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B2B e-Marketplaces in the Procurement Supply Chain of Airlines: A Strategic Concept for the Future?

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Summary: With the airline industry experiencing a global economic downturn, B2B e-Business is becoming more and more the focus of airlines' strategies. More recently, airlines have studied intensively the potential of joint-procurement possibilities and have taken measures in creating consortia-led B2B e-Marketplaces as mediators for aggregating demand and to facilitate transactions. In academic literature, limited academic research has been undertaken in exploring the value creation of B2B e-Marketplace models in the aviation industry. The aim is to conduct a theoretical analysis to explore whether or not e-Marketplaces have the potential to add value to procurement in the aviation industry. The research focuses on the potential of B2B e-Marketplaces in terms of improving an airline's competitiveness in its procurement value chain. The theoretical framework adopted supports the identification of barriers to success and critical success factors.

Keywords: Airline Industry, B2B e-Marketplaces, E-Procurement, Competitive Advantage

1. Introduction

The airline business is one of the most competitive industries within the economic environment, at least from a regional point of view (Jarach, 2002). Gradual liberalisation of international air transport has had a profound effect both on market structure and on operating patterns. Besides deregulation trends in many parts of the world, the airline industry is becoming more and more globalised due to consequent construction of global strategic alliances. Airlines in a deregulated environment now largely operate in highly volatile and competitive markets, which puts a tremendous need to reduce costs. Airlines are especially vulnerable to external economic shocks as their ability to react is very limited due to their high fix costs. Therefore, saving costs along the value chain is crucial.

Many e-Commerce principles were pioneered in the airline industry. The computer reservations systems (CRSs) developed for the travel industry were among the earliest examples of e-Commerce. They can be defined as an early version of an electronic marketplace and they were often called an infomediary. At a later stage, these reservation systems have evolved into global distribution systems (GDSs). While CRSs helps individual airlines sell and manage their own seats, the GDS consolidates information from many airlines, allowing travel agents, businesses, and individuals to shop in a single electronic marketplace. This marketplace has expanded to include hotel, rental car, and destination products and services (Smith, Guenther, Rao and Ratliff, 2001). While the airlines' focus was on B2C strategies in the early 1990s, in the late 1990s, B2B e-Business became more and more the centre of attention. In particular B2B e-Marketplaces were seen as to have the potential to positively impact the performance of supply chains by more efficient and frictionless procurement practices. While in domestic markets cost competition through better efficiency has become a major factor for airlines, in the international sector, competitive advantage is often sought through other ways, such as strategic alliances. Beyond the co-ordination of schedules and fares, etc., they also aim at cost reductions through the possibility of joint-procurement opportunities. In this respect, B2B e-Marketplaces have the potential to act as mediators for aggregating demand. However, in reality, only a small percentage of purchases have been undertaken in electronic marketplaces in the aviation industry compared to the traditional method of buying and selling aircraft parts and services and the rate of B2B e-Marketplaces that have gone out of business is very high (Gill and Wu, 2001). So far, limited academic research has been undertaken in exploring the value creation of B2B e-Marketplace models, particularly in the aviation industry. A sound theoretical analysis is necessary to explore whether or not e-Marketplaces have the potential to add value to procurement in the aviation industry.

2. Theoretical Background

A B2B e-Marketplace exchange is a central marketplace facilitated by ICT, in which multiple buyers and suppliers come together to gather information and buy and sell goods and services (Bakos 1998). The concept of B2B e-Marketplaces in the aviation industry cannot be researched without taking into

account the link between the diversity of theories of competitive advantage and ICT as well as the specific industry-related drivers. The concept of ICT as a competitive means has been strongly researched in the literature. Similarly, the overall concept of e-Business (and its subset e-Commerce) and their potential for value creation and thus the potential for creating sustained competitive advantage has been the focus of most recent research work (e.g. Amit and Zott, 2001; Rasheed and Geiger, 2003; Lee, Cho and Lee, 2002; Zott, Amit and Donlevy, 2000; Phan, 2003). However, academic literature to date has outlined the central issues of e-Business to a limited extent and so far no unified theoretical model has been developed which captures the unique features of this phenomenon (Amit and Zott, 2001). Furthermore, most of this research has focused on businesses and transactions in terms of B2C (Business-to-Consumer). In terms of B2B, ICT has been increasingly researched in recent years as the basis for inter-organisational information systems (IOS) that enable firms to transcend organisational boundaries, facilitate the flow of information, and manage linkages between suppliers and customers in the supply chain. E-Marketplaces have evolved from IOS (Reimer, 1996). Yet, the value creation potential of e-Marketplaces in the airline industry and their role in enhancing competitive advantage has not been the focus of academic research to date.

Several theories of competitive advantage provide potentially useful frameworks for the analysis of B2B e-Marketplaces in the aviation industry. The resource-based view has become a popular perspective for explaining sustainable competitive advantage in ICT and e-Business (Barney, 1991; Barney, Fuerst and Mata, 1995; Clemons, 1991; Clemons and Row 1991; McFarlan, 1984). Resource-based theory has also been suggested as a meaningful theoretical framework for pursuing competitive advantage through the development of IOS in value chain activities because of the required diffusion of new technology assets (Rasheed and Geiger, 2003, cited Angeles and Nath, 1999; Kumar & Crook, 1999). However, resource theory as it relates to using ICT to establish a sustainable competitive advantage has been equivocal. In particular, the resources involved in web-based e-Commerce may not be a source of competitive advantage. Resources in this technical context can at best be viewed as a temporary source of competitive advantage or a source of competitive parity. In fact, except for managerial ICT skills, Barney, Fuerst and Mata (1995) concluded that ICT can not be a source of sustainable competitive advantage. Because ICT resources are mobile and imitable, firms can only expect to have a temporary competitive advantage, and should view ICT as necessary in maintaining competitive parity (Rasheed and Geiger, 2003). In determining the value creation of e-Business, Amit and Zott (2001) observed that new value can only be created by the way in which transactions are enabled. In brief, these authors developed a model of the sources of value creation in which the value creation potential depends on four interdependent dimensions: efficiency, complementarities, lock-in, and novelty. Clemons (1986) identified the "create-capture-keep" paradigm by focusing on ICT-based customer switching costs as a potential source of competitive advantage. Another theory that describes sources of value creation and thus the achievement of competitive advantage is the transaction cost theory. Transaction cost can be defined as the costs of planning, adapting, executing, and monitoring the completion of a specific task (Williamson, 1983). In ICT literature, the leading perspective on e-Marketplaces is transaction cost theory (see Christiaanse and Markus, 2003). The strategic network theory is equally relevant in understanding the value creation of e-Businesses. Networks can be defined as two or more firms which, due to the intensity of their interaction, constitute a subset of one or several markets (Thorelli, 1986) and are possibly the most efficient form of organisation for today's economic circumstances (Miles and Snow, 1984). Jarillo (1988) defines strategic networks as long-term purposeful arrangements between organisations that allow these firms in them to gain or sustain competitive advantage in comparison to their competitors outside the network. Strategic networks are furthermore differentiated from vertical integration by the relative independence of participating firms. Therefore, strategic network theory expands transaction cost theory to explain the emergence of long-term relationships between firms in terms of the reduced transaction costs enabled by network collaboration.

3. The potential of B2B e-Marketplaces in the Aviation Industry

The deployment of B2B e-Marketplaces is potentially enabling a more efficient and streamlined flow of information, goods, services and payments between businesses (Bakos, 1991). In their early evolutionary stages, e-Marketplaces were meant to present a new business model focusing on the matching of buyers and sellers including the support of customers, products and services (Raisch, 2000). For the airlines, the B2B websites are an opportunity to use their leverage as major buyers to wring savings from suppliers and sell excess inventory. However, e-Marketplaces are currently evolving from simple matching services focused on transactions and e-Commerce to the provision of a

variety of value-added services that support transactions. A further step in the development will be the integration of knowledge services into the transaction exchange, thereby building value trust networks that enhance collaboration within the member communities (Raisch, 2000). Improving liquidity and addressing inefficiencies in supply chains by facilitating transactions and improving business processes, these virtual markets provide a value proposition to procurement and supply management in the aviation industry. The following elaborates areas where B2B e-Marketplaces can add value to procurement practices.

3.1. Reduction of Search Costs, Time Efficiency Enhancements and Disintermediation

The use of ICT has created increased industry competition, reduced technology costs, and increased interconnectivity of technology through open architectures in the past. Complementing these trends with infrastructures like the Internet, the consequences are more effective markets (Grover and Ramanlal, 1999). According to Jarach (2002), a web interface can generate two types of advantage: (1) greater effectiveness due to the possibility of shorter buyer search times and due to the possibility of reducing supplier response times, and thus simplifying the planning process; (2) greater efficiency, as B2B online negotiations also allow other actors, that are not part of the usual supplier network to participate in the process with a product or service offer, thus resulting in economies of variety and considerable savings in management. The power of Internet technologies to match buyers and sellers, share information, reduce search costs, and compare complex products, has been argued to alleviate market imperfections, resulting in more effective markets (Bakos, 1991). Due to the sometimes sporadic nature of demand for unpredictable aircraft maintenance parts, airline operators perceive difficulties in parts demand forecasting (e.g. Clarke, 1998; Ghobbar and Friend, 2002). Airlines often face very high costs in locating spare parts and components, especially for older aircraft types. This is also true for AOG (aircraft on ground) repair where besides the parts required by the aircraft manufacturer to be in inventory at the airlines' bases, appropriate parts have to be located in a very limited timeframe. Due to the lack of transparency of aircraft spare part inventory locations, airlines often face very high costs for such AOG repair parts. Advanced use of ICT and the evolution of e-Marketplaces can be hypothesised to decrease search times and to reduce the transaction cost for producers, thus enabling them to internalise activities that have to be purchased from intermediaries in a traditional market and resulting in a redistribution of profits within the value system (Giaglis, Klein and O'Keefe, 1999). E-Marketplaces potentially facilitate the direct matching of buyers and sellers, and as a result traditional intermediaries may be reduced or even eliminated, leading to disintermediation (e.g. Gellmann, 1996; Gates, 1995).

3.2. Increased Transparency of Supplier Base

When analysing the effect of e-Marketplace on transaction and procurement processing costs, it also needs to be considered that the airline industry is a highly complex one. In order to ensure the quality necessary and required by many federal aviation authorities to ensure safety, the aviation and aerospace industry differs from other sectors, as there are very high barriers to entry due to regulatory requirements. Usually, projects would be of high technical complexity and risk and are quite frequently collaborative between risk sharing partners. Sometimes, projects have long life cycles that can extend out to 50 years including ongoing modification, rebuilding and re-engineering. Furthermore, products are manufactured in low volume with unique design modification and option configuration status and quite often products require individual configuration history and modification tracking for certification, as well as full trace ability which is required on parts and materials. About 5% of the total parts purchased makes up about 25% of the total procurement cost in the aviation industry (Ghobbar and Friend, 2002). Mostly, high value products are sold under a requirement for full life support with in-service modifications and upgrades and vendors almost invariably supply initial maintenance packages including both spares and support. Finally, at the top of the value chain the industry has become highly consolidated with almost no competition (Chan, 2000). The world-wide market for aviation parts and products is highly fragmented and parts are supplied by many types of suppliers, including airlines, OEMs, numerous distributors, fixed base operators, traders and brokers. Suppliers of aviation parts and products are geographically dispersed and because of the specialised and complex nature of aviation parts and products, the particular part or product desired by a buyer may not be easily accessible. Buyers frequently search for a specific part or product to meet the parameters of a specific aircraft at a particular location. Buyers may spend a significant amount of time examining multiple paper catalogues and other information from different suppliers to identify the most appropriate part or product. After locating the desired part or product, buyers typically must place

orders with multiple suppliers in order to obtain parts or products related to a single aircraft. The use of e-Marketplaces has the potential to result in improved search capabilities, which results in a higher transparency of markets, and thus lower product prices.

3.3. Inventory Reductions

Aircraft availability has to be maximised at peaks and maintenance fitted into times when the planes are not required for commercial activities (Ghobbar and Friend, 2002). Demand for air transport varies with time. For example, a charter airline would experience its peaks during the summer months, and therefore schedule heavy maintenance to the less busy winter times. However, the usage patterns of a lot of parts is unpredictable. Forecasts are generally based on usage patterns such as flying hours or past parts demand, or the number and type of checks planned for every aircraft, and the fleet size. Historically, airlines are attempting to control the majority of the aviation parts and products inventory. Airlines are now beginning to reduce the size of their parts inventories in an effort to reduce inventory carrying costs. These inventory reductions have increased reliance of airlines on suppliers of new, used and overhauled parts and products, many of which may be difficult to obtain from manufacturers on a timely basis, if at all. If airlines demand time responsive inventory procurement processes, responsibility for inventory storage and handling will shift to suppliers. Bakos (1998) argues that e-Marketplaces improve information sharing between buyers and sellers, helping to lower the cost of logistics and promoting quick, just-in-time deliveries and thus reduced inventories. Most airlines, that perform at least the line maintenance at their own in-house facilities, must hold a certain amount of spare parts in their own inventories, based on projected annual flying hours. This is required by the large airframe and engine manufacturers. Also when new types of aircraft are introduced, the airframe and engine manufacturers provide a spares provisioning list. However, in many cases, airlines do hold more inventory than required, due to reasons such as avoiding AOG situations and also due to the fact that there is often still a huge amount of parts available that cannot be used anymore because of changes in the fleet type. In such cases, there is often an inventory overload, which binds a significant amount of capital that could be used elsewhere otherwise. Also many parts have a shelf life that cannot be used anymore after a certain amount of time. To reduce inventories, airlines can take advantage of means such as e-Marketplaces in order to manage their inventories and source missing parts in a time and cost efficient manner.

3.4. Joint-Procurement

The cost of material input accounts for about between 35% up to 57% of total costs at airlines, thus being the most important component (Oum, 1998). By reducing market fragmentation, a larger customer base for a specific product increases collective buying power. Also, low ICT costs enhance customer access to this product (Grover and Ramanlal, 1999). Similarly, Jarach (2002) argues that sophisticated e-Procurement applications can generate competitive improvements for firms because of the sharing of information and the planning of joint activities. In recent developments in the airline industry, a rising number of airlines involved in strategic alliances, as well as co-operations managed by holding companies can be observed. By viewing horizontal forms of co-operation as one entity in the airline industry, the procurement volume expands considerably. When putting together the purchasing power of such entities, one can identify potential cost savings in procurement. Operationally, airlines can co-operate across a wide range of activities. Oum, Park and Zhang (2000) defined 11 areas of joint or co-ordinated activities, including joint-maintenance and joint-procurement of fuel or other supplies. As the base facilities and headquarters of airlines embedded in strategic co-operations are quite often located globally, an e-Marketplace can be seen as mechanism for realising these joint-purchasing benefits by enabling aggregate buying, which means that multiple buyers can aggregate their spend in one basket, reducing the price through purchasing larger quantities. When considering the fact that co-operation in network relationships can lower total costs of various activities, e-Marketplaces can be understood as participants in collaborative supply networks (Christiaanse and Markus, 2003).

4. Results of a Survey among E-Marketplaces in the Aviation Industry

4.1. Survey Background

In order to study the value creation potential of e-Marketplaces in the airline industry in more detail, a survey was initiated addressed to the population of 59 e-Marketplaces and aviation specific portals

and service providers worldwide dedicated to the airline and aviation industry. In the year 2000, the whole industry witnessed a tremendous rise in numbers of new e-Marketplaces entering the market. Not surprisingly, the industry saw many failures, bankruptcies as well as mergers and consolidations within the population over the following years. As a result, out of these 59 portals identified, only 26 were still operational as aviation portals in 2002, whereas the rest of them ceased their operations fully or changed their business focus in another direction. Out of the 26 e-Marketplace identified as being valid for this research, 13 returned the survey, which is a response rate of 50% (see table 1).

Table 1: Background Information to Survey Response Rate

	<i>Number of Participants</i>	<i>Related Percentage</i>
Initial total number of aviation portals	55	
Number of portals that ceased operations	12	21,8%
Number of portals active in other sectors	17	30,9%
Number of active aviation portals (AAP)	26	47,3 %
Responses/Response Rate	13	50% (of AAP)

Most answers came from the United States with 46% of total received surveys, followed by 23% of answers from Great Britain and 15% from Germany. This result shows that the United States is market leader in numbers of e-Marketplaces. This finding is acknowledged by Amor (2000) and Raisch (2000). To investigate the possibility of non-response bias in the data, results were tested for statistically significant differences in the responses of early and late returned surveys. No significant differences were found and it therefore can be assumed that the sample results are representative as the population.

4.2. Services Offered

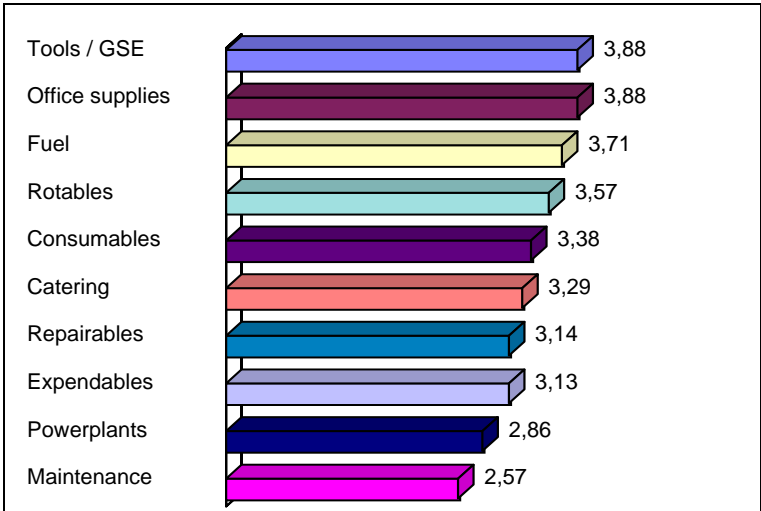
The average number of 10 months for an e-Marketplace to become operational gives a hint that at least a rudimentary e-Marketplace system is relatively easy to implement and maintain. However, this implementation time leaves room for speculation concerning the ability of such systems meeting all requirements of customers regarding content, security, service and functionality. Most e-Marketplace operators indicated that they are still in an evolutionary phase, but overall they expected that functionality and service might considerably change in years to come to better fit customer needs. The fact that most e-Marketplaces are still being in an evolutionary process can be strengthened with regard to the number of people employed. Most of e-Marketplaces only employ up to 50 people. The business focus is predominantly on offering vertical e-Marketplaces combined with a B2B focus. Few participants operate a horizontal e-Marketplace. It has further been asked if the e-Marketplaces focus on a particular customer base and if they are for profit or non-profit. From this question, it can be identified that the majority (69%) of e-Marketplaces that participated in the survey classify themselves as neutral intermediaries. Only 15% cited operating a buyer-centric and equally 15% an industry consortia-led exchange as well as 7% a seller-centric e-Marketplace. 69% of all respondents said that there is no airline financial involvement in its e-Marketplace. Only in one case was there a supplier involvement. Some participants believe that their customers tend not to prioritise the use of the Internet in procurement activities. The results indicate that the Internet still has a minor role in procurement and is not used to the full potential in the aviation industry. While supplier sourcing, posting RFQs and the use of e-Marketplaces were rated as relatively important, seeking general information about suppliers and the maintenance of procurement web sites were believed to be less relevant.

4.3. Current Status and Appropriateness of Aviation Specific E-Procurement

There was a clear indication that the use of the Internet will become more important in all aviation procurement fields in future. It can be observed that most goods and services being traded on an aviation e-Marketplace are maintenance services and repairables, followed by expendables, rotatables

and consumables. A relatively small number represent powerplants and tools/GSE (Ground Support Equipment), which are often traded on separate platforms specifically designed for these product groups. This also relates to fuel. However, office supplies are barely traded on aviation platforms at all. This finding suggests that office supplies might be traded on general horizontal e-Marketplaces, which are not designed for the aviation industry in particular. 53% of participants believed that their customers could improve their purchasing processes and so save time during procurement and sourcing. 46% fully thought that customers could achieve reductions in prices as well as a reduction in processing costs. Getting a better market overview was regarded as a major benefit. As fairly to highly realisable, survey candidates rated inventory reduction and reduced lead times. Better control over prices and a wider range of suppliers were rated as fairly important while the elimination of bogus parts plays a very minor role. Regarding documentation, 53% of participants indicated that paper reduction was very realisable on their e-Marketplaces. 46% claimed to offer extensive up-to-date documentation and 30% intelligent links. Maintenance help was rated as fairly to highly realisable. Regarding services, 46% specified that the tracking/tracing of order processes and more satisfied supplier sourcing are offered on their e-Marketplace. However, opinions diverge in view of repair/maintenance status tracking with 38% believing it to be fully realisable on their e-Marketplace and 23% rating it as not realisable at all. 31% of e-Marketplace operators offer auctions/reverse auctions and 32% rated this model as being suitable for procurement in the airline industry. Consumables, powerplants, rotables, tools/GSE and office supplies have been quoted as extremely appropriate products regarding this model of dynamic pricing. Repairables have only been quoted as fairly appropriate for auctions/reverse auctions (see Figure 2).

Figure 2: Reverse Auction Feasibility for Aviation Procurement Groupings (on a Scale from 1 = No Importance at all to 5 = Extremely Important)



Regarding fixed price catalogues, participants stated uniquely that all aviation product groupings are appropriate to extremely appropriate for this model of exchange. The joint-purchasing model has also been regarded as extremely appropriate for all products groupings. Security, speed, a high number of e-Marketplace participants, participant identity known, confidence in the operators of the e-Marketplace and system integration are all rated as extremely critical factors for an e-Marketplace. Perceived as just somewhat important are the handling of the delivery, the pre-selection of suppliers, air worthiness requirements, quality proof of offered products, homepage in native language, regional arrangement of e-Marketplace, as well as offers and demands described with pictures. Having its own clearing bank was not regarded by the participants as being an important service. Regarding any collaboration with other e-Marketplaces, 54% stated that they would co-operate with another e-Marketplace and 77% stated that their e-Marketplace was compatible with any ERP system.

4.4. Obstacles to Improvement and Critical Success Factors

In terms of the percentage of purchasing processing cost savings, the responses of e-Marketplaces ranged from as little as 10% up to 60% and more. In view of possible cost savings regarding product

costs participants indicated an average of 12%. However, the use of e-Marketplaces involves considerable investment costs for airlines and their respective supplier base. Characteristics of e-Marketplaces that affect the generation of their success and revenue are the number of members, transaction volume, number of product types, scope for expansion into related industries, scope for vertical integration, and the number of web site page views. These cost channels can include license fees, professional services, transaction fees, advertising fees, payment for supply chain savings, and subscription or membership fees. Most respondents claimed to levy a monthly or yearly fee (69%) to make use of their services, followed by the percentage per transaction fee (38%). Only 15% charge a one-off admission fee or some other alternative. Almost half of participants (46%) responded that both buyers and suppliers had to share the costs, while 30% charged costs to the supplier only. Not surprisingly, no one claimed to charge the costs to the buyers only, which suggests a relatively strong position of buyers in the e-Business world. Apart from these investment costs, e-Marketplace operators named different barrier patterns that prevent adoption of e-Marketplaces for procurement in the airline industry. The fear of a lack of security for transactions and accuracy of information were cited as the predominant barriers. The implementation of e-Marketplaces requires change management and training of employees to proceed with e-Procurement. This drawback is accompanied by employee's fear of job losses through automation. That is why many portal operators confirmed that many aviation industry participants, e.g. airlines and suppliers, are still reluctant to use e-Marketplaces at present. Rather self-critically, some e-Marketplaces admitted that they are still in an evolutionary phase and they have not yet developed to their full value creation potential. At the same time, portal operators were positive that they can extend their value propositions in future to increase e-Marketplace adoption in the aviation industry. So far, consolidation of portal operators is an ongoing process, but is likely to be followed by a more concentrated approach by these organisations left towards special core competencies which distinguish themselves from potential competitors.

5. Concluding Comments

The use of e-Marketplaces involves considerable investment costs for airlines and their respective supplier bases. Characteristics of e-Marketplaces that affect the generation of their success and revenue are the number of members, transaction volume, number of product types, scope for expansion into related industries, scope for vertical integration, and the number of web site page views. Most e-Marketplaces are still in an evolutionary phase and they have not yet developed to their full potential. Regarding current e-Marketplace models, two major trends can be identified: the concentration towards core competencies on the one hand, as well as the overall approach in trying to address various product categories and procurement departments on the other. However, it can be observed that recently, very specialised portals tend to co-operate with the larger broad types in forms of alliances or take-overs by the latter. In order to make use of the full potential of e-Marketplaces, many barriers still need to be overcome. The survey has concluded that there is still a wait and see approach among many industry participants for several reasons. First of all, there seems to be a lack of knowledge among potential customers in terms of potential e-Marketplace features and benefits. In particular, suppliers fear that they will lose control over their customers as a result of higher market transparency. As already seen in other industry sectors, numerous new entrants, bankruptcies and consolidations are often followed by a more concentrated approach by the remaining players towards special core competences to distinguish themselves from potential competitors. A trend towards such a development can already be observed, leaving the industry with more and more specialised e-Marketplace portals all dedicated to different commodities.

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