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ELECTRONIC COMMERCE AND THE BUSINESS-TO-BUSINESS CUSTOMER RELATIONSHIP LIFE CYCLE

By

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Working Paper # 440

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Electronic Commerce and the Business-to-Business Customer Relationship Life Cycle

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ABSTRACT

The development of relationships has always been important to successful inter-firm trade. The advent of electronic commerce, supported by interorganizational and internal information systems and the Internet, has increased the pace at which business transactions are arranged and completed, and the size of the potential market has also increased. To establish good relationships between supplier and customer in the face of these changes requires adapting existing practices in marketing, supply chain management, and procurement, to take advantage of the new technologies. To demonstrate the current state of inter-firm relationships, we have developed a seven phase customer relationship life cycle that characterizes the procurement process. We use this life cycle to explain interactions between supplier and customer firms, and the technologies that support relationships during the life cycle. Some of these approaches encourage market-based short term efficient relationships, while others support longer term collaborative relationships. We conclude with some observations that highlight the current and future impact of electronic commerce technologies on business-to-business relationships.

Key Words and Phrases: Interorganizational information systems, customer-supplier relationships, business-to-business electronic commerce, relationship life cycle, procurement, marketing, supply line management.

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Electronic Commerce and the Business-to-Business Customer Relationship Life Cycle

1. Introduction

In industrial economic systems, hierarchies and markets are two extremes of interorganizational marketplace organization. Hierarchies coordinate the flow of products and services (P/S) by controlling and directing it in the managerial hierarchy, either by working entirely within a vertically integrated firm or by coordinating the activities of interorganizational supplier-buyer partnerships. Markets, the second organizational form, rely on supply and demand to coordinate P/S flows, through external transactions between firms [5]. The hierarchical form implies vertical ownership and/or control of suppliers in the network by one organization, while in the market form there is free and open competition, information is freely available to everyone, and it is easy to switch trading partners. Between hierarchies and markets is a spectrum of mixed mode network structures, combining the characteristics of both in various ways. These encompass a variety of arrangements, including licensing arrangements, blanket order contracts, strategic alliances, and joint ventures [14]. They allow firms to specialize in those activities of the value chain that are essential to their competitive advantage, reaping the benefits of specialization and focus, while other activities are farmed out to other members of the network. In practice, networks are more likely than the extreme cases of hierarchies and markets to be representative of individual firm strategies [26].

From the point of view of supply line management strategies, business relationships can be competitive, collaborative, or some mix of these two. According to Hughes et al [27](Chapter 4), the choice among these strategies depends upon existing and desired relationships between supplier and customer. Some of the relevant factors in their model are (with the competitive factor level preceding the collaborative factor level for each factor in the following list): 1) sufficient vs. high degree of trust, 2) irrelevant vs. significant correlation with common goals, 3) helpful vs. critical level of personal relationships, 4) helpful vs. critical level for continuity of key staff, 5) delivery to expectation vs. high synergy levels for expectations of both parties, 6) functional levels vs. senior management and functional levels for internal relationships, 7) meeting expectations vs. high expectations from both parties for expected benefits, 8) frequent

change vs. unusual for switching to other partners, 9) market circumstances vs. joint growth for levels of business, and 10) project by project vs. long term collaboration for length of relationship. It should be clear from this list of factor levels that a pure competitive strategy is supported by electronic marketplaces and a pure collaborative strategy is supported by hierarchical market structures.

Electronic interorganizational information systems (IOS) play an important role in business-to-business trade, whether inter-firm relationships are market, hierarchical, or some intermediate form. IOS have been in use since the early 1970s, with the advent of electronic data interchange (EDI) standards for exchanging transaction information among company computers. The related IOS, which link company computers to handle transaction information (purchase orders, invoices, electronic funds transfer, etc.), are now known as EDI networks. These usually operated (and still do in most cases) over value added private networks, although some are moving to the Internet. The advent of commercial applications on the Internet, and their integration with internal information systems such as intranets and enterprise resource planning (ERP) systems, have resulted in significant changes in networking and other technologies available for IOS, allowing other business functions to make use of these networks. Malone and his co-workers [35] [36] predicted that new information technologies would lead to a shift from electronic hierarchies to electronic markets, due to advances in IOS information technologies. Clemons et al [14] suggested that, due to reduced coordination costs and transaction risks, advances in information technology would lead to a "move to the middle", where there would be a greater degree of outsourcing (away from hierarchical ownership and vertical integration) but with closer and longer term relationships between suppliers and customer firms (networked relationships).

Indeed, the advent of networked commercial applications, especially on the Internet and through IOS, has resulted in many changes in how business-to-business transactions can be carried out. New technologies have provided more effective ways in which prospective buyers can gather information rapidly about available P/S (products and services), evaluate and negotiate with suppliers, implement order fulfillment over communications links, and access post-sales services. Access to such information and the technology to support it results in a

customer-led "pull" demand supply chain that goes well beyond the traditional EDI network technologies [27]. Benefits from such an approach include rapid data exchange, low inventories, and quick response. All of these require a high degree of interaction and some degree of system integration between supplier and customer. At the same time, suppliers now have an electronic "push" channel for their marketers, and new ways to manage sales, distribution, and support services. Current trends in electronic commerce, strategic alliances, supply chain integration, and globalization [4] are facing purchasers, suppliers and distributors with major challenges in creating value from these new channels.

The purpose of this paper is to examine the impact that the new technologies have had on the support of relationships between suppliers and business customers. This is especially important in the light of the current trend of enhancing these relationships by reducing the number of suppliers and increasing the level of collaboration between supplier and customer [14]. We discuss the supplier business functions that are involved, including marketing, sales, supply line operations, and after-sale services, and the related customer procurement function. To explain how supplier-customer interactions have changed, we develop a business-customer relationship life cycle to evaluate the form of these interactions at each phase of the life cycle. We observe how IOS technologies can support these relationships from both the customer's and the supplier's perspectives. Finally, we summarize the impact of these technologies on supplier-customer relationship development and management.

2. Business Functions

Supplier-customer relationships depend upon the functional activities involved. The primary activity classifications in a value chain are incoming logistics, operations, outgoing logistics, marketing and sales, and service [45]. How these activities are carried out, and how they interact with one another, continues to be re-defined as technology provides more sophisticated methods for business interactions [51]. The network links that are active from supplier to customer during the customer's procurement process are driven by the functions of marketing and sales, supply chain management and order fulfillment (operations and outgoing logistics at the supplier end, and incoming logistics - receiving, stocking, distribution, at the

customer end), and after-sales service. When a network links supplier and customer, in each of these functions information is input, used, generated, and transmitted by internal information systems and potentially shared between supplier and customer through an IOS. In each function there are opportunities to gather information during customer procurement activities, and to use this information to improve the possibility of continuing and profitable relationships by working constructively with customers. In the following we discuss these functions and some of the methodologies and tools available to support and develop ongoing relationships.

2.1 Marketing And Sales

Marketing approaches depend upon the availability of systems to gather, store, analyze, and manipulate the information generated by customer transactions and supplier-customer interactions. The two major perspectives on marketing and related supplier-customer interactions [20] are transactional marketing and relational marketing.

The *transactional marketing* perspective was dominant historically [10], as an arms-length, impersonal approach assuming an active seller to a marketplace inhabited by passive customers. This company-centric model assumes an homogeneous marketplace, with information delivered to the marketplace and little feedback in the other direction except through the ultimate sales rate. Its focus is on the economics of the transaction, and it does not attempt to build beyond the immediate sales event. Marketing in this perspective is based on the marketing mix concept, and some form or extension of the four Ps of marketing (product, price, place, and promotion) [37];[20];[3]. An example is marketing through direct mailing or the mass media, using promotional coupons to introduce a new product.

The *relational marketing* perspective has developed more recently [10]; [42]; [52]. This concept has received a considerable amount of attention in both the academic [11]; [28] and business [38] literature. Different perspectives offered on this topic include: 1) promotion (targeted customers identified through marketing databases), 2) building relationships with individual customers, 3) retaining customers after the initial sale, and 4) strategic shift from customer manipulation to customer involvement [42]. Recent research has examined how

technologies can be applied in an innovative manner to build relationships with customers, suppliers, and competitors, for value creation through cooperative and collaborative efforts [17].

Relationships in the business-to-business environment are based heavily on information exchange, which has a fundamental effect on how markets develop and are structured [22, 41]. Relational marketing includes relationships or networks among companies and their suppliers, lateral partnerships among competitors, government, and non-profit organizations, internal partnerships with business units, employees, and functional departments, and buyer partnerships with intermediate and ultimate customers [39]. Collectively, these represent complex arrays of relationships among organizations, operationalized through information transfers. Interorganizational information systems enhance support for relational marketing techniques, because of their ability to maintain ongoing communication between supplier and customer [38]. There are several reasons for this [16]: many cycles of communication can occur in a short time, it can complement other communications, browsing and buying activities can be captured in a database for future evaluation, distribution of product and service information is managed easily, and it operates in real time.

It is less expensive and more effective to direct some proportion of the marketing effort towards maintaining customer loyalty and reducing defection rates [13]. Increasing competition in many industries is forcing companies to recognize the importance of creating durable customer relationships based on value-added service. Loyal customers create value through increased purchase volume, reduced costs of service, and word-of-mouth referrals or testimonials, resulting in a positive impact on corporate profits [47]. A customer loyalty strategy can be used as a marketing tool to distinguish an organization competitively, to attract and retain customers, and to sustain profitable growth. Every point of contact with the customer (marketing, sales, order entry, order fulfillment, field installation and service, billing and collection, and complaints) provides the opportunity either to build customer loyalty or to destroy it.

Transactional marketing can and does co-exist with relational marketing [10], and these two perspectives can be considered as a continuous spectrum [20]. Although not yet a mature approach, relational marketing has for some time made significant inroads in industrial and services industries [23]. Brodie et al [10]found that relational marketing is more likely to be the dominant approach in small, high-tech, knowledge-intensive firms, whereas transactional marketing tends to be dominant in larger, older, consumer goods firms. A major difference between the two approaches is that transaction-oriented marketing tends to emphasize the short term, while relational marketing emphasizes longer term market development with individual business customers [33]. To contrast the two approaches, consider a supplier's Web sales site, which uses transactional marketing to interface with customers as if it were a vending machine, concentrating on the immediate ordering, payment, and product shipment, with no more than the minimum information being collected. Relationship marketing in the same situation would also automatically request information on customer demographics and other interests, and whether the customer would like to be contacted in the future about new products or product updates. The sales function encompasses product and information requests, surveys, complaints, and complaint resolutions. Customer data gathered during order fulfillment can also be useful for decision-making by supply chain managers.

Relational marketing techniques have three major sub-classifications: database, interaction, and network marketing [15]. Database marketing is more relevant to consumer applications and will not be discussed here. Interaction marketing implies genuine interaction between supplier and customer, and must be mutually active, adaptive, and continuous, if it is to be effective. The interaction relationship includes negotiation and joint planning, focuses on continuous value creation for all parties, and involves reciprocal rather than sequential interdependence. Maintaining interactive relationships includes activities such as regularly advising registered customers of new products, product updates, sales, and promotions via e-mail.

Interaction marketing can involve individuals across functions and levels in the firm [15], and the entire company needs to be market-oriented to maintain effective customer relationships. The market orientation of a firm (the organization-wide generation of market intelligence,

dissemination of the intelligence across departments, and organization-wide responsiveness to it) is an important determinant of the firm's performance [30]. Internal activities of this type (e.g. market situations, goods shipments, customer responses) can be supported through internal intranet functions that disseminate information and assist in coordinating cross-functional group work.. Internal systems also support interactions and exchange of information among product designers, developers, and manufacturing partners, via e-mail, e-conferencing, groupware, and secure negotiation support systems [7, 54]. Secure extranet links enable interactions with other business partners such as lawyers, accountants, and ad agencies.

Network marketing is the modern equivalent of industrial marketing. It refers basically to relationships between firms, such as longer term relationships that exist between a business customer and its suppliers. A business network is a set of connected relationships, and these may emerge through interaction between managers at different levels of these firms [31]. The business network may be utilized by managers outside the marketing function, and it typically takes on a more strategic role than other marketing classifications [15] [29]. Network marketing has long been practiced in business-to-business commerce, where switching costs are typically high due to the long term commitments that may exist between suppliers and customers. Industrial marketers coordinate the marketing-relevant activities of a company with the procurement needs and information requirements of the buying company [50]. To foster successful relationships with customers by differentiating their product or service, they must concentrate on selling and supporting a "bundle of attributes" (both tangible and intangible) and not just a product or service [40]. Strategic alliances may also be established between companies that have common marketing goals, thus sharing the cost of customer acquisition, communications and rewards, for mutual benefit such as market access, resource exchange, etc.

Recent years have seen a trend to encourage fewer and more permanent inter-company trading relationships once initial transactions have been carried out satisfactorily [6]. Relationships may include trade agreements such as open purchase orders to facilitate ordering and delivery of P/S with lower costs, fewer errors, and shorter delivery times. This may progress towards tighter integration where companies are linked electronically so that, for example, the

supplier may have access to information on the customer's inventory levels, forecast production requirements, and product designs.

A class of online multi-vendor intermediary companies has arisen recently [18] to help manage relationships between suppliers and customers. Such intermediaries may support customers in the form of contracts or open purchase orders, that give customer representatives the ability to access supplier catalogs, customize the desired product or service, place orders, and track status and shipments [2]. Secure links to internal customer purchasing and/or ERP systems may be used to handle transactions related to invoices, payments, and returns. The benefits of such systems are claimed to be reduced transaction costs, improved information for customers, and a wider choice of P/S. Switching costs of such systems are currently quite substantial, due to up-front investment commitments. If switching costs were lowered, as they would be if there were wide use of established communications and data standards, the competitive value of established relationships would drop, so competitive advantage would be more likely to be determined by specific products or services, rather than by links to established companies [17]. The classification of these systems would then become less hierarchical and more market-oriented.

2.2 Supply Chain Management

Supply chain management is the integrated administration of goods and services from the supply side, including the logistics and operations components of the value chain, through the transformation process and distribution channels to the customer. IOS assists by linking inventory, billing, and shipping to customers and suppliers, complementing marketing, sales, and service processes that provide the supplier-customer interface. Through the order fulfillment and after-sales service processes, supply chain management intersects with marketing and sales. Most studies of the supply chain are specifically targeted to manufacturing and physical products, such as distributed manufacturing [25] but it is clear that many of its concepts can be applied to service settings [34].

How the supply chain is managed for a particular customer is determined by the customer's approach to procurement. The balance chosen by the customer between competitive and collaborative sourcing depends on the marketplace and on supplier capabilities [27]. Competitive sourcing is appropriate if sourcing tends to be ad hoc, there is an over-supply in the marketplace, little real market differentiation among P/S, rapid evolution of innovation, and the customer is interested in testing supplier capabilities. This implies less relationship building and more attention to cost efficiencies. Collaborative sourcing is the best choice if supplier and customer have complementary capabilities and resources, access is needed to vital assets and unique innovation, there are strong and enduring relationships, and common values and goals. Evidence of free market competition includes spot buying, bidding and tendering. An example is OrderZone.com®, a Web business marketplace operated by the U.S. firm W.W. Grainger, supplying business needs such as office supplies, maintenance products, safety items, scientific equipment, electronic components, etc., where purchasing is through credit card or open accounts. Movement towards collaborative sourcing is indicated by preferred supplier lists, joint venturing, strategic alliances, and co-ownership. A good example of collaborative sourcing is provided by the contract manufacturing field, with companies such as Solectron [24] working closely with their OEM alliance partners IBM, Hewlett-Packard, Sun, and others, to manufacture and supply equipment to their specifications.

Fulfillment can be supported by Internet systems through, for example, access to shipment status at on-line company or delivery service databases (e.g. Fedex.com®) , delivery via Internet of software products and information services (e.g. TopSoft.com®), access to secure transaction services while purchasing P/S, and performing on-line selection and/or customization (e.g. Cisco Connection OnLine®) with the help of software agents. Fulfillment is a yardstick by which customers measure organizational performance, as the promise to the customer is either fulfilled or broken - the product is delivered, the utility is turned on, or the software is enabled. The difference between fulfilling or breaking that pledge can mean the difference between lost business and a lifetime customer. The fulfillment function offers significant opportunities for cross-selling and up-selling to satisfied customers. Information on how well the organization delivers on its pledge can be captured and used to ensure that customers are treated appropriately and that future business is tailored effectively to specific customer groups.

The service function also offers opportunities for collecting and disseminating customer information. Digital and human help can be combined with front-end support through auto-reply e-mail systems or Web information systems that answer many common questions (e.g. Microsoft.com®). Data gathered within the service function includes complaints and resolutions, frequency of problems, problem types, time to resolve, and so on. This is useful information that helps the organization tailor responses to customers, and can be very useful in modifying future product designs. Services often include access to service functions (updates on product, service offerings), and software updates delivered and installed remotely.

3. Interorganizational Information Systems

The range of application of IOS has grown from simply handling transaction data to supporting all forms of information exchange, including procurement transactions, supply chain management, sourcing information, new product development, shared electronic mail, etc. As a result, the importance of IOS is increasing dramatically, either as private networks connecting cooperating organizations, or as networks linked through the Internet [49]. The relative financial advantages of the different forms of interorganizational structures can be analyzed by considering coordination and transaction costs [53]. These costs include marketing, gathering information, negotiating contracts, creating and distributing P/S, and the costs of processing the associated transactions. An industry study [1] showed a resulting average 5% to 10% reduction in prices for goods and services through lower material and service costs, reduction of acquisition and order fulfilment cycle times of 50% to 70%, reduction of requisition processing costs of 70% per order, and improved inventory management practices.

More advanced IOS extensions that affect supplier-customer relationships include Web-based interfaces, integration with supplier catalogs and internal information systems, and built-in business transaction rules based on purchase limits or negotiated contracts. These allow end-users to order P/S on-line without intervention by the purchasing department, including automatic fulfillment by the supplier organization, and payment via electronic funds transfer or purchasing cards. Tightly linked supplier-customer relationships, such as those between parts

suppliers and automobile manufacturers, use IOS to link suppliers to customer inventory and production forecast data, with supplier responsibility for automatic replenishment.

The adoption and growth of IOS networks depends upon relationships between trading partners, often with proactive adoption by large companies that forces reactive adoption by their trading partners [46]. However, major benefits of IOS are not achieved unless they have full management support and are integrated with internal company systems [48] such as ERP, legacy, and intranet systems. Relationships between suppliers and business customers can take two directions. One is the marketplace approach [12] that links clusters of companies as suppliers and customers, with supporting multi-vendor catalogs [19], etc. In these electronic marketplaces, buyers and suppliers can conduct business more on an ad hoc basis, without the tighter and longer-term relationships that characterize the second approach of collaborative or hierarchical-type networks. In the latter case, continuing relationships are developed by a customer with fewer suppliers [6] or by a large supplier with its major customers. The related infrastructures for both types of systems may be developed, implemented, and managed by large suppliers or large customers to support business with their customers or suppliers respectively, or by business alliances, business consortia, or third party intermediaries.

4. The Business Procurement Life Cycle

Business procurement life cycles that have appeared in the literature include a variety of phases that cover information gathering, negotiation, fulfillment, maintenance and disposal [18] [43] [32] [9] [44]. Drawing from this literature, we have developed a more detailed life cycle with seven phases which we use to match activities between supplier and customer organizations. For the customer, the phases are activities that are pursued in acquiring goods and services that meet the requirements of the firm. For the supplier, these phases create activities for the marketing, sales, supply management and fulfillment functions, as well as the service function. The life cycle provides opportunities for a business relationship to begin, develop, or decline. A procurement life cycle from the customer's perspective includes the activity phases shown in Table 1, although not necessarily in the sequential order indicated. For example, there

may be defections and returns to previous phases, if the process between customer and any specific supplier breaks down at any time. This process forms an ongoing interactive exchange, through coordinated arrangements between the parties, for the purpose of common business advantage. There is no fixed time interval over which the life cycle can occur. It is situation dependent, taking as little time as a few hours or days in a competitive scenario, ranging up to several years in a collaborative scenario.

*** Insert Table 1 about here ***

4.1 The Customer Relationship Life Cycle

Gronroos [21] was apparently the first to propose a customer relationship life cycle, and applied it in the service sector. We have re-defined the customer relationship life cycle with the same number of phases as the procurement life cycle of Table 1, and it is applicable to both products and services. Figure 1 demonstrates our customer relationship life cycle model. The model consists of a series of processes, where the supplier-customer relationship forms and changes over time, as the customer considers and then implements the acquisition and consumption of a product or service. Although the model indicates a linear progression from one phase to the next, it is more likely to be an iterative process, where the customer or supplier may defect at any phase if the relationship is not proceeding successfully (e.g. the customer decides that the supplier's P/S does not meet requirements during the negotiation phase, or the supplier decides that the customer is not a good credit risk). The customer may then re-cycle back to a previous phase to continue searching for other P/S which meet known needs. The last phase in the model is the re-purchasing decision, based on joint experience with the product or service. This may lead to a simple re-purchase decision, the solidification of the relationship through a firm long term contract, or termination of the relationship if previous P/S experience was not satisfactory.

The life cycle is a two-sided process, where both supplier and customer work to build an harmonious relationship that will have a positive impact on the process. This is more likely to succeed if the parties focus on joint value creation. If a collaborative business relationship

develops, leading to continuing high volume purchases, this may justify investment in integrating internal systems with the necessary IOS to support related transaction processing and end user access. Part of this investment may be lost if the business customer chooses to switch to a different supplier. Switching is not undertaken lightly in a collaborative situation, where the relationship is likely to be of long duration once it is firmly in place.

Table 2 summarizes customer and supplier activities, during each of the customer relationship life cycle phases, that influence the decision to move to the next phase or to abandon further contact. Also included are the supplier value chain functions involved, tools the supplier may use in each of the phases, and moderating factors that influence decisions a customer makes at each phase. Although marketing and sales play the most significant role for the supplier in maintaining contact with the customer throughout the life cycle, supplier value chain functions are involved at some time in customer support, either directly or indirectly. The customer procurement function is involved throughout the process, including end users, engineers, and purchasing agents. As the following discussion will show, IOS are not yet at the stage where they support applications in all the phases of the life cycle seamlessly. However, progress is being made, and we comment in a following section on current developments.

*** Insert Figure 1 about here ***

*** Insert Table 2 about here ***

In phase 1, the customer searches for information on available P/S. A large variety of moderators influence the customer's perceptions of the information collected, including word-of-mouth, competitors, corporate image of the supplier, brand awareness, and previous experience with the supplier. Suppliers can create positive awareness by joining electronic marketplaces or advertising through their company Web sites (e.g. Cisco.com®), multi-vendor catalogs (e.g. WIZnet.net, which includes thousands of supplier catalogs), and distributor sites (e.g. Avnet.ca®, a major distributor of electronic components and computer equipment), where potential customers can find information on available P/S. This improves the potential customer's searching efficiency, helps to identify P/S that would otherwise not be known to the customer, and helps new small businesses to enter the marketplace. If the supplier already has an ongoing relationship with the potential customer, continuing customer interaction is essential to

keeping the supplier company aware of the customer's needs so the supplier can respond before the customer goes to the marketplace. For the customer, participation in a multi-vendor catalog system that covers a broad spectrum of P/S, with many potential suppliers, can be very helpful during this phase (e.g. MetalSite.net®, a major Web site that provides commerce, information, and interaction among peers in the metals industry).

In phase 2, the customer has developed a list of potential suppliers, and needs to gather more information about the P/S to determine if they suit the company's needs. Web technology to provide information on company background, products and services, and service details, is backed up by e-mail to contact supplier sales representatives. At this point, the supplier must either be the low cost supplier or compete on features other than price, if there are a number of competitors in the market. This requires differentiation on other features such as quality, delivery, and service support. Such information can be made available through catalog information, followed up by interactive marketing to ensure that customer needs are determined and satisfied if possible. For larger contracts, Requests for Proposals (RFPs), Requests for Bids (RFBs) or Requests for Information (RFIs) may be advertised to a supplier list to assemble more specific information. An example of a system that supports this process is General Electric's Trading Process Network®, where GE purchases billions of dollars worth of P/S by soliciting bids on the Internet. Availability of trial samples, the quality and performance of the P/S offered, the availability of customization, and what the competition has on offer, all affect customer reaction during this phase.

Background review often includes evaluation of test P/S quantities from a short list of suppliers, and includes contacts that the supplier should make available, with existing customers. One way that suppliers can increase potential buyer trust is by providing short case studies on their Web site about previous installations of their products, including contact information (see, for example the Microsoft site at http://www.microsoft.com/Industry/). Supplier sales people maintain continuing interaction throughout this phase with those buyers indicating an interest in their products or services.

Negotiation is the final stage in making the sale, with a sales contract as the outcome. Trust, warranty, commitment and pricing discounts by the supplier, and the trust built up with the customer as well as the customer's goals play a role in successful completion of the contract. Groupware and electronic conferencing can assist end-users, purchasing agents, and supplier sales personnel in negotiating appropriate agreements on price, design, delivery, and payment schedules. Recent advances in negotiation support systems have improved the capability for remote negotiation [7] [54]. Negotiation by bidding through on-line Web auctions such as IndustrialBid.com® is becoming a popular method to acquire P/S that are being disposed of by companies with surplus or obsolete stocks, although this method is also normal marketing practice in some industries. If the trading partners choose to install an IOS interface to manage transaction processing during the life of the contract an important consideration will be its cost (including conversion costs), and how to apportion that cost. Such an investment is at risk, since at least part of the investment will be lost if the relationship does not become long term, and is terminated at the end of the contract.

During fulfillment, an IOS link between supplier and customer may be established if not already in place, and if the relationship is collaborative. These links will manage transactions that derive from the contract, through EDI interfaces that may include customer and supplier banks. Establishing a link of this type requires a significant investment in time and resources by both supplier and customer. Because of potential switching costs, this enhances the opportunity for a continuing relationship between companies. Linkage between a supplier Web site and an internal ERP system is demonstrated at a joint KPMG-Hewlett Packard site http://www.kpmg-hp.com/. In a marketplace IOS that utilizes a multi-vendor catalog, the customer can carry out the P/S search through the IOS and, when the contract has been negotiated, also have fulfillment managed through the IOS. Technical problems such as engineering design adjustments can be supported by distributed engineering [25]. Supply chain management software [8], such as that available from companies like i2 Technologies, can be very effective in providing the supplier with links between marketing, manufacturing, and distribution, to forecast and schedule manufacturing and delivery of customer orders. Customers and supplier performance depends on environmental conditions such as third party activity (e.g. shippers, unions, etc.), and their

perceptions are based on expectations generated during previous phases in the life cycle (e.g. promised delivery dates, payment schedules, etc.).

During consumption, maintenance, and disposal, the P/S quality becomes very familiar to the customer, and customer loyalty is either developed or destroyed. If expectations are not matched by perceptions, the relationship may be damaged. Automated service support (backed up by support personnel when necessary), on-line training, and cross-selling are all important supplier activities during this phase. As an example of customer service, Hewlett Packard maintains a Web site at hp.com for service and support of a wide range of products, including software, hardware, consulting, outsourcing, customer education. Here, for example, customers can get automated download of software upgrades, service updates, faq's etc., in addition to access to customer support personnel.

The renewal phase results in a review of customer experience with the P/S, and decisions on whether to renew a contract and/or purchase more P/S from this supplier. Internal information systems that track supplier performance, including delivery, service, P/S quality experience, and other criteria, can be valuable in supporting decision-making in this phase. The network relationships established by supplier sales and marketing personnel, in conjunction with favorable delivery performance and service support from production operations, give the supplier an advantage over other competitors at this point. For the customer, it is more convenient to re-purchase the P/S from this supplier, since both the P/S and the supplier service and support are known quantities. Going to another supplier would involve re-tracing the first three steps in the relationship life cycle, at a cost that is worthwhile only if experience with the current supplier and its P/S has been unsatisfactory. There would also be additional switching costs to align the customer's information systems with an IOS that integrates with a new supplier. This enhances the likelihood that a long term relationship, once established, will continue. For both the supplier and customer, a positive review of P/S quality, service quality, and the establishment of a good operating relationship will improve the likelihood of upgrading the relationship from occasional to regular supplier, from multiple supplier to exclusive arrangement, from short term to long term, and from local to national agreement.

5. Discussion

We conclude the paper with a series of observations based on our analysis of supplier-customer relationships throughout the customer relationship life cycle.

1. Useful insights can be derived by studying relationships through the customer relationship life cycle. Of particular interest is how both parties can improve the effectiveness of these relationships while at the same time reducing operating costs, by taking advantage of the new technologies. Successful business-to-business relationships by their nature tend to start as arms-length market relationships, but if they continue over time they eventually lead to more collaborative relationships with fewer suppliers. When the latter is the case, more of the procurement process can be automated, resulting in lower transaction handling costs and higher volumes for the suppliers involved. Savings on the supplier side are often passed to customers in the form of discounts. From this perspective, the current trend seems to agree with the "move to the middle" hypothesis of Clemons et al [14].

2. It appears likely that many more electronic marketplaces will open for business-to-business electronic commerce, but because of their competitive nature, marketplaces don't encourage the development of long term relationships between supplier and customer. On the other hand, investing in collaborative relationships can reduce the cost and improve the effectiveness of doing business. These will develop into long term relationships, if accompanied by high quality P/S and good marketing and service practices. It therefore seems likely that the growing availability of electronic markets will not reduce the need for collaborative network relationships, but that the real growth will be in IOS that can support a spectrum of markets, networks, and hierarchies.

3. No amount of advanced technology can replace human interaction in establishing and maintaining relationships. However, the IOS and related technology applications we have described can improve support for supplier and customer alike, leaving them with more time to pursue those activities that cannot be automated easily, thus providing better service and

improved relationships with existing and potential partners. For example, integrating an IOS with the internal systems of supplier and customer, and providing an intranet Web interface for end-users to requisition P/S from suppliers under existing open purchase contracts, can remove the burden of handling routine purchase orders from the purchasing and accounts payable departments. Experienced personnel from these departments could then spend more time assisting users in finding suppliers for new and unusual items, or handling complex exceptions such as splitting tax payments among two or more jurisdictions.

4. A substantial investment may be needed to install and maintain proprietary IOS applications (including multi-vendor catalog systems and EDI systems), in addition to the cost of converting and integrating existing internal information systems. Until communications and data standards are more widely adopted, this increases the risk from engaging in a collaborative relationship, since switching costs will tend to be high. This must be balanced against the potential reward, in the form of reduced transaction processing costs, increased end-user involvement in procurement transactions, and more effective purchasing decisions.

5. Product and service sourcing activities (information gathering, supplier contact, background review, and negotiation) are the customer activities that tend to be the least structured in the customer life cycle, and hence least amenable to automation. However, if a collaborative relationship is established, activities in the fulfillment phase can become highly routine and amenable to automation support. Mismatches between the degree of automated support for end-users at any of the life cycle stages between supplier and customer are likely to result in sub-optimal performance and/or failed relationships. These are more likely to occur if either the supplier or customer is much larger than its partner. For example, if the supplier cannot integrate its order management system with the customer's, orders may have to be mailed, telephoned, or faxed to the supplier, increasing delays, error rates, and costs. Hence it is important to ensure that these mismatches do not occur, if the relationship is to be collaborative. This may include offering a subsidy and technical assistance to the partner that lacks the appropriate system, so a compatible system can be implemented.

6. Throughout the life cycle, the market orientation of the supplier firm can have a positive effect on many of the moderators listed in Table 2 that affect the relationships between supplier and customer, and how the P/S is marketed, sold, and serviced, and the contract is fulfilled. Unless the entire firm, including especially supply chain management, marketing, and sales, is market oriented, methodologies and technologies supporting customer relationships will be less effective. This may result in a reduction in customer loyalty and a resulting loss in profitability [30] if there is a gap between customer expectations and perceptions [55].

7. In this paper we have examined the state of supplier-customer relationships in the context of the newer IOS technologies, organized through the use of the customer relationship life cycle. The state of the applications and the technology involved is currently subject to very rapid change, but one current trend is towards more on-line electronic marketplaces, hosted by intermediaries or major customers, and reached through high volume Internet portals such as Yahoo!® and Alta Vista®. At the same time, the IOS that link suppliers and customers will improve along with the integration of the applications they support, and the development and widespread application of data standards such as XML will help reduce the cost and improve the portability of IOS applications. At the same time, improved end-user customer access will reduce the need for human intervention by purchasing agents and other support personnel. In theory, an ever larger proportion of the less structured activities in the customer relationship life cycle can be automated through the application of the newer technology such as expert systems and intelligent software agents. But the main benefit of any such advanced systems will be to allow increased attention to inter-company relationships by supplier and customer personnel.

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List of Tables and Figures

Table 1. Business Procurement Life Cycle

Table 2. Customer Relationship Life Cycle Activities, Functions, Tools, and Moderators

Figure 1. Customer Relationship Life Cycle

Phase	Description
1. Information Gathering	If the potential customer does not already have an established relationship with sales/marketing functions of suppliers of needed P/S, it is necessary to search for suppliers who can satisfy the requirements.
2. Supplier Contact	When one or more suitable suppliers have been identified, Requests for Quotes (RFQ), Requests for Proposals (RFP), Requests for Information (RFI) or Requests for Bids (RFB) may be advertised, or direct contact may be made with the suppliers.
3. Background Review	References for product/service quality are consulted, and any requirements for follow-up services including installation, maintenance, and warranty are investigated. Samples of the P/S being considered may be examined, or trials undertaken.
4. Negotiation	Negotiations are undertaken, and price, availability, and customization possibilities are established. Delivery schedules are negotiated, and a contract to acquire the P/S is completed.
5. Fulfillment	Supplier preparation, shipment, delivery, and payment for the P/S are completed, based on contract terms. Installation and training may also be included.
6. Consumption, Maintenance, & Disposal	During this phase the company evaluates the performance of the P/S and any accompanying service support, as they are consumed.
7. Renewal	When the P/S has been consumed and/or disposed of, the contract expires, or the product or service is to be re-ordered, company experience with the P/S is reviewed. If the P/S is to be re-ordered, the company determines whether to consider other suppliers or to continue with the same supplier. This may lead back to either phase 1) or 4) respectively.

Table 1. Business Procurement Life Cycle

Life Cycle Stage Process	Customer Activities	Supplier Functions/ Activities	Supporting Tools	Moderators
1. Information Gathering	Searching, Observing	*Marketing:* Advertising, Customer Interaction	Trans., Int. Mktg, Web Multi-Vendor Catalogs, Distributor Sites	Word-of-Mouth, Competitors, Corporate Image, Brand Awareness, Experience
2. Supplier Contact	Learning, Evaluating, Comparing	*Marketing, Sales:* Selling	Interactive Mktg, Interactive Bid Preparation, Web Sites, E-mail	Trial Availability, P/S Quality, Performance, Customization, Competition
3. Background Review	Testing, Evaluating	*Sales, Service:* Providing Data, Case Studies	On-Line Testimonials, Web Service Support	Reputation, Experiences of Other Customers
4. Negotiation	Negotiating, Planning	*Sales, Legal, Operations:* Info. Provision, Bidding, Negotiating	Negotiation Support System, Groupware On-line Auctions	Competition, Price, Terms, Warranty, Trust, Commitment, Goals System Costs
5. Fulfillment	Tracking, Evaluating, Installation, Paying	*Outgoing Logistics, Operations:* Organizing, Scheduling, Billing	Scheduling, Tracking, EDI, IOS Network Dist'd. Engrg.	Expectations, Environment, Perceptions
6. Consumption, Maintenance, & Disposal	Learning, Using, Evaluating, Maintaining, Disposing	*Service, Marketing, Sales:* Supporting, Training, Servicing, Updating, Cross-Selling	On-line Info., Web Site Service, Interactive & Network Mktg. Dist'd. Mfg.	Expectations, Perceptions
7. Renewal	Reviewing	*Marketing, Sales, Operations:* Product/Service Announcements, Updates	Interactive & Network Mktg	Experience, Satisfaction, Competitors, Switching Costs

Table 2. Customer Relationship Life Cycle Activities, Functions, Tools, and Moderators

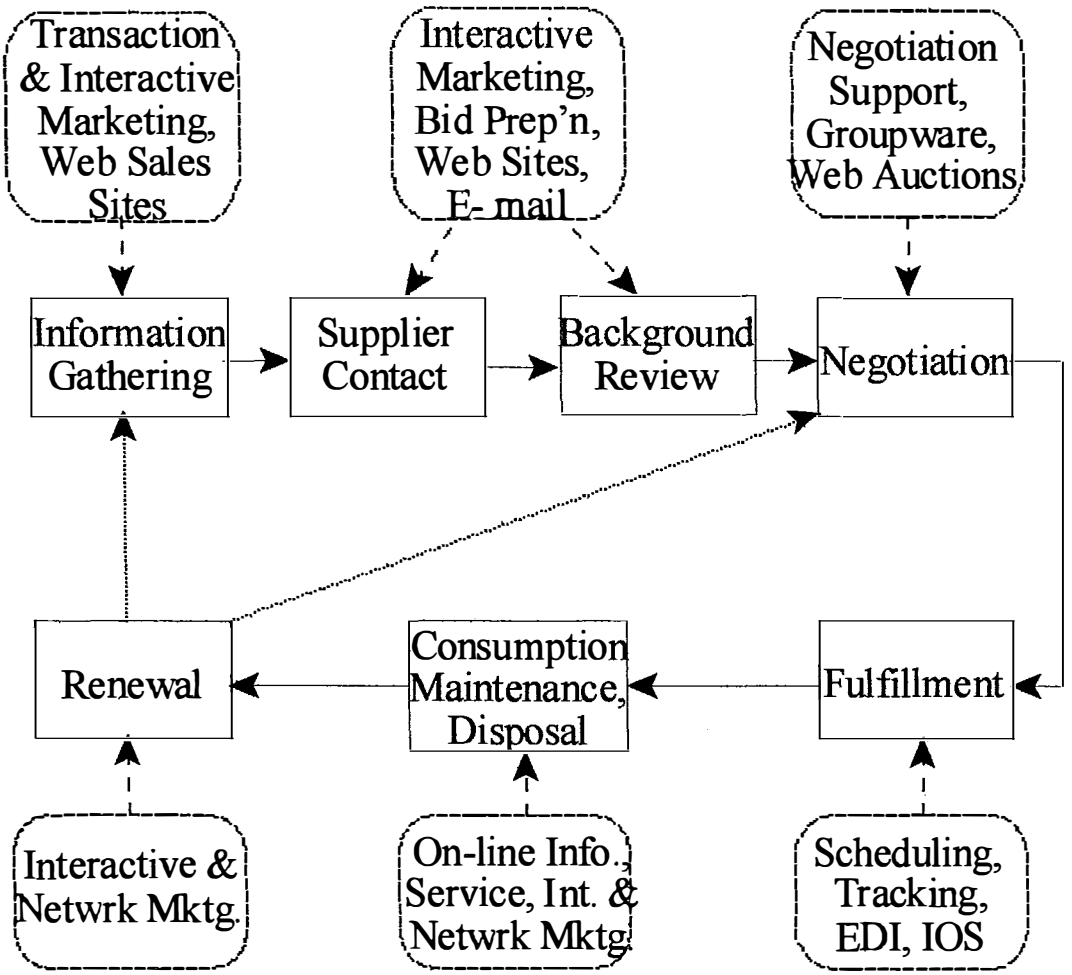

Figure 1. **Customer Relationship Life Cycle**

Customer Life Cycle Phase Vendor Tools

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