in any given domain, and furthermore that their detailed meaning will vary across different contexts, and therefore that exploratory qualitative work is important in new domains. Perceived risk has also been identified as a potential factor influencing adoption of IT-related innovations and more broadly (Eastin, 2002; Duguay et al., 2003), and we include consideration of this factor in this study, and hence include it in Table 1.

[Take in Table 1 about here.]

A review of 75 studies across numerous domains by Tornatzky and Klein (1982) gave weight to Rogers's innovation attributes, finding that these generic factors were usually, although not always consistently, related to adoption (in a positive direction, except for complexity which was negatively related as one would expect). Rogers himself (2003) demonstrates the applicability of this theory to Internet based technologies through examples of Internet usage diffusion by individual users, free email services, computer viruses and e-commerce. However, no previous studies are known which comprehensively apply diffusion of innovation theory to e-marketplace adoption specifically. Partial applications include Hadaya's (2006) study of the future use of e-marketplaces by Canadian firms, Gupta et al's (2005) study that identified the role of the network champion in the diffusion process, and Banerjee and Ma (2002) who developed a theoretical model of electronic marketplaces based

on extant literature and a pilot study. Perhaps closest to the e-marketplace domain are applications of the theory to other areas of B2B e-commerce such as He et al.'s (2006) study of online payment by Chinese organisations, Taylor and Perry's (2005) study of the use of the internet for corporate communications and Tung and Rieck's (2005) study of the adoption of electronic government services by organisations.

In summary, extant literature suggests that diffusion of innovation theory provides a useful framework within which to consider the adoption of e-marketplaces. However, mindful of Rogers's warning (Rogers, 2003) not to adopt measures developed for other innovations, the objective of this study is: *to provide a qualitative exposition of the specific factors influencing the adoption of consortium B2B e-marketplaces.*

BACKGROUND TO E-MARKETPLACES STUDIED

The study was based upon case studies of three consortium marketplaces as summarised in Table 2. A brief introduction to these marketplaces is provided here, before we turn to our method in detail.

[Take in Table 2 about here.]

Automotive – SupplyOn

A consortium of automotive tier 1 suppliers (the suppliers who sell major car components directly to the car manufacturers) including Bosch and Siemens founded SupplyOn in the summer of 2000. SupplyOn positioned itself to link tier 1 with tier 2 suppliers (those selling to the tier 1 suppliers) and downward through the supply chain. This contrasts with Covisint, a marketplace formed by several OEMs (car manufacturers) to link with their tier 1 suppliers. Following the problems of Covisint in 2004, SupplyOn has begun to work with BMW and target other OEMs. SupplyOn has offices in Germany, France and the US, but to date 60% of the companies using the marketplace are from Germany and a further 21% from the rest of Europe – a concentration that the organisation is working to redress. Its vision is to offer services that address three principal inter-organisational activities: sourcing; supply chain management; and collaborative product development.

Healthcare – The Global Healthcare Exchange (GHX)

The Global Healthcare Exchange is a US based company that was established in March 2000 by 16 leading suppliers of medical products such as Johnson and Johnson and GE Medical Systems. These

organisations have invested approximately 240 million Euros to date to establish the e-marketplace. GHX offers three services: connectivity between itself and buyers and suppliers, a product catalogue, and a platform that allows for the exchange of procurement information such as purchase orders, dispatch notification and invoices. Prices are not listed on the e-marketplace itself, as the supply-side founders understandably wish to emphasise process efficiencies rather than price comparisons.

Utilities – Eutilia

Eutilia, an electronic marketplace for the utilities sector, was founded in March 2001. The founding companies, which are all European, include EDF, Endesa, National Grid, Scottish Power and United Utilities. All these companies are under continual pressure from capital markets, customers and the regulators to reduce their costs and prices. In response to these pressures, Eutilia offers services focused on improving the performance of the procurement function within buying organisations, and the marketing and sales function within supplying ones. The services offered are in the areas of strategic sourcing tools, electronic tendering and auctions, and a transaction platform.

METHOD

Whilst the objective of the study to identify specific examples of the general factors identified in Rogers's existing framework may suggest a confirmatory research approach, the fact that these factors have not previously been identified for the e-marketplace domain necessitates an exploratory approach.

As shown in Table 2 and outlined in the previous section, a set of three consortium e-marketplaces was selected using the following criteria:

1. The chosen e-marketplaces should offer services that went beyond basic procurement activities (i.e. the purchase-to-pay process) and include one or more wider areas of functionality such as supplier management, inventory management, catalogue management, demand planning and collaborative new product development. This criterion was introduced as e-marketplaces that offer more advanced services reflect more accurately the supply chain management practices of contemporary organisations and were expected to be more sustainable (Laseter et al., 2001; Ganesh and Madanmoham, 2004).
2. In order to increase the generalisability of the study, the e-marketplaces were drawn from different industry sectors.

3. Whilst all e-marketplaces studied would be of the consortium type, marketplaces with a variation in the ownership of those consortia - buyer-owned versus supplier-owned - were selected in order to explore whether this factor influences adoption. For example, it seemed plausible that ownership by suppliers, as in the case of GHX, may limit the participation of other suppliers and hence the overall adoption of the marketplace.

From this initial screening, the three e-marketplaces described in the previous section were approached for access; all agreed.

An approach to qualitative data analysis originally proposed by Znaniecki (1934) was chosen due to it being a well-accepted method of eliciting and combining findings across multiple case studies (Gill and Johnson, 1991; Bansall and Roth 2000; Lapointe and Rivard 2005). In brief, the method involves formulating a hypothesis; comparing the hypothesis against the first case; if it does not fit, reformulating the hypothesis so as to be consistent with the data in the first case; comparing the revised hypothesis against the second case; and so on. According to Cressey (1950, 1953), an important early developer of the approach, “*practical certainty may be attained after a small number of cases, but a single negative case requires a reformulation...the procedure continues until a universal relationship is established*”.

In the context of this study, this method was operationalised in the following way. The unit of analysis was the e-marketplace as an innovative intervention in the industry’s buyer-supplier relationships. Hence for each e-marketplace, two buyer organisations and two supplier organisations were studied. The decision to study two buying and two supplying organisations for each marketplace allowed a balance between uncovering consistent and differing views across organisations, whilst being able to study each organisation’s use of the marketplace in some depth, for example by interviewing multiple staff within a single organisation. Interviews were held with executives responsible for supply chain management within buyer organisations, and those responsible for sales and customer service within supplier organisations. In all, twenty-five semi-structured interviews were conducted with twenty-seven managers from fifteen organisations, including the three marketplaces themselves. These interviews were conducted in UK (12), Germany (11) and The Netherlands (4). Of the interviewees, one was a CEO, one a Chairman, seven were directors and eighteen were managers. Each interview lasted between one and two hours

and was tape-recorded. Each interview was transcribed and summary reports were produced which were returned to the interviewees for checking in order to ensure accuracy and completeness.

Coding was undertaken by annotating the interview transcriptions with themes relating to potential diffusion factors. This annotation was conducted individually by two researchers. Notes were then compared to discuss and resolve differences. This initial coding was then used to consider each case in turn against the five variable groups discussed earlier and listed in Table 1, including the six factors within the “innovation attributes” variable group. Themes emerging from the data were categorised under one of these headings as appropriate. Each was given a fairly long title to capture the “*messy degree of complexity*” (Glaser and Strauss, 1967) common in qualitative research. So, for example, the factor of “Process efficiencies in cost, time, reliability and flexibility” was identified, and categorised as a sub-factor of “Relative advantage”, itself one of the factors within the “Innovation attributes” variable group.

While themes emerged which were sub-factors of most of the entries in Table 1, there were two aspects of Rogers’s framework where no themes emerged. Firstly, there were no potential diffusion factors relating to Rogers’s variable group of “Communication channels used”. Secondly, no subfactors were identified of Rogers’s “Observability” factor within the “Innovation attributes” variable group, although it is clear that the factors within the variable groups “Nature of social system” and “Extent of change agents’ promotion efforts” also relate to communication between potential users of the e-marketplace as well as communication between e-marketplace staff and the user base. We will return to this issue in the Discussion section. It was recognised that themes might emerge which were not sub-factors of any of the entries in Table 1, but this eventuality did not arise.

The strength of the evidence for the influence of the specific sub-factor on diffusion of the e-marketplace was then assessed. This assessment was summarised using the rating system described in Table 3, which is adapted from Daniel et al. (2003), and the resulting rating was complemented by notes and illustrative quotations. However, such a rating scheme should “*be interpreted as a concise summary of qualitative data, not as an attempt at quantification*” (Daniel et al., 2003). This qualitative and judgemental process took account of the criteria listed in Table 3, which we will briefly expand upon. Each factor is rated firstly on its presence and secondly on its influence on adoption. This can be thought of as the qualitative equivalent of the distinction in quantitative studies between the value of an independent variable and the association of that variable with a

dependent variable. For example, the security of commercial data was mentioned by respondents as a concern that needed to be addressed during the adoption process, but there was little evidence that this concern had in fact influenced the timing or extent of adoption in any of the buyers or suppliers studied. The perceived risk of insecure data is therefore listed as a factor, but one where the evidence for the influence on adoption is relatively low.

[Take in Table 3 about here.]

The rating of factor influence takes into account two broad issues. The first issue is that of consistency of the evidence between interviewees. Where more than one interviewee corroborates the influence of a factor on adoption, the evidence is regarded as stronger. This is the logic of triangulation (Denzin, 1978). The second issue concerns ‘theoretical fit’, and specifically: the fit of the data to the proposition; the presence of a plausible explanation for the proposition; and the fit of known rival hypotheses to the data. These three items are inspired by the argument of Campbell (1984), who argues that:

“the core of the scientific method is not experimentation per se, but rather the strategy connoted by the phrase “plausible rival hypotheses”. This strategy may start its puzzle-solving with “evidence” or it may start with “hypothesis”.

Whichever comes first, Campbell continues, data is considered against a hypothesis, for: a) The fit of the hypothesis to data; b) The fit of the hypothesis to other available data; and c) The plausibility of rival explanations. In a methodological paper on multiple-case studies, Wilson (2004) argues that to these should be added: d) The presence of a plausible explanation of the mechanism by which the “cause” produces the “effects”.

This process commenced with one case study and was then repeated for each of the other case studies, including scoring of each factor which had been identified in the previous case(s). Any mismatch between the subsequent cases and the hypothesised innovation sub-factor caused a review of the sub-factor. If the subsequent case contradicted the proposition, it was to be scored negatively. If the proposition could be modified to cover the new data as well as any previous data, this modification was carried out. For example, the factor “Power of internal change agents to determine agenda” arose from an influential change agent within a supplier who was using SupplyOn. It was

reworded as “Power of change agents to determine agenda within and between organisations”, when an influential change agent was found within one of the buying organisations using GHX.

Whilst Table 2 shows some quantitative measures on the diffusion of marketplaces studied, it can be seen that this data has some limitations. The organisations studied all measured their adoption in different ways and were sensitive to releasing data that would allow comparison with other marketplaces. The absolute numbers of companies quoted are also difficult to compare, since they represent a different share of the potential target market in each of the industries considered. For example, there are a limited number of buyers in SupplyOn’s target market (tier 1 automotive suppliers) when compared to the buyers targeted by GHX (hospitals). Since this study is exploratory in nature and the diffusion factors identified are assessed qualitatively, it is also appropriate to assess the dependent variable - that is, the adoption of the e-marketplace - qualitatively. The diffusion data shown in Table 2 was therefore used in conjunction with the views expressed by the interviewees regarding the adoption of the focal marketplace in their industry, to form a qualitative judgement of the level of adoption. This is shown in the final row of Tables 4a and 4b.

FINDINGS

The factors influencing adoption identified in this study are listed in the left-hand column of Tables 4a and 4b. The factors are positively related to diffusion except where indicated by “(-ve)” after the factor name. The tables also summarise the evidence for the support for each factor from each case, using the scoring system of Table 3. We discuss the factors below under the headings of Table 1.

[Take in Tables 4a, 4b about here.]

Perceived attributes of the innovation: Relative Advantage

For the automotive suppliers and utilities buyers, the expectation that the e-marketplace would deliver cost-efficient access to new trading partners was a significant motivation. However, for the automotive suppliers that expectation had failed to materialise, and the marketplace was perceived as being used by the buyers as a means to increase market transparency:

“A lot of potential customers are using marketplaces as a tool to make price comparisons, after which they then go back to their previous supplier, and say, here are the market prices, and the previous supplier agrees to supply at this price.”

Consistent with this perception, the automotive buyers did not regard this issue of price as a major motivator for the e-marketplace, and similarly the healthcare buyers were not primarily looking for price savings. This contrasted with the utilities buyers, for whom price savings were paramount. One of the primary purposes of Eutilia was to increase competition at a European level for the supply of products and services into the utilities industry:

“Today, because of changes in regulation and increased levels of competition, buyers are asking us to help them find new suppliers from within the EU, not just their home countries.”

By contrast, for the automotive buyers and for both parties in healthcare, the most significant and frequently mentioned advantage of the e-marketplace was in process efficiencies in the areas of process cost, time, reliability and flexibility. Reported savings included a reduction in errors and consequent processing costs for healthcare buyers and suppliers, reductions in operational costs for supply chain management processes in the case of automotive buyers, and marketing and sales savings for automotive suppliers. These process efficiencies can be summarised as delivering a lower transaction cost for the purchase.

Another group of factors concerns the complementary area of infrastructure costs, related to inter-organisational IT integration, administration of directories of products and trading partners, and application development. The e-marketplace can provide a single point of connection for buyers and suppliers to integrate their information systems, providing savings as compared with a point-to-point approach, as an automotive supplier stated:

“The benefit for us is that we only have to interface once with SupplyOn. As SupplyOn has standardised the processes amongst our target customers, hence we only have to adapt our systems once.”

This rationale was echoed in the healthcare industry:

“There is no point in any organisation having any more than one connection. You have to manage it, pay for it, and look after it. It misses the point. It’s like setting up your own Internet.”

One of the motivations for the automotive buyers to form the e-marketplace was the realisation that they had large overlaps in their information systems developments. They decided to cooperate in the development of new information systems, and hence reduce development activities at an individual company level. This was also the case for the utilities buyers, but Eutilia’s early emphasis on auctions software meant it was less able to prove the worth of this collaborative approach to

potential users. This left it vulnerable to replacement by individually purchased software, as illustrated by a buyer:

“Collaboration with suppliers, transacting over the Internet, is something we really want to go for. E-enabling the procure-to-pay process is a medium/long-term objective, which we will definitely achieve. But it’s unlikely to be achieved through the use of third-party services. It is far more likely to be achieved by owning and hosting our own applications.”

The final sub-factor of relative advantage concerns perceptions of whether the wider impact of the e-marketplace on buyer-supplier relationships is positive or negative. Both parties in automotive and healthcare broadly saw the e-marketplace as deepening relationships and complementing personal contact rather than replacing it. A SupplyOn buyer anticipated closer relationships though not always long-lasting ones:

“[In future] we will have two types of suppliers. The first will be long lasting, close, R&D relationship based partnerships. Then we will have some small number of specific partners who are dedicated to a product or a programme. When the OEM stops the programme, we will have to reconfigure the network, and look for the appropriate suppliers for the next challenge.”

This argument of relationship flexibility relates back to the ease of IT integration discussed earlier. It is in contrast to the views expressed by Eutilia’s suppliers, though, who saw the e-marketplace having at best a neutral and at worst a detrimental effect on buyer-supplier relationships. The utilities themselves, the buyers in this marketplace, had a different perspective again, perceiving a change to the procurement process but not to the relationship as such:

“The suppliers will say that it [the e-marketplace’s electronic auctions] is moving us back towards an adversarial relationship, away from partnerships. I don’t think it needs to do that. I think what it does is forces us to put more effort in up front, at the specification and tender stage. This comes in anyway at the proposed terms stage. What actually is happening is that this is being brought forward.”

Compatibility

For the companies trading over SupplyOn, the e-marketplace required the adoption of a new set of standardised processes for activities such as the administration of RfQs (requests for quotation). The necessity to make substantial changes to current processes was not necessarily a negative factor, however: indeed, for the automotive buyers who formed SupplyOn, standardisation of processes at an industry level was a positive objective for the e-marketplace. This intention is captured in the

original vision for the marketplace: *“the creation and use of a standardised set of processes and tools supporting the management of the supply chain”*. However, the extent of change required can slow adoption. For example, hospitals cannot make use of GHX without a centralised approach to procurement, so biasing early adoption towards those buyers who are at least on the route towards a managed procurement strategy.

Related to process compatibility is the compatibility of data formats and IT. For example, GHX hosts a standardised product catalogue which replaces the imperfectly replicated catalogues previously held by hospitals and their suppliers, a change seen as the principal reason why the number of errors in the procurement process had reduced to zero in some trials. But producing the standardised catalogue entailed a considerable amount of work, involving changing the descriptions of thirty thousand products to an agreed standard for one participant. As with process compatibility, although this factor slowed the extent of adoption within some companies, it did not appear to prevent it if a clear relative advantage could be perceived.

Compatibility with the views of senior management was also a factor. Intriguingly, this seemed an issue even in one of Eutelia’s founders, which in an echo of some early B2C dot-com experience had appeared to invest out of a desire to realise a high share price from the e-marketplace, rather than in order to improve buyer-supplier relationships. The e-marketplace now found itself at odds with the utility management’s attitude that software applications should remain in-house rather than be outsourced, and that *“it is no longer our view that collaboration between buyers in the same industry would yield benefits”*.

For one of SupplyOn’s founders, changing the perceptions of individuals at operational levels of the purchasing function was also seen as essential to adoption:

“If you have been working for 20 years in a purchasing department, and your USP is knowing which supplier is able to produce which part to a particular level of quality, the marketplace approach, where all this information is available via a online tool in a instant, can often be seen as very threatening.”

Trialability

All three e-marketplaces were benefiting from their decision to make it easy for participants to adopt the e-marketplace gradually across its services and product groups and adopt a staged

approach to business change. Trialability of service adoption was particularly important for SupplyOn's users, given its wide range of services across the product lifecycle from new product development through procurement to supply chain management. Trialability of adoption across product groups/business units was important to hospitals, one starting for example with supplies to a Catheter Lab, so that new procedures could be tested before being rolled out more widely.

The third trialability sub-factor concerns the extent to which the standardisation of processes and the integration of internal IT systems with the e-marketplace can be divided to aid early trials. Again, each e-marketplace had done what it could to maximise this, each for example providing the means for participants to interact with it via the use of a web browser as a simple alternative to full integration. There were understandable limits, though, on the extent to which some core services could be adopted on a limited basis. Because SupplyOn's early use, for example, focused on the standardisation of RfQs, each participant needed to make appropriate internal changes in order to participate. The equivalent for GHX is the need to adopt the e-marketplace's catalogue data format. Although these issues could slow adoption, they were not viewed as sufficiently significant to prevent adoption, and consequently were viewed as an inevitable cost of achieving the perceived advantages.

Complexity

The perceived complexity of e-marketplaces relates closely to the trialability and compatibility issues discussed above. In particular, two major aspects of complexity we have mentioned are the need to integrate internal IT systems with the e-marketplace, and the need to make corresponding process and data changes. The extent to which these acted as brakes on adoption was reduced if connectivity to only one marketplace would be required. The automotive suppliers, for example, expressed concerns about the cost and complexity of having to form relationships with one or more e-marketplaces:

“The biggest problem for companies using marketplaces is that they are so separate. Which means that if I want to cover various industries, then I need to take part in many marketplaces, and every marketplace is different in terms of its processes, and means of connection.”

This left the supplier feeling unable to invest in full integration, and hence (unlike the automotive buyers) unable to gain fully from the marketplace's potential to increase process efficiencies, reducing its role to *“little more than a glorified fax machine”*. Similarly, a hospital buyer stated that

the scope of the products that can be procured via the e-marketplace did not cover all the hospital's needs, hence *"limiting the extent to which the [Hospital] Trust can rely on GHX as the sole means for it to conduct commerce electronically"*.

The lower level of perceived relative advantage in utilities led to a greater reluctance to tackle the hurdle of complexity. The buyers interviewed had not yet integrated IT systems, taking the view that:

"The challenge is, what is the minimum level of integration that we could do, to see what benefits we could derive, without incurring excess cost?"

The reason for this very different attitude in utilities is still somewhat unclear. As discussed, it seems to be partly due to Eutilia's early focus on auctions, so leaving the case for process improvements through transactional integration unproven. This left it exposed to substitution by other means of performing the same limited job of running auctions:

"The e-marketplace is not adding a lot of value really. Although at the moment they have the expertise in using the [auction] tools, many other utilities have gone out and bought their own applications."

Perceived Risk

There were three respects in which perceptions of risk figured substantially in the interview data. Firstly, concerns about the security of commercial data were mentioned in both the automotive and utilities industries. In one instance, relating to the management of user rights, a buying organisation related the need to be proactively involved in minimising this risk. During a security audit, a test buyer was able to register under the name of a different company and see data sent to this company from a trading partner.

Another risk identified was that of reliance on an e-marketplace which might prove unsustainable. In deciding to adopt GHX, one of the hospital buyers had taken into account its backing by some of the largest suppliers in the industry. They believed that this made it financially more secure than independent electronic marketplaces, which were often funded by limited amounts of venture capital. This increased confidence in consortium marketplaces, compared to other ownership models, lends support to our focus on these in this exploratory study.

The third risk factor related to the risk of change in the external environment, and in legislation and regulation in particular. There has been much discussion within the UK's National Health Service (NHS) about possible future centralised purchasing across the NHS, and about the related proposals for a standardised platform for electronic trading. Realisation of this centralised approach was likely to be many years away. However some hospitals did not want to invest in e-marketplace adoption that may later become redundant. Others, including those in this study, took the view that advantages to be gained in the meantime from the use of the e-marketplace justified the investment, despite the risk of further changes in the future.

Type of innovation-decision

For some suppliers - one in automotive and both in utilities - the main reason for joining the marketplace was none of the positive factors we have discussed - an optimal innovation decision in Rogers's (2003) language - but rather buyer pressure. As one put it:

“The question for suppliers is not, do I want to take part in SupplyOn or not? But, do I want to take part in the automotive industry or not?”

As this suggests, SupplyOn was becoming an important part of the market in which this supplier operated. Pressure to use Eutilia was more sporadic, being focused on certain auction events, but nevertheless in these instances left suppliers feeling they had no option but to participate. This would suggest the presence of what Rogers refers to as an authority innovation decision.

Nature of social system

The presence of strong peer networks and the existence of strong buyer-supplier relationships both appeared to aid in the observability of the e-marketplace's benefits and hence its diffusion in one or more of the cases. The pre-existence of a strong peer network for the larger automotive suppliers had contributed to the formation of SupplyOn:

“It's always the same people coming together and having ideas, this is a network where cooperation is stronger than competition, despite some of us being competitors.”

The e-marketplace was also proactive in using peer networks amongst the tier 2 and 3 suppliers to support the recruitment of suppliers, both via publications and face-to-face meetings.

Often, though, recruitment of suppliers was conducted by buyers, or vice versa, resulting in few examples of new relationships being established as a result of the e-marketplace. Automotive buyers

consciously targeted their key suppliers, one for example having a “*goal of having its business relationships with all strategic suppliers conducted solely via SupplyOn from 2003 onwards*”. The process was the other way round in the case of GHX, which being supplier owned, had suppliers seeking to recruit their key customers.

Again the story for Eutilia was rather different. The geographically dispersed utilities had a relatively weak peer network compared with the other cases, as did their suppliers. Attempts by the Eutilia e-marketplace itself to act as a change agent were also weak, contributing to the medium to low rate of diffusion of this marketplace. We now turn to this issue of change agent behaviour.

Extent of change agents’ promotion efforts

The beneficial impact of change agents in the e-marketplace domain has been demonstrated by Gupta et al. (2005). They term such agents as ‘network champions’ and find they can play an important role in bringing buyers and suppliers together and into the marketplace. Evidence of such champions was present in the case of GHX, where the marketplace actively sought out hospitals that had supply chain managers who were viewed as “*maverick, innovators, enthusiastic and open to new ideas*”. They actively used these managers to engage the supplier’s business unit heads by organising joint workshops.

The utilities demonstrate the need to avoid those that are resistant and engage change agents with both the power and incentive to enable change:

“At the beginning we started to speak to procurement people about our auction and tendering services, but they were not interested. They said that they managed much better with the paper and face-to-face processes. We would then go to CEOs and senior managers [not from procurement] of the same companies, and said that these same services would be able to tell them exactly what savings had been made and have data to analyse, such as the details of tenders, buying criteria and performance against these criteria. They were much more interested than their more junior colleagues. This is particularly true when the buyers had 20 years’ experience, and hence are difficult to move.”

The utility e-marketplace managers also described how they were seeking to act as a change agent in the wider industry, but the need for a certain level of adoption before an e-marketplace has the power to act as a change agent at this level was evident:

“Through our role as an industry consortium we can play a part in standardisation of processes and procedures..... So far we don’t have sufficient numbers of buyers or suppliers to do that. Even through we are backed by eleven utilities suppliers, we have yet to change the rules of the market in this regard.”

GHX had a similar experience when it tried to enable the adoption of industry standards, for example in catalogue management, only to have to relax its insistence on these standards when there was resistance from some adopters. In recognition of the lack of power that e-marketplaces have in persuading buyers and suppliers to adopt industry level standards, SupplyOn is currently working with various industry bodies to develop these collaboratively.

ANALYSIS BY CASE

We have presented twenty-six factors influencing e-marketplace diffusion. Before discussing the wider implications of our findings, we will first briefly summarise how the identified factors are inter-related in the adoption of each marketplace studied.

SupplyOn: Of the three e-marketplaces, SupplyOn has diffused most rapidly, with a proposition which offers some relative advantage to both the tier 1 buyers and their suppliers. The benefits are higher, though, for the buyers, due to the possibility of price savings as well as transaction efficiencies and shared infrastructure economies. The pressure to participate in this case therefore comes from these buyers, for whom the costs of involvement (in terms of complexity, compatibility and trialability), while significant, have been minimised by the use of existing IT and processes where possible. Suppliers also stand to gain much from process efficiencies, though, and may also gain from increased reach. Trialability is important particularly to smaller suppliers, and is achieved partly through a browser-based facility to enable participation prior to full integration. Adoption is therefore likely to increase as buyers move beyond their current efforts to recruit their key, larger suppliers, and focus on smaller suppliers.

GHX: The healthcare sector is relatively immature as far as purchasing automation is concerned and hence the short-term competition to the e-marketplace is not point-to-point or private marketplace electronic trading but paper-based processes. Suppliers are adopting GHX aggressively due to the perceived risk of inaction, which includes the risk of competitor e-marketplaces being established, and the fear that these e-marketplaces may cause pressure on prices due to auctions and comparative pricing, and require fees to be paid to third parties. Transaction efficiency gains are also regarded as significant. These factors are offsetting the substantial set-up and integration costs. Adoption by buyers, though, has some barriers relating to compatibility, particularly with existing purchasing structures, and communication, in the form of direction from key staff such as the purchasing director. Hospitals with centralised purchasing where the key managers are advocates of e-marketplace use are adopting fast due to the considerable efficiency savings that are possible. Those with fragmented purchasing structures and with mixed views amongst key staff are adopting more slowly.

Eutelia: Whereas SupplyOn, which was also founded by buyers, focused on process benefits in the automation of existing tendering processes, Eutelia's early focus on auctions provides a perceived advantage to buyers but not to suppliers. With suppliers reluctant to join the e-marketplace, buyers also become reluctant to join, and hence the network effects (Katz and Shapiro, 1986) inherent in a many-to-many marketplace are not realised, dissuading other buyers and suppliers from participating. Furthermore, buyers can buy and operate their own auction software, effectively operating a private marketplace, obviating the need to participate and pay fees to a consortium or third party marketplace.

DISCUSSION

It can be seen from Table 4a and 4b that in the case of two of Rogers's hypothesised diffusion factors, communication channels and observability, no diffusion sub-factors were identified in our research. The absence of sub-factors relating to communication channels may reflect the relatively early stage of adoption of e-marketplaces in general and the three we studied in particular: as is evident from the subfactors relating to the nature of the social system, diffusion has been so far occurring primarily amongst pre-existing peer networks and pre-existing buyer-supplier relationships, by direct personal communication. While Rogers (2003) includes interpersonal channels as well as mass media channels in his discussion of communication channels, we have preferred to regard our factors "Presence of strong peer networks" and "Presence of strong existing

buyer-supplier relationships” as subfactors of Rogers’s “Nature of social system” factor rather than as aspects of his “Communication channel” factor; however, there is clearly an overlap between these two of Rogers’s hypothesised diffusion factors.

The absence of factors relating to observability – the degree to which the results of an innovation are visible to others - may again be a function of the relatively early stage of adoption of the e-marketplaces studied, and the dominance of the pre-existing social system in their diffusion at this stage. As is evident from the numerous sub-factors relating to relative advantage, the potential benefits and drawbacks of an e-marketplace are complex, so observing these benefits is not trivial. In our study, this observation seemed to be taking place by rich direct personal communication among the existing social network. It may be that no specific subfactors emerged relating to observability because of the lack of variation in this independent variable in our sample: an e-marketplace focused on price negotiation in a commodity market, for example, might prove to have simpler and more readily observable benefits, which may influence its diffusion. We would therefore caution researchers against omitting either this factor or that of communications channels in future research, as diffusion of e-marketplaces continues.

We now broaden our discussion to consider how the findings of this study relate to extant literature and what this suggests for the adoption of electronic consortium marketplaces. Three issues are identified as particularly significant and are discussed in turn: the maturity of relationships, the ownership of marketplaces and the type of products or services traded.

The variation in sources of relative advantage across the three cases sheds light on the rival “move-to-the-middle” and “move-to-the-market” hypotheses in previous literature on inter-organizational IT (Malone et al., 1987; Clemons et al., 1993). Much of the experience of SupplyOn and GHX fits the “move-to-the-middle” model which posits that increased use of IT will result in fewer, longer-term relationships between buyers and suppliers. SupplyOn’s suppliers, though, reported benefits in terms of increased reach which is more consistent with the alternative “move-to-the-market” hypothesis. While Eutelia’s adoption to date has been limited, there are many reasons for this in such issues as change agents’ promotion efforts and perceived risk which do not necessarily invalidate its attempt to “move-to-the-market” via an e-marketplace.

A consideration of the relative maturity of the underlying relationships can help to understand this complex and mixed picture. Where buyer-supplier relationships are relatively mature, the e-marketplace can deliver mutual advantage via process efficiencies and infrastructure cost sharing. The e-marketplace may also aid price transparency and/or enable some price reductions through passing on of lowered costs or bulk buying. Network effects such as standardised IT integration and shared development costs are needed if the e-marketplace is to provide advantage relative to other electronic trading mechanisms such as point-to-point connection or private marketplaces. High transitional costs due to complexity and compatibility factors act to reinforce a concentration on fewer key suppliers. The relationship may be further deepened through extensions of e-marketplace functionality into new product development and supply chain management.

By contrast, where buyer-supplier relationships are basic or exploratory (McDonald et al., 2000), the e-marketplace may deliver price advantages to buyers through increased reach, price transparency and dynamic pricing. But even here transaction efficiencies on both sides are likely to be the larger opportunity in most cases, as they help to recruit suppliers and hence achieve the network effect of increased reach for both parties, which is essential if the e-marketplace is to compete with private marketplaces which offer lower compatibility barriers. Existing relationships will not aid the observability of the e-marketplace to the same extent as when relationships are more mature, so observability is likely to rely more on the change agents' promotion efforts if the necessary scale is to be achieved for network effects to be present. A single e-marketplace may cater for both of these broad types of relationship – mature and basic - and therefore need to address both the sets of diffusion factors discussed above in respect of their different target segments.

Thus network effects, or self-reinforcing advantages accruing from having many e-marketplace participants (Schilling, 1999), are important for both mature and basic relationships, although their implications for relative advantage vary. We have seen how SupplyOn in particular is achieving strong network effects. Some of the basic transaction efficiencies were already in place in the industry from EDI. So by concentrating on the reach (business directory) and mechanics of sourcing (RfQ and auctions), SupplyOn aims for a network effect which is of value to both buyer and supplier. The way in which RfQs can ripple through several tiers further strengthens the network effect.

The “move-to-the-market” arguments we reviewed earlier, then, are at least not universally applicable, being less likely to be valid where existing relationships are mature. Porter’s (2001) argument that “*switching costs are likely to be lower, not higher, on the Internet*” seems to be far from the case where mature relationships are further embedded with expensive system and process integration. Only if an e-marketplace achieves a sufficiently high penetration in an industry and all potential buyers and suppliers are fully integrated with it will switching costs reduce. Porter’s expectation of a migration of competition to price is also only partially consistent with our evidence. The more mature relationships in the healthcare sector enabled by GHX found no additional pressure on price as a result of e-marketplace use – although, of course, the e-marketplace had been biased away from price comparisons by its supplier founders. But even in the case of the buyer-owned SupplyOn, only 2% of transactions used its auction functionality, and the 2.5% price savings reported by one buyer were solely due to bundling of orders within the different divisions of the company. This buyer put much more emphasis on the 55% reduction claimed in sourcing process costs and 30% reduction in supply chain management process costs.

Correspondingly, the “move-to-the-middle” view from previous literature (Holland, 1995; Bytheway and Dhillon, 1996) tends to apply only to mature relationships, but with two subtleties. Firstly, the e-marketplace tends to support existing strategies to reduce and deepen the supplier base rather than acting as a cause in itself. Secondly, although the resulting relationships may be “*on a much more intensive scale than before*”, as described by one automotive buyer, they are not necessarily long lasting as Clemons et al. (1993) had suggested. The e-marketplace increases the flexibility of the supply chain and therefore allows it to be reconfigured rapidly as circumstances demand, as was reported by the users of SupplyOn.

Our observations on ownership are inevitably limited by the set of only three e-marketplaces representing only two (buyer and supplier owned consortia) of the several possible ownership models. Nevertheless, there is little evidence within our cases of a potential evolution of ownership models towards privately owned functionality as suggested by Krammer (2001) or Stevenson (2001). The utilities’ case does offer a limited suggestion of a possible migration from the consortia model towards privately owned e-hubs. However, as we have argued, a future transition in this case is well explained by other factors such as the lack of the necessary network effects in Eutilia’s approach, and there is no suggestion of such a transition within the SupplyOn case where these network effects are most strongly present.

GHX is interesting in having so far escaped the logic which regards buyer-owned e-marketplaces as more likely to succeed due to their having by default a ready-made set of customers (Ordanini et al., 2004; Milliou and Petrakis, 2004). Because GHX does not include auction functionality or transparent comparative pricing, it offers in theory a lower relative advantage to buyers than it might. However, the fragmentation of buyers into individual hospitals and trusts makes the investment entailed by private marketplaces seem unlikely in the near future, while GHX is part of a consortium bidding for the National e-Commerce and Finance System to be set up in England, to cover its options. It may indeed prove that this supplier-owned model will ultimately be transitional.

We can summarise this discussion on ownership as follows: e-marketplaces are more likely to be formed by buyers where these are relatively concentrated, or by suppliers where buyers are fragmented and the supply side is relatively concentrated. Large numbers of both buyers and suppliers may favour neutral e-marketplaces formed by start-ups or existing offline intermediaries. However, the successful diffusion of the e-marketplace will rely on its owners using their power with discretion to ensure that both buyers and suppliers have sufficient motivation to adopt rapidly. Further research is needed to establish whether these observations hold more widely.

Our final observation with respect to previous literature concerns the types of products/services which will suit the e-marketplace model. We quoted earlier Porter's view that the Internet "*gravitates procurement to standardised products that reduce differentiation*". In similar vein, Malone et al. (1987) regarded the complexity of product description and the product specificity – the extent to which a product is specific to a particular customer and use – as negative indicators of the use of electronic markets. Our cases do not provide support for this view, SupplyOn flourishing despite the high product specificity and products which could only be described through a complex request for quotations. We suggest instead that product specificity influences the necessary functionality of an e-marketplace if network effects are to be achieved. In the case of more commoditised products, the e-marketplace can gain from a shared product catalogue and/or transparency of pricing and price negotiation support across suppliers. In the case of more tailored products, the e-marketplace can provide advantage through support for new product development and the tendering process, an advantage which is emphasised where multiple tiers are present.

CONCLUSIONS AND LIMITATIONS

In summary, e-marketplaces were hypothesised as vehicles which would lead to increased price competition and a commoditisation of many product groups. This led to a profusion of start-ups and whilst some have continued to operate, many have failed. To date studies of actual marketplace adoption have tended to focus on single industries and have produced an array of antecedents, barriers and benefits, leaving practising managers and those that study this domain uncertain about future adoption of e-marketplaces. We have sought to improve understanding in this domain by exploring the detailed factors influencing adoption. We have identified twenty-six factors influencing diffusion, summarised in Table 5. These factors are consistent with previous diffusion of innovation literature, in that they form sub-factors of four of Rogers's (2003 p221) five variable groups, including five of the six most commonly identified attributes of the innovation influencing adoption. However, they also provide valuable richness as to the meaning of these factors within this domain that mean that they are practically useful both for acting managers and as a basis for further research.

[Take in Table 5 about here]

Table 5 also shows the degree of support for each of the factors across the cases for both the buyers and suppliers studied. It can be seen that data from the cases supports or is consistent with the majority of factors for both buyers and suppliers, suggesting that these factors are not specific to either group and should be addressed when considering the adoption of an e-marketplace by any organisation.

It should be noted that although the factor '*reduced price of goods bought/sold*' had support from both buyers and suppliers, the impact on uptake is different between the two groups. Consistent with other studies of e-marketplace adoption (Arbin and Essler, 2005; Howard et al. 2006), suppliers are concerned with marketplaces being used to undertake price comparison and hence pressure from buyers for price reductions. However, this study also finds support from suppliers for compatibility with senior management views, values and strategy, which in all three cases was around a desire to find new customers. It would therefore seem that e-marketplaces offer senior managers in supplying organisations with a dilemma: the opportunity to find new customers, but with the possibility of overall price reductions. Addressing the other factors identified that positively contribute to the adoption of e-marketplaces, such as the considerable process efficiencies reported by some, could tip the balance towards making adoption of the marketplace worthwhile for

these suppliers. Without this, suppliers will continue to be reluctant to join e-marketplaces, resulting in the benefits that they have been shown to offer being lost to all.

Table 5 also shows that the perceived risk factor '*security of commercial data*' did not yield sufficient data to determine the influence on adoption in any of the cases. As shown in Tables 4a and 4b, interviewees cited data security as a concern, but were able to describe how they found acceptable ways to mitigate the perceived risks. We have included this factor in Table 5 as we believe it is an aspect of marketplace adoption that would benefit from further understanding and hence should be included in future studies.

Our study also sheds light on how three wider issues will influence the adoption and nature of e-marketplaces, namely the maturity of relationships, ownership models and the nature of the products or services traded. E-marketplaces used to support mature relationships are likely to place relatively little emphasis on price, with process efficiencies being more important. However, the term 'maturity' does not necessarily refer to the duration of a relationship, rather to the depth of that relationship. As we found in the case of SupplyOn, users intend to use the e-marketplace to form deep relationships with certain partners, but when required to reconfigure them and form equally deep relationships with other partners. Whilst a number of ownership models for e-marketplaces have been suggested, successful diffusion will rely on the owners using their power and influence in order to ensure that both buyers and suppliers have sufficient incentives and correspondingly few disincentives to adopt, rather than simply coercing adoption. Finally, high product specificity and product complexity, rather than limiting e-marketplace adoption, impacts on the specific functionality required from a marketplace.

A limitation of our study was the small number of marketplaces studied and, to a lesser extent, the limited number of interviews undertaken within each marketplace and its buyers and suppliers. This limits the variation within our data set of products traded and relationship types studied. Our focus on consortium marketplaces also restricts our observations on ownership models. Although this limited data set is consistent with our exploratory aims, the findings presented should be treated with caution. Other e-marketplaces may exhibit very different sources of advantage or indeed different diffusion factors in other respects. Further research could usefully therefore broaden out the examination of e-marketplaces commenced here, including any impacts on diffusion of their

different emphases in functionality, ownership models, product specificity, relationship maturity and vertical industry.

The study is also limited by the method employed. Its substantive contribution is in the grounded generation of a set of factors that appear to influence e-marketplace adoption, not in testing the relative impact of these factors across a representative sample of e-marketplaces and their users. Thus conclusions cannot be made concerning the extent to which adoption is influenced, for example, by low levels of supply chain process complexity and high levels of e-marketplace service trialability in a specific industry. Further research to test the relative impact of the factors we have described on adoption via a cross-sectional survey would be useful. The findings reported in this study provide a base on which such a quantitative study could build multi-item scales for diffusion factors as independent variables.

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Table 1: Factors Affecting Adoption (Rogers 2003; Eastin 2002)

Variable group	Definition
<i>PERCEIVED ATTRIBUTES OF THE INNOVATION</i>	
<i>i) Relative Advantage</i>	The degree to which an innovation is perceived as being better than the idea it supersedes
<i>ii) Compatibility</i>	The degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters
<i>iii) Complexity</i>	The degree to which an innovation is perceived as relatively difficult to understand and use
<i>iv) Triability</i>	The degree to which an innovation may be experimented with on a limited basis
<i>v) Observability</i>	The degree to which the results of an innovation are visible to other potential adopters of the innovation
<i>vi) Perceived Risk</i>	The degree of risk (technical or other risk) associated with adoption or use of the innovation
<i>TYPE OF INNOVATION DECISION</i>	The degree to which the individual or organisation adopting the innovation has the freedom to adopt based on what is optimal for them vis-à-vis collective and authoritative decisions
<i>COMMUNICATION CHANNELS USED</i>	The means by which knowledge and attitudes about a new idea are conveyed from one individual or organisation to another, including mass media channels and interpersonal (peer-to-peer) communication.
<i>NATURE OF SOCIAL SYSTEM</i>	The degree to which there is a social system in place which connects the parties supplying and adopting the innovation with a common purpose
<i>EXTENT OF CHANGE AGENTS' PROMOTION EFFORTS</i>	The degree to which the change agents in the social system into which the innovation is being introduced are opinion leaders and are active in promoting and supporting adoption of the innovation.

Table 2: Details of sample

	Industry Sector		
	Automotive	Healthcare	Utilities
Marketplace studied (no of staff interviewed)	SupplyOn (6)	Global Healthcare Exchange (1)	Eutilia (4)
Type of marketplace	Buyer owned consortium	Supplier owned consortium	Buyer owned consortium
Key functionality offered	Identifying suppliers Selecting suppliers Transacting (purchase-to-pay) New product development Supply chain management	Catalogue Management Selecting suppliers Transacting (purchase-2-pay)	Identifying suppliers Selecting suppliers Transacting (purchase-2-pay)
Adoption Measures (Europe): Number of buyers registered Number of suppliers registered Total transaction value	10 * 1,550 * - (estimated as 6 billion Euros)**	62 (hospitals) 15 - (estimated as 4 billion Euros)**	- (estimated as 5)** 4,108 1.5 billion Euros
Buyers studied (no of staff interviewed)	ZF (1) Siemens (2)	Leeds Teaching Hospital (2) Plymouth Hospitals (1)	Scottish Power (1) United Utilities (1)
Suppliers studied (no of staff interviewed)	Webotech (1) Josef Rees (1)	Boston Scientific (1) J&J (2)	Tata Consulting (1) Vauxhall Motors (2)
Total number of staff interviewed	11	7	9

* roles not distinct as buyers can act as suppliers in this industry for some products and vice versa

** estimates drawn from public sources such as company press releases and newspaper and analyst report

Table 3: Rating system for evidence about diffusion factors

	RATING OF PRESENCE OF FACTOR
o, *, **	The extent to which the factor is present in the case. ** indicates the factor is fully present; * indicates that the factor is partially present; o indicates that it is not present. Eg: o indicates that the e-marketplace has no impact on reach to trading partners; * indicates that there is some increase in reach to trading partners; ** indicates considerably increased reach as a result of e-marketplace use.
DK	The data is insufficient to rate the case on the factor.
	RATING OF INFLUENCE OF FACTOR
+, ++	The factor appears to be influential in determining e-marketplace diffusion. ++ = the case supports the factor; + = data consistent with factor but inconclusive. Criteria used in assessing include: a) Data consistency/triangulation: consistency of story from different interviewees; the substantiation of user perceptions with narrated events. b) Theoretical fit: i. where the factor is fully or partially absent, diffusion is reduced or absent ii. where the factor is present, diffusion is occurring, or there is some other plausible reason for slow diffusion iii. a plausible causal explanation links the factor to the rate of diffusion. For a ++ score, all three points under b) and at least one point under a) need to be addressed.
-, --	The factor is not influential in determining diffusion. -- indicates clear evidence, - indicates some indication. Note: no instances found in this study.
DK	While there is no or insufficient indication that the factor is influential in determining rate of diffusion, there is equally no or insufficient indication that it is not.

Table 4a: Factors influencing diffusion rate - Buyers

Factor	SupplyOn		GHX		Eutelia	
Perceived Attributes of the Innovation						
RELATIVE ADVANTAGE						
<i>Reach to trading partners</i>	DK		DK	-	This was cited as the main reason for the adoption of the marketplace.	**/++
<i>Reduced price of goods bought/sold (-ve for suppliers)</i>	Reduced prices due to bulk buying enabled by greater visibility of procurement spend.	*/+	Expectation that process savings will enable lower prices to be paid.	*/+	An increase in the number of potential international suppliers, which would create a downward pressure on prices.	**/++
<i>Process efficiencies in cost, time, reliability, flexibility</i>	Multiple savings made in the areas of procurement, supply chain management and new product development.	**/++	Multiple savings made in the procurement process e.g. catalogue management.	*/+	Transaction functions not tried yet; hence no savings have been reported.	o/+
<i>Efficiencies in inter-organisational IT integration</i>	Creation of a single point of integration enables process integration with multiple suppliers.	**/++	Creation of single point of integration enables process integration with multiple suppliers.	**/++	DK	-
<i>Reductions in replication of directory administration</i>	Although a directory was present, its use was not clear as products tend to be highly asset specific.	*/+	Use of a shared catalogue led to an elimination of errors in the procurement.	**/++	Product directory not standardised so cost savings have not been realised.	o/DK
<i>Savings from collaborative IT application development</i>	Sharing IS acquisition costs across organisations means there is less replication of effort and investment.	**/++	DK	-	Not seen as a major factor as auction systems [main focus to date] are seen as relatively cheap.	*/+
<i>Shared investment to establish marketplace or moderate fees</i>	DK	-	DK	-	Doubts raised on the returns generated.	*/+
<i>Positive impact on relationship number, quality & duration</i>	Introduction of dynamic networks that enable the deep integration of suppliers on a short-term basis.	*/++	Increased collaboration has led to more information sharing and process optimisation.	**/+	No significant impact noted on the buyers' relationships with their suppliers.	o/+
COMPATIBILITY						
<i>Compatibility with existing/desired future processes</i>	Adoption of SupplyOn meant the need to standardise processes across the company.	**/++	Adoption of the marketplace required the centralisation of procurement.	**/++	Only minor changes to the tendering process were needed.	*/DK
<i>Compatibility with existing data/IT standards</i>	Limited value obtained from the marketplace.	**/++	Buyer was prioritised for adoption by the marketplace because it had a widely used ERP system.	**/++	Integration would be "expensive" relative to the estimated savings. Hence this is not being actively pursued.	o/+
<i>Compatibility with senior management views, values and strategy</i>	The company is an equity holder.	**/++	Marketplace targeted 'maverick innovators'.	**/++	Collaborative nature of marketplace is seen as being counter to views of senior management.	o/+

<i>Compatibility with operational culture</i>	Marketplace challenges information is power view currently held.	**/++	DK	-	Evidence of a mismatch but not perceived to be a limiting factor.	*/DK
TRIALABILITY						
<i>Option to adopt services by type</i>	Services offered could be adopted on an individual basis.	**/++	DK	-	One service only was used during the early period of adoption.	**/+
<i>Option to adopt services discretely across business units/products</i>	Due to the complexity of integrating intra-organisational processes it was considered too difficult to adopt simultaneously.	**/++	The marketplace's services were adopted by individual wards, which allowed for a probe and learn approach to be taken.	**/++	The early adoption of the services involved a small number of trials.	**/+
<i>Trialability of process of standardisation & integration</i>	Not possible due to the services offered by the marketplace being based on standardised processes.	*/++	Catalogue which required a wholesale change in the content used in the hospitals information systems.	*/++	Standardisation of processes was perceived as being indivisible from the integration of the marketplace and the buyers' internal information systems.	*/+
COMPLEXITY						
<i>Level of IS-marketplace integration needed to leverage benefits (-ve)</i>	A high level of investment, change and effort required to integrate the buyers' information systems.	**/++	Integration between the hospital's ERP system and the marketplace was essential to ensure full benefits.	**/+	Lack of integration is preventing use of some services.	*/++
<i>Degree of process/data changes required to leverage benefits (-ve)</i>	Agreement of standardised processes seen as essential for the adoption of the marketplace.	**/++	Major changes required to catalogue data and processes used to manage changes to this data.	*/+	Minor changes were needed to adopt the marketplaces services.	*/DK
<i>Effort involved in accessing multiple marketplaces (-ve)</i>	DK	-	The marketplace did not cover all of the items that the hospital procured.	*/+	DK	-
PERCEIVED RISK						
<i>Security of commercial data</i>	Management of user rights proved to be complex and action was required to ensure this did not become a security issue.	*/DK	DK	-	Security was expressed as a concern but was perceived to be effectively addressed by the marketplace.	*/DK
<i>Reliance on an unsustainable third party (-ve)</i>	DK	-	Perceived sustainability of the marketplace was a key factor in adoption.	o/++	DK	-
<i>Risk of legislative/regulatory change to purchasing practice(-ve)</i>	DK	-	Possible creation of government owned marketplace was perceived to be acting as a barrier to adoption.	*/++	Approval from the EU was needed to ensure it compliance with anti-competitive legislation.	**/+
Type of Innovation-Decision						
<i>Power of buyers to demand or influence supplier participation</i>	(Not applicable)	-	(Not applicable)	-	(Not applicable)	-
Communication Channels						
Nature of Social System						

<i>Presence of strong peer networks</i>	Founding group of companies consisted of a network of peers from the industry.	**/++	DK	-	The idea for marketplace built upon an earlier collaboration that took the form of a buying consortium.	*/+
<i>Presence of strong existing buyer-supplier relationships</i>	Strategic suppliers were targeted to ensure the impact of adoption was maximised	*/++	The founders were key suppliers, who then actively targeted buyers viewed as innovators.	**/++	Buyer/supplier relationships are considered to be relatively distant, with little focus on supply chain collaboration.	o/DK
Extent of Change Agents' Promotion Efforts						
<i>Quality of e-marketplace support to manage complexity</i>	DK	-	Extensive help was given with the implementation, particularly in the area of system-to-system integration.	*/+	Perceived as good, but qualified as within the limited number of the marketplaces' services used.	*/+
<i>Power of change agents to determine agenda within or between organisations</i>	New VP role responsible for marketplace adoption across the whole business was created.	**/++	DK	-	Powerful buyers forced the adoption of the marketplace by conducting their purchasing activities through it.	**/++
Rate of Diffusion	High		Moderate. Innovators adopting aggressively		Moderate to low. One founder=40% of trade	

Table 4b: Factors influencing diffusion rate – Suppliers

Factor	SupplyOn		GHX		Eutilia	
Perceived Attributes of the Innovation						
RELATIVE ADVANTAGE						
<i>Reach to trading partners</i>	Finding new customers a primary motivation.	**/++	DK	-	DK	-
<i>Reduced price of goods bought/sold (-ve for suppliers)</i>	Provision of high margin RfQs via that marketplace is a major determinant of the decision to adopt.	*/++	No price comparison service means that there is not a “market” element to the services offered.	*/++	This was the main disincentive for the use of the marketplace by suppliers.	**/++
<i>Process efficiencies in cost, time, reliability, flexibility</i>	Savings could be possible in theory, but at the moment they are limited by limited volume of transactions.	*/+	Multiple savings made in the procurement process e.g. catalogue management.	**/++	Transaction functions were not used – hence no benefits gained.	o/+
<i>Efficiencies in inter-organisational IT integration</i>	The provision of a single point of system-to-system integration.	*/++	Single point of integration.	**/++	DK	-
<i>Reductions in replication of directory administration</i>	Ability to access new customers through the marketplace.	**/++	Use of shared catalogue eliminated errors in the procurement process.	**/++	DK	-
<i>Savings from collaborative IT application development</i>	Suppliers were not investors in the marketplace – hence did benefit in this regard.	*/+	DK	-	The suppliers were not investors in the marketplace – hence did benefit in this regard.	o/DK
<i>Shared investment to establish marketplace or moderate fees</i>	DK	-	Investment in the marketplace seen as a means to reduce replication of IT development costs.	**/++	Moderate charges were made that were not seen as prohibitive.	*/+
<i>Positive impact on relationship number, quality & duration</i>	“Relationships will be closer” was the expected from adoption.	**/+	Increased levels of collaboration were seen as a result adopting the marketplace’s services.	**/+	Auctions (the principal service used by the supplier) were seen as “less than favourable”.	o/+
COMPATIBILITY						
<i>Compatibility with existing/desired future processes</i>	Seen as a means to win more business due to the increased visibility.	*/++	Some new processes were required to be implemented.	*/+	Minor changes to tendering process were needed.	*/DK
<i>Compatibility with existing data/IT standards</i>	No adaptors for the ERP systems that SMEs use were available.	*/++	Catalogues required complete reformatting.	*/++	Hosted systems meant investment in new systems was not required from supplier.	*/DK
<i>Compatibility with senior management views, values and strategy</i>	The use of the marketplace was closely aligned with the corporate aim to win new business.	**/++	Marketplace was seen as closely aligned to their senior management’s views and strategy.	**/++	The use of the marketplace was closely aligned with the corporate aims to win new business.	**/++
<i>Compatibility with operational culture</i>	DK	-	DK	-	DK	-

TRIALABILITY						
<i>Option to adopt services by type</i>	Suppliers could adopt the services on an individual basis.	**/++	DK	-	Suppliers could adopt the services on an individual basis.	**/+
<i>Option to adopt services discretely across business units/products</i>	DK	-	The marketplace's services were adopted by individual business units on a discrete basis.	**/++	The early adoption of the marketplace's services used limited trials.	**/+
<i>Trialability of process of standardisation & integration</i>	Not possible – suppliers needed to adopt the standardised processes.	*/++	Several ways to integrate with the marketplace were made available.	**/++	DK	
COMPLEXITY						
<i>Level of IS-marketplace integration needed to leverage benefits (-ve)</i>	Levels of transactions via the marketplace need to reach a certain level to make this viable.	*/++	Prevents re-keying of data, which is a major source of errors in the procurement process.	**/+	There is no need to integrate to use the marketplace's services.	*/DK
<i>Degree of process/data changes required to leverage benefits (-ve)</i>	Only becomes a problem when trading via many marketplaces.	**/++	Major changes required to catalogue data and the processes used to manage changes to this.	**/+	Need to redesign the RfQ/bidding process to take into account the role of electronic auctions.	*/DK
<i>Effort involved in accessing multiple marketplaces (-ve)</i>	This is seen as a major problem as there is a need to access several marketplaces in different industries.	**/++	Marketplace did not cover items the supplier sold hence the need to use multiple marketplaces.	*/++	DK	-
PERCEIVED RISK						
<i>Security of commercial data</i>	This was addressed by an external audit.	*/DK	DK	-	Security of data was a concern but sufficiently addressed.	*/DK
<i>Reliance on an unsustainable third party (-ve)</i>	DK	-	DK	-	DK	-
<i>Risk of legislative/regulatory change to purchasing practice(-ve)</i>	DK	-	DK		DK	-
Type of Innovation Decision						
<i>Power of buyers to demand or influence supplier participation</i>	This was one of main reasons for the adoption of the marketplace.	**/++	Gain first mover advantage over buyers forming their own marketplace.	*/+	One of main reasons for the adoption of the marketplace.	**/++
Nature of Social System						
<i>Presence of strong peer networks</i>	The marketplace actively used these networks to recruit other suppliers.	*/++	These were used by buyers to bring about a change in the healthcare supply chain.	**/++	This was not present due to the highly fragmented nature of the supply base in the utilities industry.	-
<i>Presence of strong existing buyer-supplier relationships</i>	Suppliers were targeted by key customers and pressured to adopt the marketplace's services.	*/++	Customers with whom relatively high volumes of business were being undertaken were targeted.	**/++	"Founders should have included suppliers" was one of the factors to which the limited adoption of the marketplace was attributed.	o/DK
Extent of Change Agents' Promotion Efforts						

<i>Quality of e-marketplace support to manage complexity</i>	DK	-	DK	-	It was perceived that good guidance was given for the services used.	*/+
<i>Power of change agents to determine agenda within or between organisations</i>	DK	-	Presentations given by influential buyers at a suppliers' meeting was seen as a major contributing factor to adoption.	**/++	Initial efforts to recruit were seen to be less than satisfactory and one of the factors attributed to the limited adoption of the marketplace	*/++
Rate of Diffusion	High (large suppliers); Moderate to Low (small suppliers)		Moderate (high within shareholders)		Moderate to low	

Table 5: Factors influencing diffusion rate - summary

Factor	Buyers	Suppliers
PERCEIVED ATTRIBUTES OF THE INNOVATION		
i) RELATIVE ADVANTAGE		
<i>Reach to trading partners</i>	Supported (1 case)	Supported (1 case)
<i>Reduced price of goods bought/sold (-ve for suppliers)</i>	Supported (1 case)	Supported (3 cases)
<i>Process efficiencies in cost, time, reliability, flexibility</i>	Supported (1 case)	Supported (1 case)
<i>Efficiencies in inter-organisational IT integration</i>	Supported (2 cases)	Supported (2 cases)
<i>Reductions in replication of directory administration</i>	Supported (1 case)	Supported (2 cases)
<i>Savings from collaborative IT application development</i>	Supported (1 case)	Consistent (1 case)
<i>Shared investment to establish marketplace or moderate fees – encourages participation</i>	Consistent (1 case)	Supported (1 case)
<i>Positive impact on relationship number, quality & duration</i>	Supported (1 case)	Consistent (3 cases)
ii) COMPATIBILITY		
<i>Compatibility with existing/desired future processes</i>	Supported (2 cases)	Supported (1 case)
<i>Compatibility with existing data/IT standards</i>	Supported (2 cases)	Supported (2 cases)
<i>Compatibility with senior management views, values and strategy</i>	Supported (2 cases)	Supported (3 cases)
<i>Compatibility with operational culture</i>	Supported (1 case)	DK
iii) TRIALABILITY		
<i>Option to adopt services by type</i>	Supported (1 case)	Supported (1 case)
<i>Option to adopt services discretely across business units/products</i>	Supported (2 cases)	Supported (1 case)
<i>Trialability of process of standardisation & integration</i>	Supported (2 cases)	Supported (2 cases)
iv) COMPLEXITY		
<i>Level of IS-marketplace integration needed to leverage benefits (-ve)</i>	Supported (2 cases)	Supported (1 case)
<i>Degree of process/data changes required to leverage benefits (-ve)</i>	Supported (1 case)	Supported (1 case)
<i>Effort involved in accessing multiple marketplaces (-ve)</i>	Consistent (1 case)	Supported (2 cases)
v) PERCEIVED RISK		
<i>Security of commercial data</i>	DK	DK
<i>Reliance on an unsustainable third party (-ve)</i>	Supported (1 case)	DK
<i>Risk of legislative/regulatory change to purchasing practice(-ve)</i>	Supported (1 case)	DK
TYPE OF INNOVATION DECISION		
<i>Power of buyers to demand or influence supplier participation</i>	N/A	Supported (2 cases)
NATURE OF SOCIAL SYSTEM		
<i>Presence of strong peer networks</i>	Supported (1 case)	Supported (2 cases)
<i>Presence of strong existing buyer-supplier relationships</i>	Supported (2 cases)	Supported (2 cases)
EXTENT OF CHANGE AGENTS' PROMOTION EFFORTS		
<i>Quality of e-marketplace support to manage complexity</i>	Consistent (2 cases)	Consistent (1 case)
<i>Power of change agents to determine agenda within or between organisations</i>	Supported (2 cases)	Supported (2 cases)

Key: *Supported:* Data from one or more cases support the factor being influential in determining marketplace adoption (i.e. indicated as ++ in tables 4a and 4b). *Consistent:* Data from one or more cases is consistent with the factor determining marketplace adoption (i.e. indicated as + in tables 4a and 4b). *DK:* Insufficient data to determine influence of factor in any case. *N/A:* not applicable.