



A model of B2B e-commerce, based on connectivity and purpose

A model of B2B
e-commerce

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Andrea J. Cullen

School of Informatics, University of Bradford, Bradford, UK, and

Margaret Webster

School of Management, University of Bradford, Bradford, UK

Abstract

Purpose – To present a complete and comprehensive model by which business-to-business (B2B) e-commerce transactions for sales and purchases between organisations may be categorised.

Design/methodology/approach – Literature from the e-commerce and operations management fields was studied, and the findings were synthesised to develop a preliminary conceptual model of B2B interaction. The conceptual model was tested empirically using a qualitative research procedure involving focus groups. From this, its structure and content were validated and refined.

Findings – The research found that the developed model, incorporating nine exclusive e-commerce trading scenarios, covers all B2B selling and purchase transactions, which suggests that it is comprehensive. It further found that trading occurs in each of the nine scenarios within the model, thus suggesting that it is complete. These findings support the conclusion that the model represents a valid taxonomy for the classification of B2B e-commerce transactions.

Research limitations/implications – Although the literature findings are international, the empirical study was restricted to the UK. The model has been validated through this research, and now provides a framework by which the mechanisms of B2B trade may be further investigated.

Practical implications – The model allows commercial organisations and researchers to recognise and understand the complexity and multiple dimensions of e-commerce use for B2B sales and purchases. It provides a framework onto which individual trading scenarios may be mapped. The framework offers guidance to operations and supply chain managers in organisations as to the most appropriate approach to adopt in particular e-commerce implementation projects and supply chain transactions.

Originality/value – This paper furthers knowledge in the areas of e-commerce and operations management by proposing a new model of B2B interaction. This provides a comprehensive means of classifying all available transaction types, the characteristics of these and the likely technology used within them. It offers the ability, systematically, to identify, map and understand all available B2B e-commerce trading mechanisms.

Keywords Buyer-seller relationships, Electronic commerce, Focus groups, Supply chain management
Paper type Research paper

Introduction

In recent years, the literature and popular press has produced extensive coverage of first the e-commerce boom and then the fall of many within the technology sector. Cagliano *et al.* (2003, p. 1143) refer to the early literature as “the first, enthusiastic claims on the ‘miraculous’ effects of the ‘new economy’” suggesting that a more mature view has since followed. As this more developed view evolves, research increasingly includes the investigation of e-commerce within more traditional organisations rather



than within the so-called “dot coms”. However, as industry moves to embrace technology, academic research within this area is lagging behind (Reynolds, 2000).

Research into technology implementation is often strategically focused, with less attention given to operational aspects (Jones and Beatty, 2001). Research into the technology that is used to conduct business electronically (e.g. using mechanisms such as the e-auction, marketplace or e-bid) is commonplace, relative to study of the implications of e-commerce for management. This research investigates e-commerce from the perspective of operations management rather than technology, and at the operational level rather than the strategic level of an organisation. Based on these points of departure, the purpose of this paper is to present a taxonomy by which e-commerce business-to-business (B2B) transactions may be classified.

The implications for management of this taxonomy relate to the fundamental importance of B2B exchange within operations. Specifically, B2B transactions take place within supply chains (Croom, 2001; Graham and Hardaker, 2000; Kehoe and Boughton, 2001; Patterson *et al.*, 2003; Quayle, 2003; Rivard-Royer *et al.*, 2002) or supply networks (Harland, 1996; Lamming *et al.*, 2000). Within these, e-commerce facilitates the integration of buyers and sellers (Gunasekaran and Ngai, 2005). A sequential process of e-commerce adoption or evolution from the most limiting to the most comprehensive has been suggested (Cagliano *et al.*, 2003; Croom, 2005; DTI, 2001). This implies that an organisation should be able to identify a single point at which it operates for all its B2B exchanges on a notional e-commerce continuum. It is argued here, however, that organisations may be at different stages of e-commerce adoption concurrently, depending on the type of transaction. In this context transaction type is characterised by its purpose (e.g. for buying or selling) and by its connectivity (the number of agents involved). In support of this, the idea that organisations may implement e-commerce as a series of multiple small and well-defined projects developed simultaneously, rather than as a “one-size-fits all” process for all transactions is identified by Bendoly and Schoenherr (2005). Thus, by providing classification of the possible transaction types (i.e. by connectivity and purpose) and understanding of their relationships to e-commerce mechanisms (such as e-auction, marketplace or bid), organisations can be guided as to the most appropriate approach to adopt in particular e-commerce implementation projects and supply chain transactions.

The taxonomy was generated in conceptual form, based on the findings of a comprehensive literature review, and was subsequently developed through a rigorous empirical investigation. In respect of the latter, Rao *et al.* (2003, p. 14) state that “little or no empirical research on model development and theory testing is reported, mainly because of the nascent stage of the e-commerce field”. The purpose of the work undertaken here makes a contribution to the shortfall in model development.

The taxonomy models B2B e-commerce transactions between buyers and sellers on a two-dimensional framework. The first dimension relates to the “connectivity” of the transaction, in which the number of (potential) buyers and sellers in a particular transaction is defined. This can be thought of as the bandwidth – the number of agents communicating, or potentially communicating, in order to complete the transaction. The second dimension relates to the primary “purpose” of the user who initiates or controls the transaction, i.e. it relates to whether the user is buying or selling or interacting with a partner as part of an on-going integrated trading relationship (e.g. for

the exchange of design data). The resulting model defines transactions within nine distinct scenarios.

The structure of the paper is as follows. Initially, we present a review of the literature, reporting prior research into e-commerce use for B2B interaction. Summarising this, an existing B2B connectivity model with four scenarios is used as the basis for the development of the preliminary conceptual model. The methodology for the empirical work to test this is then described, and the use of qualitative focus groups as the method of data collection is justified. The findings of the analysis of both primary (empirical) and secondary (literature) data are synthesised in the presentation and explanation of the taxonomy. Discussion and conclusions, including consideration of the implications of the work, complete the paper.

Literature review

Discussion of the technologies associated with e-commerce is beyond the scope of this paper. Nevertheless, in order to provide context, a number of key concepts need to be considered. There is no universal agreement on a definition of e-commerce (Hansan and Tibbits, 2000; Subramani and Walden, 2000; Wyckoff and Colecchia, 1999). Whereas the scope of e-business includes information exchange, commercial transactions and knowledge sharing between organisations (Croom, 2005), e-commerce focuses only on commercial transactions. The Office for National Statistics (ONS) classifies e-commerce as the use of electronic networks to place orders (using all types of computer-mediated networks), rather than as a payment or delivery channel (Rowlatt, 2001). It is this latter definition that has been adopted within this work.

Some of the technologies associated with e-commerce include “web sites, electronic mail, extranets to promote electronic communication ordering with suppliers, intranets to facilitate internal knowledge sharing and EDI” (McIvor and Humphreys, 2004, p. 242). Technically, an extranet is differentiated from an intranet by the addition of internet connections and its accessibility from the web (Preston and McCrohan, 1998). Therefore, an intranet user must be located within the physical confines of a network whilst the extranet user can gain access from any remote location via the internet. An extranet is most often described as a secure connection between an organisation and its business partners (Kehoe and Boughton, 2001; Turban *et al.*, 2000; Messerschmitt, 2000; Zinkhan, 2002) and an intranet as restricting access solely to company personnel (Kehoe and Boughton, 2001; Watson, 1999; Zinkhan, 2002). These distinctions are not universally accepted because it is also said that an intranet can be used between business partners (Strader *et al.*, 1999; Turban *et al.*, 2000).

In order for e-commerce to take place, the notion of an electronic marketplace or exchange can be envisaged. This is a facility to link buyers and suppliers electronically to automate corporate procurement (Porter, 2001), and has three principal components – the product providers, the market maker (Klein and Quelch, 1997; Mahadevan, 2000) and the portal (Mahadevan, 2000). Many mechanisms potentially exist within a marketplace for B2B sales and purchases, but all involve up to three participant types – buyers, suppliers and intermediaries. One of the aims of the empirical work presented in this paper was to identify actual mechanisms used for e-commerce in B2B transactions and to classify these on the taxonomy based on connectivity and purpose. These two issues are discussed below.

B2B connectivity

Connectivity refers to the number of agents (potentially) communicating within a transaction. Possible options have been described as one-to-many, one-to-one and many-to-many (O’Callaghan and Turner, 1995; Reed, 2001) and any-to-any (Zeng and Pathak, 2003). Alternatively, transactions can be described as open or closed (Grieger, 2003, 2004) or public and private (Whitaker *et al.*, 2001). Closed/private transactions are restricted to only specific members of a (buying or selling) community, with no distinction made between a membership of one and a pluralistic membership. Open/public transactions imply free access to all members of the community. The first ignores the option whereby only a few agents (buyers and/or sellers) may interact, and the second excludes the option whereby only one agent (buyer and/or seller) is involved. Thus, it is necessary to develop a more comprehensive model that accurately represents all the available connectivity scenarios that exist, ranging from one-to-one to many-to-many but also incorporating options where only part of the supply base or market is involved.

The model shown in Figure 1, initially developed by Lief *et al.* (1999) and subsequently modified by van de Velde (2000) was found to be the only relevant B2B e-commerce model in existence. It was used to form the basis for the development of a more fine-grained model. It illustrates e-commerce transactions by connectivity, and adopts quadrant titles that reflect the electronic mechanisms that are used to facilitate these. Although it is appreciated that organisations conduct transactions using both e-technology and more traditional methods (such as mail), this study focuses on those transactions that use e-commerce only. A brief explanation of each of the scenarios follows.

Auction (one-to-many). Although alternative auction types have been proposed (Kandampully, 2003; Kung *et al.*, 2002), the one referred to here is an event where the seller initiates the transaction. Potential buyers bid for products with the price escalating until a final figure is agreed. There is connectivity between one seller and many buyers. In e-commerce terms, internet auctions adopt the same process within an on-line marketplace using a system-wide standard auction that is open to all participants (Klein and Quelch, 1997).

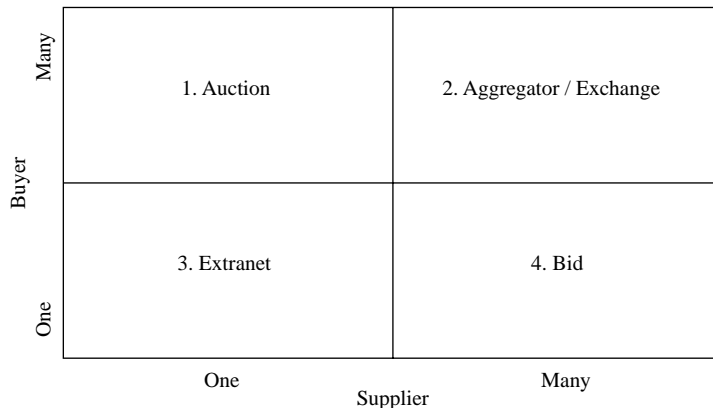


Figure 1.
E-commerce mechanisms
for exchange

Source: Adapted from Van de Velde (2000)

Aggregator/exchange (many-to-many). Here, many buyers and many sellers may connect within a range of transaction types. Buying organisations may join together to request customised products and services from suppliers, and suppliers may form alliances to create new products (Reed, 2001). Alternatively, buyers may access the market to identify the “best” seller, maximising the chance of finding the lowest price (Choudhury *et al.*, 1998). An exchange or electronic market may be seen as a neutral transaction-facilitating intermediary (Sparks and Wagner, 2003) or where buy and sell orders between multiple buyers and sellers are centralised and matched (Grieger, 2003). Exchanges can be horizontal (across many industries) or vertical (industry specific) (Smart and Harrison, 2003).

The aggregator or exchange reflects a marketplace where many buyers and sellers interact, however, distinction is not made between restricted or limited connectivity between organisations. It is argued here that transaction types exist whereby connectivity is restricted to only part of a potential supply base or market. (Examples of this are given later within the discussion of the proposed model). Although differentiation has elsewhere been made between open (unlimited number of participants) and closed (limited suppliers and customers) interaction (Grieger, 2003, 2004), this is restricted to internet activity. It does not include legacy systems and other electronic technologies such as electronic data interchange (EDI). The model developed within this work incorporates the notion of limited or partial connectivity for all forms of e-commerce.

Extranet (one-to-one). This quadrant is possibly the most controversial in Figure 1 as it expressly refers to one-to-one interaction and defines this as an extranet. An extranet is, however, more generally regarded as a mechanism in which interaction is limited to specific trading partners, but not necessarily just between one buyer and one seller. Thus, the extranet’s connectivity should more accurately fall within the band between one and many.

Bid (many-to-one). The bid, a buying transaction, is also called the reverse auction (Kung *et al.*, 2002; McNealy, 2001) the online auction (Emiliani, 2000) or the buyers/downward auction (Choudhury *et al.*, 1998) where prices are gradually reduced and the lowest quotation accepted. A bid has been described as a mechanism for products typically purchased via request for purchase (Lief *et al.*, 1999), request for quotation (RFQ) (Emiliani and Stec, 2002) or tender (Smart and Harrison, 2003). It enables a wide range of suppliers to bid competitively in real time (Lief *et al.*, 1999).

The e-commerce marketplace model (Figure 1) incorporates transaction types that illustrate connectivity between buyers and sellers of products. However, it fails to consider the practical scenarios in which connectivity is limited to only part of a supply base or market. Further, it is argued here, that another aspect of buying and selling transactions between organisations has been ignored in previous research. This relates to the primary purpose of the transaction that is taking place.

Primary purpose of the transaction

An extended model needs to consider the full range of options whereby interaction can involve one buyer and/or seller, all buyers and/or sellers or part of a supply base or market, and further, can involve a selling, buying, or more integrated activity. The latter dimension relates to the primary purpose of the user who initiates the transaction. This may be an organisation that is intent on selling a product (seller), or one that is looking to buy a product (buyer). Alternatively, an e-commerce transaction

may take place between two (or more) organisations that have an on-going trading relationship, for the exchange of data such as orders, invoices, payment, design or operational data. Cagliano *et al.* (2003) refer to this form of joint or integrated interaction using the internet as e-collaboration, whilst Rao *et al.* (2003) suggest that, in its ultimate form, this is “enterprise integration”. Within this paper, the term “integrated exchange” is used to define the purpose of this form of transaction.

Transaction options have been categorised as private (one-to-one), broad-cast/push (one-to-many), pull (many-to-one), or multi-cast (many-to-many) (Pisaniyas and Willcocks, 1999). “Push” equates to a selling purpose and “pull” refers to a buying purpose. This classification goes some way towards combining the notion of connectivity with the purpose of a transaction.

Based on the shortcomings of existing work discussed above, a new conceptual model for B2B transactions was proposed and developed. This categorises interaction by “connectivity”, i.e. one buyer and/or seller (*one*), all buyers and/or sellers (*all*) or part of the supply base/market (*part*) and by “purpose”, i.e. selling/buying/integrated exchange, and incorporates nine distinct scenarios (Figure 2). In order to further the work, the form and content of this conceptual model needed to be validated empirically. The following section presents the methodology by which this was achieved.

Methodology

An aim of the empirical research was to determine all the mechanisms used by organisations for the sale and purchase of products, and to establish the part that

	1 Individual Trading Selling [1 Supplier : Many buyers]	2 - I Collaboration Selling [Few suppliers : Many buyers]	3 - I Marketplace Selling/buying [Many suppliers : Many buyers]
All			
	4 Proprietary Sales Selling/Integrated [1 supplier : Few buyers]	5 - I Private Trading Exchange Integrated [Few suppliers : Few buyers]	6 - I Aggregation Buying [Many suppliers : Few buyers]
Part			
	7 Intranet / EDI (Partnership/Joint venture) Integrated [1 supplier : 1 buyer]	8 Restricted Bid, RFQ Buying [Few suppliers : 1 buyer]	9 Reverse Auction Buying [Many suppliers : 1 buyer]
One			
	One	Part	All
	Supplier (goods and services)		

Figure 2.
Preliminary conceptual model of B2B e-commerce, based on connectivity and purpose

Note: I- indicates an activity that is most likely to involve an intermediary

e-commerce plays in these activities. It further aimed to test the proposed model and to validate its form and content. Exploratory focus group research, with experienced sales and purchasing professionals, was considered the most suitable method of achieving these aims.

The goal of a focus group is to gain insight and in-depth understanding via group discussion (Krueger, 1994; Lockwood and Ansari, 1999; Morgan and Scannell, 1998), and it has the benefit of generating rich data (Cooper and Schindler, 2003; Krueger, 1994; Morgan and Scannell, 1998). It is not intended to develop consensus (Krueger, 1994), but is a technique suggested for data collection when researching relatively new topics (Threlfall, 1999). On this basis, its use for studying e-commerce is appropriate.

Focus group format

Views on the ideal number of focus group meetings needed within a study vary. Most agree that one is insufficient (Jankowicz, 1995; Krueger, 1994; Morgan and Scannell, 1998; Morgan, 1988). Between one and four groups is advocated for fairly structured exploratory work (Jankowicz, 1995; Krueger and Casey, 2000). When the groups become repetitive theoretical saturation may have occurred with little to be gained from additional discussions (Morgan and Scannell, 1998; Krueger and Casey, 2000). Accordingly, four groups were planned for this study, but theoretical saturation was reached after three, and the fourth was not required.

Suggestions for the ideal number of focus group participants vary: 6-10 (Cooper and Schindler, 2003; Morgan and Scannell, 1998), 4-12 (Jankowicz, 1995), 6-12 (Kelley, 1999), 6-8 (Leitao and Vergueiro, 2000) and 8-12 (McClelland, 1994). In this research, between four and six people attended each session, a number chosen so that each individual would be able to participate fully in discussing this complex topic (Krueger and Casey, 2000; Morgan, 1988).

The sessions were designed with a moderate degree of structure in order to combine the ability to learn about the participants' interests (a less structured focus group) with the need to retain the researchers' own focus (structured focus groups). The "funnel design" whereby the session starts with one or two broad, open-ended questions, followed by three or four central topics and concludes with several specific questions, is appropriate for the moderately structured focus group (Morgan, 1988), and was used in this research. Appendix 1 lists the questions used and the process followed.

Each group was conducted by the same moderator who was responsible for the planning and management of the session. Each time, one or two assistant moderators provided support. Forms of bias that could have been introduced during the meetings included moderators influencing respondents by asking questions in a leading manner, the group drifting off the subject, a lack of well defined goals and domination by sub-groups of participants, (McClelland, 1994). All but the last of these were avoided by thorough pre-planning and careful management of the sessions' structure and content. Prior plans had also been made for dealing with dominating sub-groups or individuals. In a seating arrangement in which dominators are placed next to the moderator, it becomes challenging for them to acquire too much attention (Krueger and Casey, 2000). Seating could have been rearranged part-way through the session by taking a coffee break. A polite approach in which the dominator is thanked for a contribution, and less vocal participants invited to contribute, may also have been appropriate. In the event,

these measures were not required as there were no major problems with sub-group domination.

The focus groups were recorded using video/audio equipment and the narratives were fully transcribed prior to analysis. Transcript-based analysis, which uses unabridged transcripts (Krueger and Casey, 2000), was considered to be the most appropriate in view of the exploratory nature of this research. Although less time-consuming analysis methods such as tape-based abridged transcription, note or memory-based techniques were considered, it was decided that a full transcript was necessary so that all conversation could be used throughout the analysis process.

Sample selection

Appendix 2 lists the participants. Each session involved individuals from different organisational sectors, selected using purposive sampling. This non-probabilistic technique is widely used for qualitative research including focus groups (Morgan and Scannell, 1998). It involves selecting participants known to have relevant experience and to be able directly to address the research goals. It typically results in small samples chosen to be particularly informative. In this case, participants were selected from lists of executive post-graduate programme members and from individuals known to the researchers. All had relevant commercial experience. Within this form of research process, bias may be introduced into group selection by selecting participants from memory, because they express concern about a relevant topic or because they are similar to the person making the selection (Krueger and Casey, 2000). In choosing participants, care was taken to avoid such bias by selecting people known to, and nominated by, different members of the research team.

Participants were sought with backgrounds in corporate purchasing or selling and with varying experience of using IT and e-commerce to conduct B2B transactions. Variation among participants generates contrasting opinions and greater discussion (Krueger and Casey, 2000). It was felt that the different backgrounds and experiences of participants would generate useful discussion and hence rich data.

Data analysis

As a first stage of "getting to know the data" each session was concluded by the moderator and assistant moderator(s) with an oral summary of the discussion. This gave participants the opportunity to confirm the essence of the discussion. A week or so later, a brief summary report was prepared and circulated to participants. They were asked to verify that it accurately represented the discussion and to comment on any omissions or alterations. Thereafter, more formal analysis was undertaken.

Analysis of focus group data should be carried out in a methodical and orderly manner, supported by a well-defined and documented process (Krueger and Casey, 2000). The ultimate aim is to find the "big ideas" (Krueger, 1994, p. 149). Further considerations include noting the precise words used, context, internal consistency, frequency or extensiveness and intensity of comments and specificity of responses (Krueger, 1994). Thus, there was a need to organise the data and to uncover patterns, themes and categories that emerged from it.

In contrast to deductive analysis where categories are pre-determined and data is fitted into them, a process of inductive analysis requires that the categories emerge from the data. This happens when concepts are "mentioned frequently enough to merit

their own categories” (Frankfort-Nachmias and Nachmias, 1996, p. 338). Inductive coding of data is used when a study is exploratory in nature or when little theory exists (Frankfort-Nachmias and Nachmias, 1996). In this respect, inductive coding was considered appropriate for this research.

This stage of analysis involved making sense of the vast amount of data by formulating patterns, extracting themes and assigning individual data – in the form of quotes from the transcripts – to the emerging categories represented by codes. As part of the process the category structure evolved, with new ones emerging and existing ones changing. To facilitate this, the complete transcript from each focus group was imported into the software package NUDIST (for “Non-numerical, Unstructured Data – Indexing, Searching and Theorising”) (Gregorio, 2001). Its use eliminates a number of problems associated with managing large amounts of data; keeps an audit trail of the analysis process; forces researchers to think ahead; and facilitates re-coding (Gregorio, 2001).

The proposed B2B e-commerce model

This section presents the outcome of the research process by describing and discussing the nine B2B scenarios that make up the proposed model.

Themes emerged from the data analysis that helped identify transactions occurring in each of the nine scenarios. They further informed the development of four defining characteristics of transaction types that are used to distinguish between the scenarios: connectivity, purpose/control, technology medium, and interaction type (Table I). Although these characteristics are used, the originality and contribution of the model is based on its bi-dimensional categorisation of transactions by connectivity and purpose. For completeness, the descriptions of the scenarios use all four characteristics.

Scenario 1. Individual trading (open, selling, WWW, direct)

This is a non-intermediated market where buyers and sellers interact, communicate and purchase products (Pisaniyas and Willcocks, 1999). Individual trading involves a single supplier selling to other business organisations. The transactions could take the form of a seller auction or a more conventional sale. An example is www.sweetpaper.com where “Customers can place orders online, request pricing online [and] check up-to-the-minute inventory levels” (Sweet Paper, 2005). The web site facilitates the sale of products to trade customers where transactions take place between one supplier and many purchasers. From the focus groups:

... companies that supply all the MRO [maintenance, repair and operations] needs to companies have their own web sites and ... [are] ... servicing the whole of the industry base. ... You can order things via their web site [using] the internet. So it is one supplier that [has] invested only in one web site in most cases, and they are servicing all of their customers as a result of that.

Characteristic	Options
Connectivity	Open, closed, or restricted
Purpose/control	Selling, buying, or an integrated exchange
Technology medium used	WWW, extranet, intranet, or EDI
Interaction type	Direct or intermediary (in which the transaction is mediated by a third party)

Table I.
Key characteristics of the proposed model

Further:

... it is quite common in the computer industry; [and] common in books and things like that.
... [we order] stuff on a web site ... I don't always trust it.

For this scenario, the technology medium used is the world wide web and transactions take place without the use of an intermediary.

Scenario 2. Collaboration (open, selling, WWW, intermediary)

This selling scenario is differentiated from individual trading because the products being sold are supplied as a result of collaboration by a number of organisations. The sellers' collaboration could, for example, involve a combination of complementary products. McIvor *et al.* (2003) describe an intermediary, known as factory network, which acts as a single point of sale to US retailers for simple commodity type paper-based products that are sourced from approximately 50 different SMEs in China. This collaboration is similar to traditional wholesaler activity, where collaboration is seen as a "marriage of convenience" (Harland *et al.*, 1999, p. 664). The focus groups identified this scenario in the pharmaceutical, chemical and motor industries. One stated that "a load of aerospace suppliers have got together to sell to the industry in general [using this mechanism]". One suggested that they used "a couple of web sites that are doing it for pharmaceuticals ... I think they are really into supplying services". Others noted that customers would tend to have contact with a group of companies/an intermediary rather than a relationship with a specific supplying organisation and may regard all companies as interchangeable. Transactions are open to all purchasing organisations using world wide web technology and facilitated by an intermediary agent.

Scenario 3. Marketplace (open, selling & buying, WWW, intermediary)

The marketplace is described as an electronic form of a traditional market, open for all buyers and suppliers to trade to facilitate both buying and selling of products (Klein and Quelch, 1997). It tends to involve the sale of commodity or standardised products, offering everything that a single source sales channel can, but with the addition of products from competitors (Benjamin and Wigand, 1995). In the chemical industry, for example, ChemConnect is an intermediary that hosts an internet-based electronic marketplace for worldwide buyers and sellers of chemicals, in order to match supply with demand (Grieger, 2004, Fairchild *et al.*, 2004, ChemConnect, 2004). The focus groups confirmed that ChemConnect "is something that most large chemical companies are going in for. The big companies ... are going to go with this as a platform."

This scenario uses world wide web technology, is open to all purchasing and selling organisations and is facilitated by an intermediary agent.

Scenario 4. Proprietary sales (restricted, selling/integrated, extranet, direct)

The primary purpose of proprietary sales is for the sale of products to an existing buyer market restricted possibly through membership, association, legislation, company strategy or policy. Sales of goods such as prescription medicines, pesticides and guns have obvious restrictions applied. Wolverine (2005) Supplies specialises in the sale of firearms in Canada where certain products are only available to law

enforcement and military personnel. Private e-markets such as these provide the highest level of proprietary data, information sharing and collaborative capabilities (Whitaker *et al.*, 2001). Thus, although this scenario primarily has a selling purpose, the nature or the transaction frequently indicates a purpose that is more integrated.

The selective choice of participants can lead to possible criticism over price and competition fixing (Whitaker *et al.*, 2001). From the focus groups:

... there are closed auctions in the motor trade where [for] a main agent, e.g. a Citroen agency, ... the manufacturers will put to auction on the Internet certain products. ... You [as an agent] would bid as the particular car comes up for sale.

Further:

I suppose this is like drugs because our suppliers will only supply to certain hospitals, doctors, GP surgeries. Lots of things they won't supply directly to the public.

The transactions within this scenario are restricted in some way and do not involve the use of an intermediary agent.

Scenario 5. Private exchange (restricted, integrated exchange, extranet, intermediary)

This is a marketplace that exists for the purpose of integrated trading exchanges, where access is restricted to part of a supply base and/or market. This might occur, for example, as part of long-term supply chain relationships in which information beyond straightforward order details is traded. Focus group participants identified clearly with this scenario, describing how:

... in the private trading exchange projects that I have either been involved in, or touched, there is much more there of adding value than there is of supplying the product.

and noting an "interconnectivity with linked businesses within the supply chain". Further: "my current project [is] a private trading exchange in the IT industry".

In the chemical industry, two different marketplaces exist, which offer alternative opportunities to customers (Grieger, 2004). As described in scenario 3, customers may use ChemConnect, mainly for spot buying, but also to reduce prices when auctions are set up. Conversely, they can use Elemica which is regarded as "the preferred solution for order fulfilment with key suppliers/customers" (Grieger, 2004, pp. 93) for more integrated exchange. The suggestion is, therefore, that open and closed marketplaces/exchanges offer different functionality and that their use depends on the products exchanged and the nature of the trading relationship.

Scenario 5 is a marketplace in which restriction is achieved by the use of extranet technology which facilitates the establishment of "intimate linkages between the company, its suppliers and its wholesale buyers" (Anandarajan *et al.*, 1998, p. 123) and by an intermediary agent.

Scenario 6. Aggregation (open, buying, WWW, intermediary)

Aggregation is a mechanism whereby buyer groups are organised to make purchases for the best possible price. E-commerce can make this possible for buying organisations that do not necessarily trade together or have any formal contact. EnergyMarkets (2004) is a source of information in North America for the power

industry. It describes an aggregated purchase, facilitated by an intermediary service provider named PowerSpring, whereby consumption data is aggregated within a particular geographical area. Following this:

PowerSpring then holds a live auction on the internet where natural gas producers, transporters and marketers who supply gas ... bid competitively to supply gas for the aggregated demand – at lower prices (EnergyMarkets, 2004).

Aggregation was seen by focus group participants as a mechanism primarily with advantages for smaller organisations to benefit from the economies of scale that they would not have independently. They perceived that:

... the risk with collaborative buying or aggregation is that you lose your [buying] advantage – if you have got one – against your competitors.

Aggregation is open to all purchasing organisations using web technology and an intermediary agent.

Scenario 7. Intranet/EDI (restricted, integrated exchange, intranet/EDI, direct)

EDI is considered to be a traditional form of inter-organisational information system (Soliman and Janz, 2004). This is integrated interaction on a one-to-one basis using technology such as EDI or an extranet/intranet link. This scenario is the most restricted in terms of the number of participants, where transactions take place on a one-to-one basis. Focus group participants identified it as a significant and efficient mechanism for larger organisations in dealing with large numbers of repeat orders:

... it is something that the automotive and retail trade in this country [UK] have done for ... years. [In] the organisation I work for – more than 80 per cent of our sales come through EDI links direct from the major retailers.

They felt that its implementation using EDI is a barrier to trade for smaller organisations where the set up costs can be prohibitive. Its achievement through Intranets is less restrictive (McIvor *et al.*, 2000), although industries associated with high adoption of EDI tend to have the lowest adoption of the internet (Cagliano *et al.*, 2003).

Scenario 8. Restricted bid (restricted, buying, extranet, direct)

The essence of this buying scenario is the restrictive nature of the interaction. The restricted bid is a request to a limited number of pre-determined suppliers. In contrast, the reverse auction (scenario 9) is open in nature. Translogistica (2005) provide the technology to facilitate the purchase of logistics services, whereby they:

... enable shippers to compare and rank all the responses to their tender using qualitative as well as quantitative measures – strategic procurement is not based solely on price. The tools provide buyers with true decision support rather than just forcing out the lowest price.

This suggests that the scenario is not price focused.

From the focus groups:

... it is just normal practice to go out to two or three suppliers for a request for quote ... you couldn't do it to a hundred because it would take forever.

Further:

... you can put ... out to tender quite easily. [There is a] lot of time to be saved, in terms of shuffling paper backwards and forwards, doing it in that way and that is certainly the way the procurement supplies agency is going for the NHS.

RFQs may be issued to only a limited number of potential suppliers restricted for example, by being on an approved suppliers list, the use of technology (i.e. an extranet) or the requirement for suppliers to register in order to participate. Once through an initial screening process whereby suppliers are selected to qualify for negotiation, e-tendering is the process of sending requests to them and receiving responses electronically (Knudsen, 2003). For the most part, this scenario was regarded negatively by the focus group participants – seen as a mechanism for driving down prices and “squeezing” suppliers.

Scenario 9. Reverse auction (open, buying, WWW, direct)

This buying transaction involves the buyer posting a full specification for the product that it wishes to buy and determining the maximum price that it will pay for this. Sellers then bid for the contract to supply the product. Hedgehog (2005) provide hosted web-based e-procurement solutions. In their reverse auction:

... you initiate the auction by sending out purchasing specifications that detail what you want to buy. Suppliers compete against each other in web-based, real-time auctions to win your business, driving down the price in the process.

The process can involve real-time, dynamic, open bidding conducted over the internet between tens of suppliers as opposed to the traditional static three-quote closed bidding process, and auction rules give the buyer discretion to accept any bid, not just the lowest (Emiliani and Stec, 2002). This type of buyer-orientated activity using technology is less common than supply orientated systems as many e-commerce transactions are seen as supply-centric (Quayle, 2002). Focus group participants saw it as a useful mechanism for finding new product suppliers or where supply had proved difficult in the past. Further, they saw it as potentially replacing some scenario 8 transactions because the global reach of the internet facilitates access to new suppliers:

If the company has a requirement for plastic moulded parts it will go to an open auction. Or ... – I don't have very many details - but there are companies that run these auctions and you say... these are my requirements and then in so many hours you get bids in from various companies around the world that can supply you the product.

Further:

The high street chains ... are doing it a lot at present. They are just basically quoting details on a web site and inviting all and sundry to quote ... led by Wal-Mart and their global view. Whereas in the past it would have been more limited in RFQ's amongst a limited number of regional suppliers now Wal-Mart is saying lets open it up. It is a global community.

As with scenario 8, the focus group participants tended to regard this scenario negatively in respect of its impact on suppliers:

... it is being viewed quite negatively at present. To say as it were [that] business is being lost on the click of a mouse.

To summarise, this scenario facilitates transactions between one buyer and many suppliers, and is web-based.

Discussion

The aim of this research was to develop an empirically-validated, fine-grained taxonomy by which B2B e-commerce transactions could be classified. Study of the literature facilitated the development of a conceptual model that incorporated nine separate trading scenarios (Figure 2). This was examined empirically at a series of focus groups, resulting in validation of its structure and principal elements. Specifically, question 4 of the focus group protocol asked participants to list all the mechanisms that they could think of by which buying and selling takes place. The responses to this question were then mapped onto the proposed nine-box model. As a result of this, each suggested mechanism was able to be located in at least one of the nine boxes, and each of the nine boxes was populated with more than one mechanism type. This suggests that the model is complete and comprehensive.

During the empirical process, based on Figure 2, a number of important issues arose. Firstly, it was evident that focus group participants experienced some difficulties in both the process of mapping mechanisms to boxes, and the fact that some mechanisms fit into more than one box. There was particular difficulty, in this respect, with auction-type mechanisms (Cullen, 2004). Whilst this issue was not regarded as detracting from the validity of the proposed model or requiring any change to it, it is suggested that it might inform the future development of the taxonomy. This should ideally be based on an extended process of empirical research in order to give greater validity to the findings.

A further issue that emerged from the focus groups related to the connectivity concept. In its initial form (in Figure 2), the nine-box structure defined just three possible connectivity states for buyers and for sellers relating to whether the transaction involves *one* buyer and/or seller, *part* of the supply base or market, or *all* buyers and/or sellers. Focus group participants had difficulty relating this rigid structure to their own experiences of trade, and preferred instead to see each of these axes as a continuum. The starting point would be completely closed or private (with just one buyer or seller or both) and the final point would be completely open or public (with free access to all potential buyers or sellers or both). Between the two extremes, any number of "restricted" supply base (sellers) or market (buyers) scenarios were felt to exist. This resulted in more comprehensive understanding of the connectivity concept and is suggested as a factor to consider in future development of the model. Further, more focused research to investigate this issue with a broader empirical base is needed.

Conclusions

This research has resulted in the development of a model with nine scenarios whereby organisations may buy and sell, using e-commerce. These are categorised principally by connectivity and the purpose of the transaction. The model was initially developed conceptually and was then validated following focus group discussions at which the nine discrete categories of interaction were confirmed. As the participants were from different organisations and sectors, the model is not specific to a particular industry, making it potentially of widespread use.

The model is original and makes a unique contribution because it combines earlier classifications of e-commerce, e.g. vertical/horizontal (Smart and Harrison, 2003); buy-side/sell-side/neutral (Fairchild *et al.*, 2004); open/closed; and fixed/variable pricing (Grieger, 2004; McLaren *et al.*, 2002) with those that describe their connectivity (Grieger, 2003, 2004; Lief *et al.*, 1999; Whitaker *et al.*, 2001). It thus furthers academic

knowledge. The taxonomy benefits organisations as they implement e-commerce for B2B transactions, either as part of a “one size fits all” strategy or as a project-based strategy whereby alternative scenarios are used for different products and partners. By providing classification of possible transaction types and understanding of the role of e-commerce within these, organisations can be guided as to the most appropriate approach to adopt in particular circumstances.

The uptake of e-commerce within industry continues to increase, and this argues for continuing research on the topic. From the management perspective, there is a need, for example, to establish how e-commerce transactions may be conducted successfully and to identify the likely benefits from its introduction within an organisation. The understanding gained from the framework presented here provides a sound foundation on which such research can build.

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Appendix 1. Focus group process and questions

The preliminary nine-scenario model, developed from the literature, was tabled part way through each focus group session. This was presented in a format that was similar to the one shown in Figure 2. The model was discussed and, by asking participants, to consider it in the light of their own experiences of purchasing and selling activity, it was validated. Confirmation that e-commerce trading occurred within each of the nine scenarios was also obtained. The rationale for the questions draws on the work of Krueger and Casey (2000):

- *Q1. Opening question.* This is not designed to be analysed, is often factual and is useful for making participants feel comfortable. Ideally it should be answered within thirty seconds and is to encourage participants to talk freely and easily throughout the session.

“Please tell us who you are, and a little bit about yourself”.

- *Q2. Introductory question 1.* This is designed to help participants to start to think about the topic to be discussed and should be open-ended to encourage conversation. It aimed to identify the steps involved in selling before moving on to consider the role of technology within these.

“Let’s list the main steps involved in the activity of selling a product”

- *Q3. Introductory question 2.* (As for question 2)

“Let’s list the main steps involved in the activity of buying a product”

- *Q4. Transition question.* The transition questions serve as the logical link between the introductory questions and the key questions that follow.

“Can you think of all the mechanisms (e.g. auction) that a company can use to sell or buy products from each other?”

Focus group participants were asked to list all available mechanisms that they could think of. Following the discussion of this question, the preliminary nine-scenario model was presented to participants for comment. They were also asked to identify which of the scenarios they had direct experience of:

- *Q5. Key question 1.* These are the most important questions that drive the study and each should typically involve 10-20 minutes of discussion.

“How have advances in technology changed the activities carried out in each box?”

This question was presented with reference to the nine-box model. All participants were, therefore, able to discuss changes in general, and those that had particular significance in any of the nine scenarios:

- *Q6. Key question 2.*

“If you could introduce technology to automate buying and selling within a company, what important benefits would you seek?”

- *Q7. Key question 3.*

“How can electronic B2B sales and purchases be done successfully. Can we list what you feel are the most important factors for success?”

- *Q8. Key question 4.*

“Let’s look at the model. What do you think are the five most important success factors for USING each different type of mechanism? (as a selling company and a buyer)”.

This question was considered in conjunction with the proposed nine-box model

- *Q9. Closing question.* This is critical to analysis and allows participants to reflect on the discussion, to make additions, and to resolve areas of concern or conflict. Ideally it should be preceded by a brief summary of the foregoing discussion.

“We are looking at the ways organisations can conduct business-to-business electronic sales and purchases successfully. Is there anything that you feel we have missed or any additional information you feel is important?”

Appendix 2. Profile of participants

Group	Nature of organisation(s)	Position of participant	Size of organisation	SIC (92)
1	Consultancy and marketing company	Director – selling marketing services	Small	7,484
1	Investment company - various (carpet manufacturer, stationery manufacturer)	Chief executive – buying and selling organisations	Small	7,484
1	IT sales	Non-executive director	various	7,220
1	IT consultancy for computing solutions	Director – sales of software solutions to large companies	Small	7,210
2	Chemical manufacture	Purchasing manager	Large	2,413
2	Electronic motor manufacture	Director	Small	3,110
2	Engineering	Supply chain management, consultant	Large	7,420
2	Clay pipes / chimney pots manufacturer	Director / sales and administration	Small	2,640
2	Vehicle wholesale	Director – buying and selling vehicles	Sole trader	5,010
2	Soft drinks manufacturer	Supply chain and production control	Large	5,139
3	Computer consultancy	Consultant selling software solutions	Small	7,220
3	Manufacture soft drink flavouring	Customer services, purchasing and logistics	Large	1,589
3	Jewellery wholesalers	Purchasing director	Small	5,147
3	NHS hospital pharmacy	Drugs purchasing pharmacist	Non-profit/large	8,511

Table AI.

Corresponding author

Andrea J. Cullen can be contacted at: a.j.cullen@bradford.ac.uk

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