

Multi-Criteria Markets: An Exploratory Study of Market Process Design

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INTRODUCTION

Kumar *et al.* (1998) note that the key argument underlying inter-organizational relationships is that organizations and individuals are economically rational actors whose primary purpose is to maximize their resources. This rationale has been central to the views of social theorists (Monge and Contractor 2001) who purport that in their quest for utility maximization, actors take 'a zero sum view of the economic pie' and an adversarial view of other actors (e.g., customers, suppliers, competitors). This adversarial view leads to aggressive competitive strategies, as even in co-operative agreements that are supposedly based upon expectations of mutual benefit, the focus of many parties is on self interest (Kumar *et al.* 1998). Consequently, the price mechanism is traditionally used to coordinate the activities of firms operating in a particular market (Hayek 1945); such markets cultivate arms-length and short-term relationships (Malone *et al.* 1987). More recently, researchers have acknowledged that other factors including quantity, design and delivery target schedule may be utilized to coordinate market activities (Hess and Kemerer 1994). In this context, market forces determine the design, price, quantity and

delivery target schedule for a given product; the buyer of a good or service compares its many possible sources and makes a choice based on the best combination of these attributes (Hess and Kemerer 1994, Malone *et al.* 1987). Despite this, the vast majority of electronic markets have been based purely on a single variable (price) as the factor that determines 'the winner'. Markets based on multi-attribute auctions automate negotiation on multiple attributes of a deal (Bichler 2000, Bichler and Kalagnanam 2005), and are useful in areas such as corporate procurement as such negotiations are dependent on more than just price (Bichler *et al.* 1999; Bichler and Kalagnanam 2006). Such auctions may hold the key to higher market efficiency through a more effective exchange of buyer's requirements and supplier's offerings (Bichler and Kalagnanam 2002, 2006). However, the process is complex as the description of all attributes and the determination of the overall utility offered by various combinations of attributes is a difficult and time-consuming task (Bichler *et al.* 1999). Despite this, multi-attribute auctions are likely to be very useful in expanding the range of products and services that are traded using electronic markets. However, little

A b s t r a c t

This paper explores market process design for multi-criteria markets using the electronic market process design work of Ribbers *et al.* (2002) and Kambil and van Heck (1998). The study utilizes a case study of a market intermediary in the utilities sector to examine how multi-criteria markets differ from price-only alternatives. The study reveals significant differences in the role of the intermediary in the operation of multi-criteria markets, as well as marked differences in market process design in the areas of authentication, product representation and communications/computing. We conclude that these differences represent a fundamental shift in B2B procurement relationships from those described by Kaplan and Sawhney (2000) towards strategic sourcing.

Keywords: multi-variable auctions, strategic sourcing, procurement, case research

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research on multi-attribute electronic auctions exists (Bichler and Kalagnanam 2002), making it important for researchers to examine the applicability of existing e-market theories in light of the developments in multi-attribute auctions (Bichler *et al.* 1999).

The paper investigates the design of multi-attribute markets in the utility sector, and reveals that the use of an electronic market intermediary creates a middle ground of interaction between spot and systematic sourcing; creating organizational competitive advantage by automating, for the buyer, certain general parameters and trade context processes. It thus contributes to our understanding of electronic markets by: (i) providing an exploratory study of multi-criteria markets in practice, thus forming the basis of theory development; (ii) responding to the need to examine extant theories of electronic markets in light of developments in multi-criteria bidding; and (iii) documenting key differences between price only and multi-criteria markets in relation to market process design and the role of the market intermediary. The next section presents the conceptual foundation for the paper, and is followed by a description of the research method. The findings and conclusion are then presented.

THEORETICAL FOUNDATION

This section builds the conceptual foundation for the study of electronic market process design based on multiple criteria by examining extant theories for price determined markets. It begins by categorizing business-to-business (B2B) interaction based on product/market categorizations by Kaplan and Sawhney (2000) in order to set the context for electronic markets in business

procurement. Researchers (O’Reilly and Finnegan 2005, Soh *et al.* 2006) have noted the increased role played by intermediaries in designing and operating electronic markets. Indeed, research (O’Reilly and Finnegan 2005) has illustrated that if intermediaries are to be successful, the design of electronic markets and their processes is crucial. The work of Ribbers *et al.* (2002) on the design of electronic markets is examined as it explicitly links buyers, sellers and products (objects) with success by considering the design of the market organization (intermediary). Finally, the issue of market process design is examined using the work of Kambil and van Heck (1998). This approach allows us to build the conceptual foundation for a study of market process design, while providing the broader market design context that is driving the demand for multi-attribute markets.

Electronic markets; buyers, sellers and products

Kaplan and Sawhney (2000) considered B2B interaction based on product/market categorizations by differentiating between direct/indirect inputs and commodities/non-commodities (Figure1). Kaplan and Sawhney (2000) define systematic buying, either horizontal or vertical, as using e-hubs, based upon type of input. These e-hubs create value through aggregation and matching. E-hubs are illustrated as an aggregation mechanism for both buyer and seller in systematic sourcing. For Kaplan and Sawhney, markets are operated as e-auctions and e-exchanges as they are designed around the commodity purchasing parameter in spot markets. E-auctions and e-exchanges that are established for one buyer to many possible sellers, for systematic

	Operating Inputs	Manufacturing Inputs
Systematic buying (non-commodities)	horizontal hubs (procurement hubs) Ariba W.W.Granger	vertical hubs (catalogue Hubs, vortals) Chemdex SciQuest.com PlasticsNet.Com
Spot buying (commodities)	e-auctions (yield managers) Aduauction.com	e-exchanges E-Steel PaperExchange.com

Source: From Kaplan and Sawhney (2000)

Figure 1. The B2B Matrix.

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buying, the authors call reverse auctions. Kaplan and Sawhney (2000) state that these 'biased e-hubs' (biased towards one side of the transaction) can exist as aggregators in systematic sourcing and matchers in spot sourcing.

Information technology reduces the perceived complexity of products (Bakos 1991, Malone *et al.* 1987), allowing buyers to search and compare complex products by providing information in a manner that is easy to interpret; thereby enabling buyers to switch among alternative suppliers in the market (Malone *et al.* 1987). Therefore, migrating a market to an electronic setting has traditionally been viewed as suggesting a movement towards purely price competition among suppliers; as information technology reduces transaction costs, reduces perceived complexity of products, reduces asset specificity and increases free information flow (Bakos 1991, Malone *et al.* 1987). Thus, traditional economic theory suggests that information technology reduces market imperfections and allows more players to compete in cyberspace; thereby resulting in more effective markets (Grover and Ramanlal 1999).

However, such views of electronic markets are not without their critics. Researchers (Clemons and Row 1992, Grover and Ramanlal 1999) argue that the view of competition being purely based on price is one where buyers exploit sellers. Such views do not deal with electronic markets from a seller's perspective. Grover and Ramanlal (1999) suggest that: (i) product customization, enabled by IT networks, could allow sellers to exploit buyers; (ii) increased outsourcing could reinforce the sellers monopoly by sustaining higher prices; and (iii) open market structures could be exploited by suppliers to create captive buyer networks that can sustain higher prices.

Furthermore, Hess and Kemerer (1994) note that, for certain buyers, there is a worthwhile trade-off in utilizing the electronic market mechanism in order to obtain goods. They state that as interaction patterns change, and buyers migrate from interacting with a limited number of suppliers (electronic hierarchies) to many suppliers (electronic markets), the cost of coordinating business will rise. However such costs, they argue, will be offset by information technology. Due to increased competition, suppliers will be encouraged to manage their production costs more carefully and accept lower prices. Hess and Kemerer (1994), therefore, maintain that buyers will prefer electronic markets because they will pay less.

Sourcing choices

Electronic markets exist because of the need of firms for supplier choice for sourcing of goods. Zenz (1994: 120) defines sourcing as 'the strategic philosophy of selecting vendors in a manner that makes them an integral part of

the buying firm for a particular component or part they are to supply'. In other words, sourcing in the strategic sense no longer refers to getting materials at desired prices, but a decision incorporated into the operating strategy of the firm, allowing purchasing to support or even improve the firm's competitive advantage (Zeng 2000). In designing their sourcing strategy, firms have choices on how they integrate these suppliers into their purchasing procedures, either via systematic sourcing or spot sourcing. Systematic sourcing involves negotiated contracts and a long-term relationship between buyer and seller. Spot sourcing addresses a buyer's objective to fulfil an immediate need at the lowest possible cost, therefore, it does not require any long-term relationship between buyer and seller.

Therefore, combinations of these approaches, in the form of strategic sourcing, can lead to sound relationships with suppliers that can provide improvements in the firm's performance in many areas, such as total cost reduction, better product quality and faster delivery (Zeng, 2000). The design of electronic markets plays a role in assisting in efforts in strategic sourcing. In this research, we examine how multi-attribute auctions provide a greater advantage in this strategic sourcing effort than traditional single variable e-auctions, allowing firms more variables in designing the optimal sourcing relationship.

Market and market process design

Researchers (Lee and Clark 1996, O'Reilly and Finnegan 2005, Soh *et al.* 2006) note that electronic markets can be created by 'market making firms' or 'intermediaries'. Such intermediaries are motivated by regular economic performance indicators –such as total revenue, profit and number of transactions realized (O'Reilly and Finnegan 2005). Nevertheless, meeting the needs of buyers and sellers is critical to an intermediary's success. Thus, the effectiveness of electronic markets depends on how critical processes are designed and the nature of the product being exchanged (Ribbers *et al.* 2002). Ribbers *et al.* (2002) consequently argue that market design must then concentrate on buyers, sellers, objects (products), the market organization (the intermediary, market process design, trust, and IT innovation), and competition with other marketplaces. The market process design aspect can be examined in more detail using the work of Kambil and Van Heck (1998), who specify a generalizable model of exchange processes. The framework distinguishes five trade processes (search, valuation, logistics, payments and settlements, authentication) and five trade context processes (communication and computing, product representation, legitimization, influence, and dispute resolution). Using this framework, Kambil and Van Heck (1998) assess how trade context processes

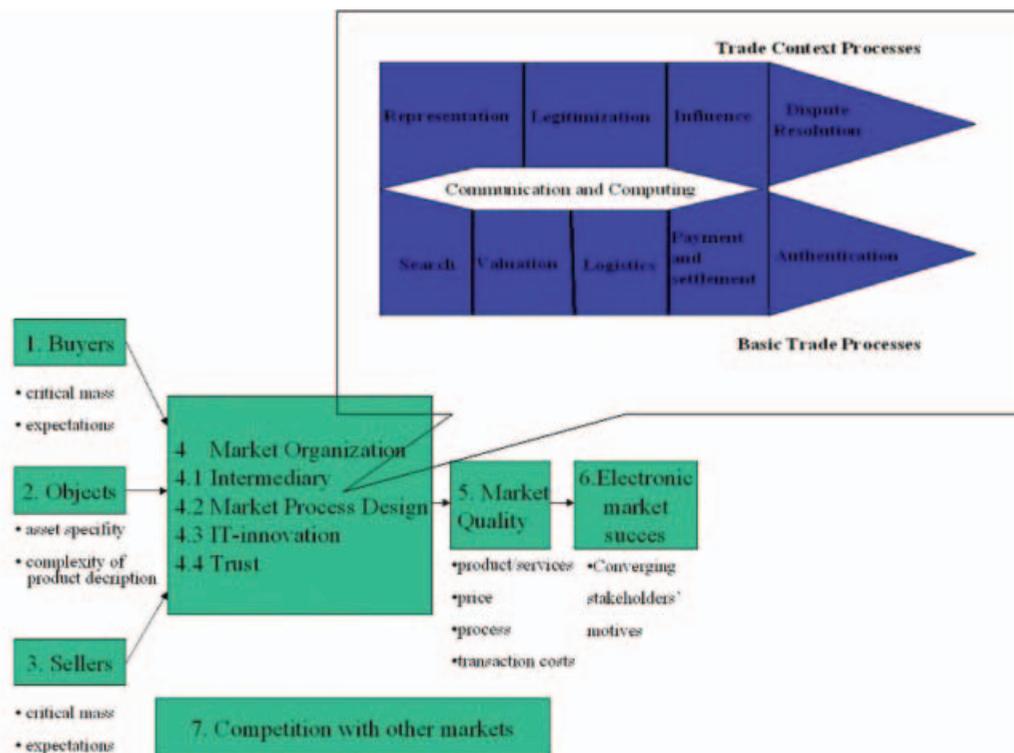
(representation, legitimization, influence, dispute resolution and information technology) reduce the traditional costs associated with basic trade processes (search, valuation, logistics, payment and settlement and authentication) in an effort to explain the efficiency of an electronic market from the perspective of buyers, sellers and marketplaces. Figure 2 summarizes the theoretical lens for the study by presenting an integration of the work of Ribbers *et al.* (2002) on market design with that of Kambil and Van Heck (1998) on market process design.

RESEARCH DESIGN AND APPROACH

Our objective for this study was to explore the design of multi-attribute electronic auctions, i.e. electronic markets where factors other than price are used to determine the winner. This study focuses on exploring the role of the intermediary that facilitates such auctions and how these auctions are designed. Marshall and Rossman (1989) argue that a case study can be used for such exploratory research. The case study approach is one of the most commonly used research methods in the information systems field (Benbasat *et al.* 1987, Darke *et al.* 1998, Eisenhardt 1989). It aims to obtain

an in-depth understanding of the phenomenon and its context (Cavaye 1996). Case studies enable researchers to investigate pre-defined phenomena without explicit control or manipulation of any variables (Cavaye 1996, Darke *et al.* 1998, Yin 1994). They serve to capture the reality and richness of organizational behaviour in detail (Gable 1994, Galliers 1992). Yin (1989) further argues that case studies are appropriate when the object is to study contemporary events.

The case examined was Eutilia; a leading pan-European marketplace for the utility sector, offering source-to-pay services to buyers and suppliers. Eutilia was created as a result of the European Commission’s decision to liberalize the utilities market across Europe. Indeed Eutilia’s creation had to be cleared by the European Commission as it operates in an area governed by public procurement directives. The CEO of Eutilia during its formation stated that the advantage of using a marketplace is ‘not so much about price, it is more about having better prices and improved transparency’. Increased competition and transparency were two principles which the European Commission was anxious to encourage in the utilities sector. Headquartered in Leiden, the Netherlands, Eutilia is open to all companies on both the buy and supply sides. While being an independent marketplace, Eutilia has the financial



Source: derived from Ribbers *et al.* (2002) and Kambil and Van Heck (1998)

Figure 2. Conceptual foundation for study Source: derived from Ribbers *et al.* (2002) and Kambil and Van Heck (1998)

Table 1. Position of interviewee, duration and documentation analysed

<i>Interviewee</i>	<i>Documentation analysed</i>
Chief Executive Officer 2 hours	Business plan
System delivery programme manager 4 hours	Technology papers
Commercial manager 1 hour	Internal presentations
Auction manager 2 hours	Financial reports
Business analyst 2 hours	Marketing documentation Press releases

backing of 11 of Europe's largest utility providers including Electrabel (Belgium), Electricite de France (France), Endesa (Spain), ENEL (Italy), Iberdrola (Spain), Nuon (Netherlands) and RWE (Germany). These 11 organizations account for the vast majority of the annual procurement spend in the European utilities market. Eutilia's services include supplier commercial assessment, e-tendering, e-auctions and transaction services.

Data gathering took place over an 11 month period from July 2003 to June 2004,¹ using a three phase approach. Phase one was concerned with obtaining background information on the electronic marketplace concerned. This meant that the researchers reviewed publicly available documents on the marketplace. Phase two incorporated an onsite visit to interview marketplace

personnel and to gather relevant documentation. Phase three consisted of follow up interviews in order to clarify specifics and verify the analysis. The people interviewed as well as the documentation analysed are outlined in Table 1.

All interviews were transcribed. Data were analysed using checklist matrices as documented by Miles and Huberman (1994). The parameters for these matrices were developed from the frameworks by Ribbers *et al.* (2002) and Kambil and Van Heck (1998).

FINDINGS AND ANALYSIS

This section discusses the findings from the Eutilia case. An analysis of the findings with theories derived from traditional single parameter (price) markets reveals how certain general parameters and trade context processes are enhanced by use of an intermediary over traditional market processes. For example, within the general parameters, suppliers are pre-qualified and the intermediary provides several additional value activities in market making and automation. The basic trade process of authentication is affected. Also, in the trade context process, product representation and communication are all impacted differently than in a single parameter auction.

General market parameters and the intermediary

Table 2 provides an overview of the findings from the Eutilia case analysed using the general market parameters

Table 2. Case analysis –general parameters

<i>Indicators</i>	<i>Findings</i>	<i>Difference from theory on traditional price auctions</i>
Buyers	Predominately used by European utility organizations to procure manufacturing (e.g., cables, transformers) and operating products (e.g., protective clothing, vehicles)	Eutilia creates auctions for single buyers to meet multi-attribute requirements.
Sellers	Preselected and prequalified international suppliers who are invited to participate if it is deemed that they meet buyer's requirements.	Pre-scanned across multiple attributes
Products	Multi-faceted and varied. Include core (e.g., cables, transformers) and non-core (e.g., protective clothing, vehicles) products.	Less homogenous products as MVB provides meaningful assessment of full offer.
Intermediary	Eutilia facilitates the communication, selection and negotiation processes for buyers. It does this through its supplier optimization services (SOS) incorporating supplier pre-qualification, supplier commercial assessment, e-tendering and e-auctions.	More planning required and more emphasis needs to be placed on auction design and structure due to multiple attributes. Buyer decides whether the object (contract) is suitable for auction.
Competition with other markets	While having no direct competitor in the European utilities sector for core products, it competes with markets for non-core products. Biggest competitor to Eutilia's business is from the individual buyers traditional paper based e-tendering process	Competition reduced due to full service nature of procurement process offered.

derived from the work of Ribbers *et al.* (2002). It is evident from the study that the role of the intermediary is different from traditional conceptualizations of electronic markets. Eutilia has essentially established itself as a strategic sourcing partner for utility industry buyers. This is evident from the manner in which Eutilia customizes procurement auctions for each buyer, and engages in substantial pre-auction activities to ensure that the process meets the explicit requirements of each buyer.

Eutilia utilizes a roadmap for auction preparation in order to ensure that the process fulfils EU regulations. To begin, Eutilia holds discussions with the buyer to decide whether an auction is a suitable mechanism for the product being procured. There is no definitive model to decide on this. Every contract is deemed to be unique, as the procurement environment for any given product is continuously changing. All that can be done is to consider the market at that point in time in order to establish if the environment is suitable for running an auction. A critical element is the importance of the contract to the market. For example, Eutilia management describe a scenario where a supplier is invited to an auction but they believe that the contract is not important. Consequently, the supplier would rather lose the contract than reveal their best margin. Eutilia staff advise buyers, but it is the buyer that decides whether or not to go ahead with an auction for a specific contract. At this point, a commercial contract is agreed with the customer. This incorporates all terms and conditions for the auction.

The next stage is to define the auction structure. Eutilia's Auction Manager believes that structure is very important as it influences the auction result. He stated that 'the first decision I have with buyers is to go through the complexities and how to structure an event'. It is possible for an auction event (contract) to consist of more than one auction line (product). Buyers will have to decide if they want one contract with one supplier for the entire event (one auction) or whether they wish to conduct a multiple auction event, thereby allowing for the possibility of numerous contracts. If a buyer wants a dynamic situation for each auction line then that needs to be reflected in the auction design. This process is more complex than Eutilia just providing the software with planning of the auction structure being crucial. Eutilia's auction manager stated that 'there are crucial questions which need to be answered. The buyer should know everything about the products, about the market, about the suppliers'. Preparing bidders is also a key task. Eutilia staff train suppliers in order to ensure that they are completely comfortable with the process. Between 1-2 days are set aside to train users. Eutilia's Auction Manager believes that this is crucial to an event being successful.

Eutilia have noted that a key issue for design of an auction structure is the perceived level of interdepen-

dency between various auction lines. For example if you have two products in an event, the outcome may be affected if the events are run in parallel as, for example, suppliers that lose in auction A may go deeper in their prices for auction B. If buyers believe that, Eutilia need to ensure that auction B does not end before auction A. If it is decided that there is interdependency between auction lines, individual auction running times can be linked. There are also practical limitations to this when deciding on auction structure. For example, if the buyer decides to run eight lines simultaneously, then suppliers have to concentrate on them all, especially if they are interested in all product lines. For practical reasons, they should not all finish at the same time. Therefore it is clear that dependencies between product lines will impact upon auction structure.

Eutilia also supports single or multi-currency bidding. Buyers may decide that it is advantageous to allow bidders to bid in their own currency. The opening price may be individual (per bidder) or general (per auction). The systems will also allow users to decide on whether to show or hide the opening price. It is usual to hide general opening price when current market levels are unknown. It is also possible to specify a minimum bid decrement. This will depend on the chosen auction type; English Reverse (ER) or Dynamic Sealed Reverse (DSR). It is also possible to show or hide the lead bid. It is usually good practice to hide the lead bid when individual prices differ hugely.

Eutilia works closely with buyers to determine an appropriate auction structure that takes into account the product and the prevailing market conditions. The auction structure outlines the activities and responsibilities of both Eutilia and the customer (buyer) in organizing the auction. A sample auction structure, showing activities over a 12-week period, is outlined in Figure 3. Figure 3 illustrates Eutilia's heavy involvement in organizing the auction.

Market process design

Building on the examination of general market parameters and the role of the intermediary in the previous section, Tables 3 and 4 provide an overview of the market process design in the Eutilia case using the basic trade and trade context processes derived from the work of Kambil and Van Heck (1998). Our analysis reveals that two basic trade processes (authentication and product representation) are central to the design of multi-attribute markets and are considered below. Furthermore, the communications/computing underlying both basic trade and trade context processes were also found to be significant, and are also considered in more detail.

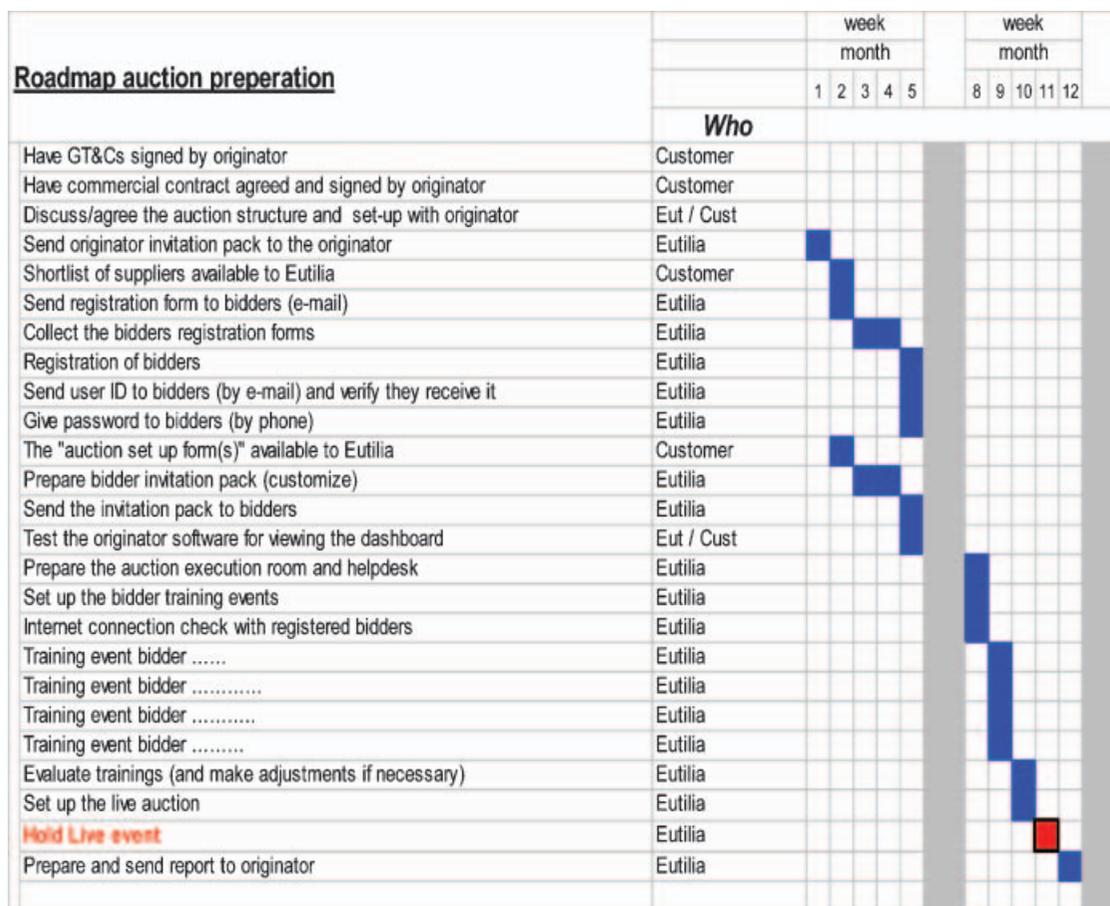


Figure 3. Eutilia's auction structure

Table 3. Case analysis – basic trade processes

Indicators	Findings	Difference from theory on traditional price auctions
Search	Buyers may utilize Eutilias database of prequalified and preselected suppliers to search for core and non-core products.	Search based on multiple criteria
Valuation	Multi-variable bidding (MVB) with price being just one characteristic. Other variables defined by buyers on a case-by-case basis. For example in the Scottish Power/United Utilities case who conducted an auction for vehicles, variables such as vehicles' residual value, repair and maintenance costs were some of the variables utilized. Auction type: English Reversed (ER), Dynamic Sealed Reverse (DSR)	Valuation based on weighting of multiple criteria
Logistics	Case specific on whether logistics are buyer or sellers responsibility – logistics may be one of the criteria utilized by buyers for multi variable bidding. Will be the buyer's decision in relation to whether they want to include logistics as one of the criteria in multiple variable bidding.	Logistics may be included as an evaluation criteria under MVB
Payments and Settlements	Final contract outside scope of Eutilia. Once an auction is completed, confirmation is sent to the buyers either directly to the buyer by the supplier or through Eutilia. Final contract and method of settlement is outside Eutilias scope. Direct communication between buyers and sellers on terms and method of payment	No differences observed
Authentication	Eutilia prequalifies all suppliers who are invited and sign up for tenders. They collect information in relation to a supplier's financial position, environmental policies and legal issues. Eutilia evaluate supplier's technical ability and test all products.	Extensive pre-qualification of suppliers by intermediary to ensure the integrity of the auction process.

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Table 4. Case analysis – trade context processes

<i>Indicators</i>	<i>Findings</i>	<i>Difference from theory on traditional price auctions</i>
Communication and computing	Auctions are live through Eutilia's proprietary auction software and conducted over the Internet.	Ongoing as bid preparation is online. Sellers can determine ranking in advance of auction
Product representation	As part of the qualification process, Eutilia checks the technical specifications and tests all products. Eutilia encourage buyers to move toward standardized products as there are efficiencies in the context of pricing. If buyers have specific needs, e.g., technical requirements, these will be incorporated in the tender	Buyers determine how object is represented across multiple attributes
Legitimization	Bid validity based on output of multi-criteria analysis. Contracts exchanged between buyers and sellers after event.	No difference observed
Influence	Eutilia owned by 11 leading European utilities. It may be deemed to be buyer biased as it only conducts forward auctions.	No difference observed
Dispute resolution	Contract between buyer and seller – Dispute resolution beyond the scope of Eutilia	No difference observed

Authentication. A significant value-added provided by Eutilia is the authentication provided by pre-qualification. The pre-qualification process may be broken down into three distinct stages. Stage one is known as commercial pre-qualification where Eutilia collects supplier information in relation to the supplier's financial condition, supplier capabilities, environmental and safety policies, outstanding legal issues and references. Stage two involves examining the supplier's technical capability. This involves Eutilia assessing the technical ability of suppliers through supplier audits and visits. Stage three involves product qualification where Eutilia tests the product to ensure it meets specifications.

The objective of Supplier Commercial Assessment (SCA) is to provide instant pre-qualification information on suppliers as an input to the utility sourcing process. The Supplier Scan Service uses online and offline searches for potential suppliers, supported by the market knowledge of Eutilia's sourcing experts. The service can be used to generate a long list of potential suppliers or taken a step further to apply specific search criteria. The benefits of Supplier Commercial Assessment (SCA) include shared supplier data among utilities, consistent pre-qualification, and reduced sourcing cycle times. SCA also enables the identification of new suppliers by virtue of a shared centralized database of utility suppliers

The aim of Eutilia's supplier commercial assessment (SCA) is to make the assessment and selection of suppliers as easy and transparent as possible for utility industry buyers. All utilities using SCA are obliged to share their supplier data with other users. Eutilia staff believe that by using the SCA service it can save up to 60 days on the overall procurement process compared to traditional calls for competition.

Both buyers and suppliers who use Eutilia's auctions must sign up to Eutilia's terms and conditions, which are contained in a legal document. Post auction, suppliers must send a mail or fax to buyers as confirmation.

Eutilia's management team also advises buyers to ensure that all the suppliers that they invite are 'serious candidates' for the contract. Eutilia's Auction Manager stated that in the case of reverse auctions for example 'we forbid buyers to use running dogs that are used to drive prices down but are not serious candidates.'

Product representation. Eutilia's tendering process is fully transparent for both buyers and bidders. All questions must be answered in a standardized format and the buyer may choose to make certain questions mandatory. This enables cross-tender analysis across multiple attributes. One of the key benefits of MVB is that buyers can factor in elements other than price. Therefore, when a multi-variable auction is used, a key issue is communication. It is important to communicate to suppliers that factors other than price are used to decide the winning bid. Eutilia's e-auctions manager noted that a weighting can be put on each supplier that participates in a specific auction. This weighting can be an amount and/or a percentage. A positive weighting (a bonus) adds to the bid and a negative weighting (a malus) deducts from a bid. In a reverse auction (where the lowest bid is best), a bonus is negative for the bidder and a malus is positive for his position in the auction. Eutilia's auctions manager stated that 'in order to be able to give correct weightings, the buyer needs to be able to quantify the advantages or disadvantages into an amount or percentage of the bid. Subjects that normally make weighting necessary are logistics, guarantee, terms of payment, differences of debit etc'. For example, if weekly delivery was important to a buyer, a bonus could be given to suppliers who meet this criterion. Therefore, when deciding to use a multi-variable auction, a buyer really needs to understand all aspects of the procurement process. This is reiterated by the comments of Eutilia's auction manager who stated that 'for instance, when logistics is an issue, the buyer needs to know what

storage, receiving and registering of incoming goods costs his company. Of course they should know this when they don't do an auction, but an auction, because of its set visibility and transparency makes this inescapable.' When two of the UK's largest utility companies, United Utilities and ScottishPower decided that they were seeking suppliers to provide them with a mix of cars, vans and trucks for their vehicle fleets, they issued a tender document with a value of 250 million euro over three years. As well as price, factors like the repair and maintenance costs, residual values and fuel efficiency were important for both organizations. In conjunction with Eutilia both companies decided to utilize multiple variable bidding (MVB) in which buyers factored in all of the variables they are seeking from the contract.

In this example, a total of 26 different auctions were held, making up three auction events covering cars, vans and trucks. This approach suited the buyer's needs along with the time and cost savings enabled by participating. Participants did not need to travel to a physical auction and because suppliers were pre-qualified, their involvement in any further auctions would be even more streamlined.

In total, the buyers received 167 bids and during the process the importance of Eutilia's multi-variable bidding approach emerged strongly. Manufacturers were invited to sharpen up their initial bids and this had benefits for buyers. In many cases, it was not the supplier offering the lowest price that won the auction but the one that could provide the lowest life cost. In addition, Eutilia management believe that those suppliers that invest in customer service are often revealed as offering better value than competitors who quote a lower headline price. From a buyers' perspective, Eutilia's Auction Manager stated that '7–21% savings are normal for buyers who use MVB auctions.'

An important element in Eutilia's auction system is the Dashboard. This enables buyers to see the bids during the live auction, and to list these using such criteria as bid time, ranking and whether the bid is on the total quantity or part of the quantity. Reports are available in Excel with the best bids and all bids listed in chronological order. An extension time mechanism is also available to enable bidders to react to a previous bid where it is deemed advantageous. The number of extension times may be limited. All of these decisions are made by the buyers in conjunction with Eutilia.

Until recently bidders were not able to see the number of bids which had been entered in relation to an auction. In many auctions bidders saw the auction times being extended and they did not see anything happening unless they made a bid themselves; especially if the leading bid was hidden and they didn't have a rank in the top three for instance. The system was recently changed to improve transparency with bidders now able to see bids coming in. They can, therefore, see how others

bidders are reacting and this may stimulate them into making a revised bid.

Eutilia are also leading the drive towards standardized products in the utilities sector. The advantage for the buyers is that they have a broader base of suppliers from which to purchase and it makes the task of procuring certain goods less uncertain. By not only pre-qualifying suppliers, but products as well, buyers can be assured that all goods meet the specified technical standards and have been fully tested.

A comprehensive set of IT tools and services are offered to suppliers to present their products and services to buyers. The application enables the creation, maintenance and distribution of customized catalogues. The system forces suppliers to answer questions in a specific format. Suppliers cannot release their offers until mandatory questions are answered. During the auction, Eutilia's helpdesk supports up to 10 languages to facilitate a broad range of suppliers. Once the auction is closed, a report can be generated with the suppliers ranked under specific criteria.

Communications and computing. The complexity of the buyer's requirements and product offerings necessitates that Eutilia have a formal process for representing both in advance of and during a live auction. This is necessary as suppliers need to be able to customize their offering in light of competing bids, and the buyer has to be able to evaluate offerings across a number of criteria.

Eutilia uses a formal series of processes to distribute information during the auction set-up and the auction event. Incorporated in this process is:

- publication of the tender document;
- invitation of pre-selected, commercially assessed suppliers; and
- helpdesk support during the auction to deal with queries.

Eutilia's proprietary eSource system provides all necessary information to buyers and suppliers to ensure that the auction is as transparent as possible. This system utilizes up-to-date encryption technology, and is protected by a series of firewalls. The system enables buyers to develop electronically and centrally stored tender documents. It also enables the buyer to communicate simultaneously with all bidding suppliers and support the efficient evaluation of responses. The application is available in three languages; English, German and French. This helps to extend the market reach by ensuring that suppliers from various countries can take part in auctions with language not being a barrier.

The first stage in the process is to set-up the tender. Eutilia examines all the documentation which a buyer traditionally distributes to suppliers through 'snail mail'. The tender is designed with weightings attached to specific criteria. Several answer formats are possible, and

the buyer decides on the format and which questions should be mandatory.

Once a list of suppliers is finalized, suppliers are contacted and invited to tender. This process is undertaken by Eutilia by distributing registration forms by email. Interested suppliers (bidders) return these registration forms. User IDs are then sent to these suppliers by email, with passwords distributed via phone.

Bidder training events are then organized. This consists of Eutilia personnel being online with a supplier for half an hour in order to educate them on how to use the application. If there are 20–25 suppliers, this process may take up to two days. Eutilia tried to automate this approach by providing an online demo, but abandoned this approach as they found that personal contact is necessary to build trust. While Eutilia believe that this process is necessary, it is expensive.

Eutilia then tests the software to ensure that the buyers can view the dashboard. The auction execution room is then prepared and the helpdesk is set up. During the publication period, the buyer can monitor the event. For example, the buyer can check if specific suppliers have accepted the invitation, logged in to the event, or have worked on the tender. Eutilia is continuously communicating with the suppliers during this period in order to establish if they have any questions about the system or the tender.

CONCLUSION

This study has contributed to building our understanding of multi-criteria markets using extant theories of market design (based on Ribbers *et al.* 2002) and market process design (based on Kambil and Van Heck 1998). Our study has revealed significant differences in the role of the intermediary in the operation of multi-criteria markets, as well as marked differences in market process design in the areas of authentication, product representation and communications/computing. We conclude that these differences represent a fundamental shift in B2B procurement relationships from those described by Kaplan and Sawhney towards strategic sourcing (see Figure 4). Strategic sourcing is a buying process that includes definition of product and service requirements, identification of qualified suppliers, negotiation of pricing, service, delivery and payment terms, and supplier selection (Fairchild 2006).

The move towards strategic sourcing is evident from the nature of the products traded, the role of the intermediary and the relationship between the intermediary and buyers/sellers. First, we examined the nature of products that can be procured through multi-criteria markets. A key differential between the procurement mechanisms proposed by Kaplan and Sawhney was the product type (direct and indirect input). Evidence from our study regarding the variety of products traded

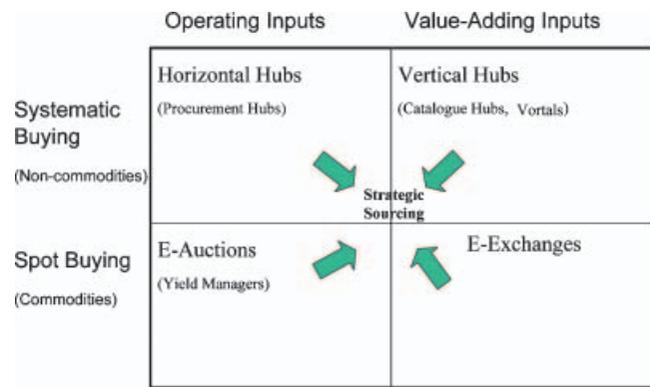


Figure 4. Moving towards strategic sourcing

through Eutilia illustrates that multi-variable electronic auctions are likely to be useful for procuring a wider range of operating and manufacturing input that has been considered possible with traditional, price only, auctions. This is because such products can be effectively evaluated across a range of criteria in real-time if there is sufficient support from the intermediary for the process. Multi-variable electronic auctions can, therefore, be seen to be more beneficial than systematic sourcing, as the variables may differ across individual auctions for the same product type, allowing the best solution to be provided from a portfolio of qualified suppliers.

Second, the changing role of the intermediary represents further evidence in support of our conclusion regarding the move to strategic sourcing. In particular, we found that the role of the intermediary changed to include greater responsibilities for authentication, product representation, with consequential changes in communications/computing. We found that multi-attribute markets necessitate much more interaction between the intermediary, buyers and sellers, akin to the traditional face-to-face negotiation of deals from the past. They specifically require much more interaction between the buyer and intermediary with regard to planning, designing and structuring the auction. The relationship between the intermediary and suppliers thus becomes much more complex as both suppliers and the products need to be pre-qualified and audited – thus the observed changes in authentication and product representation.

Third, as the intermediary develops a greater understanding of the value chain activities of buyers and sellers, we conclude that this understanding could lead to long-term partnerships between the intermediaries and various buyers and sellers. Eutilia management emphasized the importance of building long-term partnerships with both buyers and sellers; many of whom participated in multiple auctions with Eutilia. This is reflected in the amount of time dedicated by Eutilia to educating and training personnel from both buyer and supplier organizations. Furthermore, as a result of Supplier Commercial Assessment (SCA), suppliers were

invited by Eutilia staff to participate in numerous auctions. We, therefore, conclude that such partnerships are likely to facilitate the type of cooperation that has traditionally been associated with systematic sourcing arrangements between buyers and sellers. Given the market nature of the transaction we propose that this cooperation represents a move towards strategic sourcing where many operating and manufacturing inputs can be sourced using electronic auctions rather than horizontal or vertical hubs. However, in arriving at this conclusion, we propose a note of caution. Buyers utilizing a 'full-service' electronic market intermediary are likely to enjoy many of the benefits of both spot and systematic sourcing. However, the process activities by the intermediary may not aid the evolution of long-term, buyer-seller partnerships. With the reliance on an intermediary for activities such as search, communication and product representation, we would argue that power and control of the buyer-seller relationship rests with the intermediary.

Finally, it is important to note that the methodology utilized for the study was exploratory, and thus the findings need further investigation. This study should be duplicated as part of the process of validating its findings in a context that is not just exploratory. In particular, further research is needed to replicate the study by studying market process design in a variety of multi-criteria markets. Opportunities to do this type of study should develop as multi-criteria markets become more common. Further research is also needed to test our conclusion regarding the move towards strategic sourcing. We have come to this conclusion from the evidence gathered from our examination of general market parameters and market process design (Tables 2-4), but these findings need further testing. Finally, we suggest further research to explore the role of market intermediaries in electronic markets and strategic sourcing.

Note

1. Eutilia shareholders decided on the 23 November 2006 to liquidate the company, citing that 'despite five years of successful operations, most customers preferred a private marketplace solution' (www.eutilia.com). An overview of Eutilia operations from 2001 to 2006 is provided in Appendix I.

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APPENDIX: FACTS ABOUT EUTILIA (2001–6)

- Employees
 - 57 permanent employees
 - 80 temporary employees
 - 20 'secondees'
 - Use of eSource
 - 1,537 registered buyers
 - 8,012 companies registered as suppliers
 - 6,305 single users attached to different projects
 - 28,212 active participation on projects as suppliers attached
 - eTenders
 - 1,719 tenders published
 - 12,969 suppliers invited to tender
 - Euro 1.3 billion traded
 - eAuctions
 - 1,161 auctions held
 - 6,147 suppliers invited to auction
 - 34,431 bids placed in total
 - Euro 1.6 billion traded (value of bids placed)
 - Euro 230 million savings generated
 - Indirect impacts
 - Euro 160k saved on postal costs for the suppliers
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