RETHINKING B2B E-MARKETPLACES AND MOBILE COMMERCE: FROM INFORMATION TO EXECUTION

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ABSTRACT

This article investigates the interface between the exchange relationship in the digital economy and the emerging and continuously improving wireless technology. Exchanges become highly relevant when we look at how collaborative processes are performed. A special emphasis is placed on enabling collaboration between multiple business partners. In most cases, companies require standardization of information flows and business processes to be able to collaborate. Here, trading platforms, private and public exchanges will play a much more important role due to their increased ease-of-use (as opposed to EDI for example).

The key line of thought is that collaboration is essentially based on information sharing, information sharing enables exception management, exception management relies on near real-time data, and real-time data can be collected through wireless technologies. The key ideas of online marketplaces are discussed along with the evolution and future of exchanges in the digital economy, to help management rethink the exchange relationship in the digital economy.

Introduction

B2B is about connecting the existing buyer and sellers. It is not a disintermediation play. It is about intelligently implementing Internet technology to improve business processes. The online B2B market across the world is increasing in value rapidly, but there are some hurdles and limitations to be met in the near future. The report, from Strategy Analytics (an international research and consulting firm), notes that s global B2B e-commerce transactions will grow from $226 billion in 2001 to $2.02 trillion in 2006 [Bellomy 2002].

The B2B eCommerce revolution includes eProcurement, B2B exchanges, and business infrastructure relationships. eProcurement involves firms selling supplies, equipment, materials, and services with a streamlined online purchasing function that often eliminates traditional intermediaries, thereby reducing costs and cycle times while offering greater flexibility and responsiveness to changes in demand. Web-based supply chain management networks improve coordination between trading partners by linking a firm's forecasting and production planning systems with its suppliers' and distributors' systems. They can create dramatic savings and quality improvements.

B2B exchanges include various categories of market spaces, including vertical market portals ("vortals"), hubs, and various types of auctions. A single Infomediary (industry consortium or 3rd party) brings together many buyers and sellers within a specific vertical market, such as plastics, steel, or industrial chemicals, charging a commission on all transactions. Hundreds of industry-specific exchanges have now been launched, and more are being developed every day. Some of these 'market spaces' operate with posted pricing models, while others employ collaborative negotiated prices, auctions, reverse auctions, Dutch auctions, and other pricing mechanisms. Many are used in spot markets for industrial materials, overstocks, and perishable goods, as well as business services transactions.

More important is the development of entirely new eBusiness infrastructure industries. Many firms support online activity by facilitating the interaction between various parties in eCommerce as preferred outsourcers for eBusiness processes. They have become integral to the effective operation of Internet-based activities and may account for the largest source of profits from the future growth of eCommerce. They provide digital content or improve its delivery, bring new customers to websites, finance acquisitions, and provide many other services. They include application services providers, content maximizers, wireless service providers, and payment processors.

The key questions addressed in this paper are: What does the exchange landscape look like in the digital economy and what can be inferred from the past to chart the direction and value proposition for the future? This

paper is structured as follows: Following this introduction, we will describe the characteristics and differentiators of online marketplaces followed by the evolution of e-marketplaces. In the next section we conduct an in-depth assessment of e-marketplaces and discuss event management and wireless-enabled exchanges. The concluding section tracks the transforming future of exchanges in the digital economy and provides a summary of the more general lessons, in terms of rethinking the exchange relationship in the digital economy.

Online Marketplaces: Characteristics and Differentiators

The possible forms of B2B marketplace are point-to-point connections (extranet), or e-marketplaces (Independent Trading Exchange (ITE)). As shown in figure 1, e-marketplaces can be either one-to-many or many-to-many environments. The key pricing mechanisms are fixed/static pricing (i.e., catalog-type/aggregator sales), and dynamic/variable pricing which includes both exchanges and auctions where price is negotiated in real time. An auction is one buyer and many sellers, or one seller and many buyers, whereas an exchange is many buyers and many sellers. However, caution is advised since almost everything is calling itself an exchange. Most are simply catalogs where buyers can search across multiple suppliers.

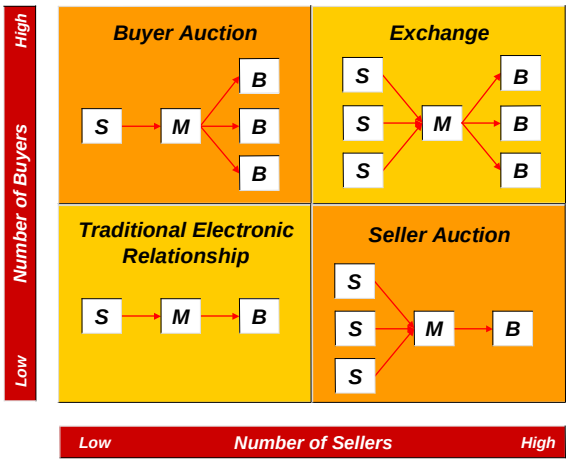

Fig. 1: Types of E-Marketplaces

As online marketplaces proliferate, a bewildering array of subvarieties and hybrid exchange models will emerge. Here the term "model" is referred to as a general case through a typological metamodel (as illustrated in figure 1) and then we discuss the distinguishing characteristics of models. These variants can be distilled into six primary flavors of online marketplaces, serving both the B2B and B2C markets [Kaplan and Sawhney 2000; Bakos 1991; Malone et al. 198]:

1) Online Buying Services
2) Auctions
3) Functional Exchanges
4) Vertical Exchanges
5) Industry-Sponsored Exchanges
6) Net Markets

The salient characteristic shared by all six is that they increase the ease with which buyers perform one or many steps of the purchasing process, from product consideration to demand generation through to the transaction itself. Specifically, online marketplaces deliver:

- Price and product transparency (i.e., the ability to easily locate and compare products and prices).
- Supplier and seller discovery, or the ability to aggregate demand and supply.
- Convenient and reliable transactions, by matching buyer and seller orders, and enabling a wide variety of pricing and market-making mechanisms.

Ultimately, value-added services to enhance the selling process, including logistics, inventory management, financing, forecasting, advertising, catalog management, and more.

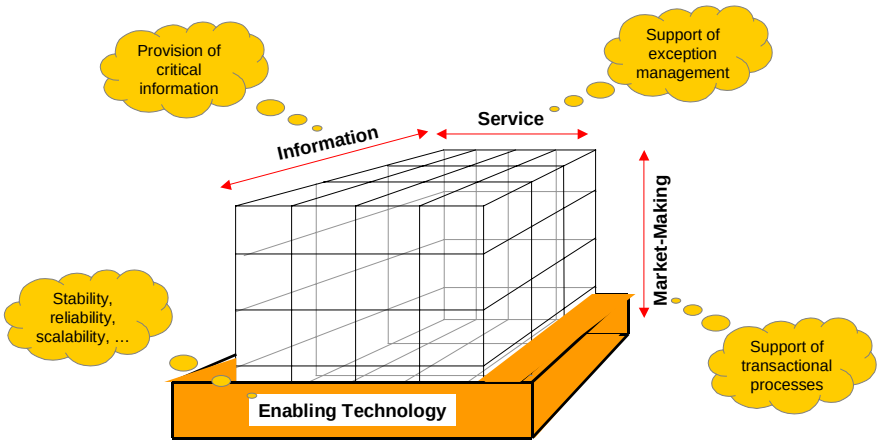

Fig. 2: Four dimensions of E-Marketplaces

As shown in figure 2, each type of marketplace differs fundamentally along four axes:

1. Level of information provided (e.g., price, availability, and range of substitutes).
2. Breadth of services offered (e.g., quality assurance, financing credit risk, and customer support).
3. Type of market-making mechanism (i.e., the way transactions occur, such as Dutch auctions, reverse auctions, real-time transactions, and collaborative negotiations).
4. Enabling technology (e.g., web shopping agents, content management, levels of database, and transaction infrastructure).

Next the taxonomy of online marketplaces, i.e., its six flavors are described in detail below:

Online Buying Services

These services offer support during the awareness and demand generation phases of the selling process. Specifically, they provide price and product transparency (e.g., via shopping agents and comparison sites), buyer and seller discovery (e.g., shopping agents, price aggregators and industry catalogs), and quality recommendation and selection aides (e.g., analyst and review sites). Online buying services are targeted primarily to B2C markets, such as big-ticket consumer retail (e.g., electronics) and one-of-a-kind novelty purchases, as well as small business markets. The individual services that make up online buying services will be absorbed into more mature exchanges and net markets over time. Examples include mySimon, CarPrices.com, and CNET.

Auctions

Auctions are online markets that aggregate demand and match buyers and sellers for a wide range of B2B and B2C products. They employ a variety of market-making mechanisms (e.g., reverse, Dutch, English, and sealed-bid auctions) to meet specific business objectives such as demand aggregation and price maximization. Auctions serve B2B, B2C, and C2C markets, including retail, novelty, maintenance, repair and operations (MRO) purchases, distressed inventory/perishables, spot purchases of commodities and raw materials, and secondhand capital equipment. In the B2B space, auctions are generally targeted to small business customers that lack both purchase power and sophisticated purchasing operations. Examples include Amazon.com (auction) and Mercata (demand aggregator).

Vertical Exchanges

Vertical exchanges are trusted intermediaries that facilitate B2B e-commerce with vertical market and product-specific expertise. They offer real-time pricing and complete product information. Eventually, they are to offer a range of value-added services across an array of vertical markets (e.g., MRO, spot purchases of commodities and raw materials, capital equipment, secondary markets, distressed inventory and perishables, and some direct materials such as semifinished and engineered products). Examples of vertical exchanges include PaperExchange.com and FreeMarkets.

Functional Exchanges

Functional exchanges are trusted intermediaries that facilitate mostly B2B e-commerce involving process, functional, or channel-specific expertise. These exchanges market an array of primary services or solutions that automate or support specific business functions or processes (such as HR benefits or energy management).

Functional exchanges offer real-time pricing, complete product information, and value-added services. Examples include tradehub and Celarix.com.

Industry-Sponsored Exchanges

Limited to B2B commerce, these exchanges have equity participation or sponsorship from major industry buyers and (frequently) technology partners as well. They act as intermediaries to facilitate B2B e-commerce in industries with high concentrations of buying power. Industry-sponsored exchanges offer the same range of services as other exchanges, including real-time pricing, complete product information, and value-added services and information. Over time, these exchanges will accommodate more highly engineered products and direct materials.

Examples include COVISINT (the GM-Ford-DaimlerChrysler joint venture) and Globalnet Exchange.

Net Markets

The holy grail of online marketplaces will be Net markets, or federated Net markets. These markets are sophisticated networks and combinations of online marketplaces that will emerge over the next three years. Net markets will develop from the quilting of functional and vertical exchange capabilities and expertise, and the assembly of value-added services across the supply chain (e.g., logistics, inventory, demand forecasting). This type of market will deliver more value-added services and will require high levels of buyer collaboration to conduct complex transactions. Because Net markets will demand the integration of many industry supply chains and the coordination of multiple large and small markets, they will not mature for several years.

In the short term, each of these online marketplaces creates value by facilitating the sharing of information about products and pricing, matching many buyers and sellers and improving the ease and speed of transactions. Longer term, value will arise from greater levels of purchase-process integration and through the delivery of value-added information and services.

Vertical hubs with market focus in industries such as plastics, steel, chemicals, paper, telecom and so forth. Vertical Net operates over 40 exchanges that attempt to serve nearly all facets of one niche industry, such as Chemical Online, a chemical industry portal; MachineToolsOnline, a machining industry portal; and Aerospace Online, an aerospace industry portal.

Horizontal or functional hubs may "horizontally" cross several different vertical hubs, while providing vital services to different industries with process focus such as logistics management; maintenance, repair, and operations (MRO) goods or services procurement; project/capacity/HR/credit management; or auction applications.

A private exchange is driven by a single seller or buyer and it typically involves a company automating its own supply chain. The customer base and participation is generally open to suppliers or customers of the company. Companies that have perfected this model include Dell, Cisco, and Wal-Mart. A public exchange is an industry consortium or a third-party dot-com forming an entity (such as Covisint and e-Steel) to aggregate the buying behavior of a group of buyers and their suppliers, with an emphasis on the buy side.

The Evolution of B2B E-Marketplaces

The evolution and diffusion of B2B e-marketplaces has occurred in three distinct waves [Berryman and Heck 2001; Swahney 2001]. In the first wave of B2B, there were approximately 1,000 independent on-line marketplaces for commodities such as paper and steel (e.g., PaperExchange and e-Steel) to specialized components such as airplane parts (e.g., MyAircraft.com). Unfortunately, most of these independent, fee-based marketplaces such as Aluminium.com inc. and Ventro Corp.'s Chemdex and Promedix were not able to maintain their liquidity since a few large organizations that generated most of the transaction volume could negotiate with the suppliers and vendors on their own and save the transaction fees. Others, such as Vertical Net Inc. and SciQuest Inc. have transformed their business models from charging fees for online B2B transactions to positioning themselves as B2B software vendors [Hicks 2001].

For instance, bandwidth exchanges are creating a liquid market for bandwidth and has obvious appeal since sellers are stuck with excess capacity due to rapid technology improvements which lead to price reduction of approximately 50% a year. With a profusion of approximately 25 bandwidth exchanges, it is harder for any one site to generate liquidity. This may lead to some consolidation in the telecom B2B market-space.

In the second wave of B2B, large corporations formed a consortia designed to reduce bid-ask spreads and to bring down transaction costs by matching buyers with suppliers and enabling suppliers to trade with one another. Examples of these consortia are the GM-Ford-DaimlerChrysler joint venture called Covisint, ForestExpress in the forest products industry and Aero Exchange International in the airline industry. Unfortunately, similar to the first-wave B2B model, the effort to transform the procurement and sales practices was directed at whole industries, instead of individual companies and purchasing managers. Although one of Covisint's initial goals was to share the costs rather than force each car builder and supplier to house its own trading software, it has revised its strategy by agreeing to host private exchanges for companies and offer portal services connecting Covisint to purchasing sites

fully operated by big manufacturers. However this strategy shift makes one wonder whether Covisint's two priorities--creating a self-sustaining business and setting technology standards for the auto industry—are in direct conflict? Moreover, a majority of the "tier 3 and 4" suppliers, i.e., those that make rubber, plastic, aluminum and other basic car materials, are not using Covisint; and BMW, Honda, Toyota, Volkswagen and other manufacturers have began constructing their own private exchanges [Joachim and Moozakis 2001]. The key factors to sustainability of a vertical market consortium is its ability to exploit not only the size and sophistication of the businesses that founded them, but also the exceptional value of their deep industry knowledge, to their advantage.

In the third wave of B2B, exchanges have customized their model/s based on the cost structures of various purchases. One of its distinguishing characteristics seems to be the idea of choosing a different model for each kind of transaction. Some models focus on collecting and distributing information, while others on reducing purchase costs and improving transactional efficiencies. Companies purchasing a commodity, for example, might value the liquidity, the transparency, and the price orientation of an on-line bourse, just as commodity contracts are already traded at the Chicago Mercantile Exchange and elsewhere. By contrast, companies making highly specialized purchases might value the possibilities for customization offered by the traditional bilateral relationship between buyer and seller. In the long-term, the models will probably lose some of their distinctiveness but their success depends on collecting and disseminating information that is not available elsewhere. [Hansen et al. 2001].

The current one-time "all-you-can-eat" subscription model, which encourages individual purchasing managers to use their facilities after their company has paid the membership dues, would not be sustainable on just an efficient trading value proposition. The key to success of digital exchanges in the current and the third wave of B2B, is better access to and the sharing of information, in addition to facilitating every kind of collaboration between buyers and sellers, such as enabling the partial integration of their operations, allowing them to improve their supply chains, and to work jointly on product designs. This assumes that buyers have strong internal strategic purchasing capabilities.

In this third wave, organizations see a need to build a value-added community/ metamarket. This will be a emerging alliance of suppliers held together by common interest, rather than by common ownership. Examples from the logistics field are www.freightmatrix.com (uses I2's SCM software), or www.nte.com (one of the most well known and well-funded industry exchanges for trucking companies, with $72 million from Dell, FedEx and Hummer Winblad). It operates on a percent of the cost, albeit it does not offer compatible software services to automate operations and ignores the ocean and airline companies, or www.freightdesk.com that links forwarders, manufacturers, ship and airline companies to the same database and lets them all talk, manage and track a shipment.

Such exchanges must capitalize not only on the price efficiencies that result from standardizing complex processes and varied products and services, but also on the unique knowledge of the industry maintained by its members. This will enable it to spread risk, and to uncover new opportunities [Devine et al. 2001].

Baumgartner et al. (2001) note that certain buyers are extremely price sensitive when they make certain purchases, which will naturally migrate to low-cost producers. But many other purchases will continue to involve information-rich bilateral relationships.

A third model—that of the "e-distributor"—lies between the two extremes of the stand-alone marketplace and the consortium. Like distributors in the off-line world, e-distributors take title to the goods they sell, aggregate those goods for the convenience of buyers, and (because they carry only certain products) in effect advise buyers which to choose. In addition, e-distributors perform a critical service for sellers by reaching hard-to-find buyers, such as small ones. For example, SciQuest, a distributor of laboratory supplies, links its on-line search-and-order engine to the in-house systems of its customers so that once an authorized manager has approved a purchase, the order is dispatched automatically; and Mercateo.com, a start-up e-distributor of MRO products, carries the stock of only the top two or three suppliers in each product category with explicit guidance and troubleshooting guides in addition to the opinions of customers or independent researchers. The result, in many cases, is significant extra value for buyers whose orders are too small for bilateral relationships, and decent profits for sellers since unlike B2B marketplaces, which depend on collecting a vast number of small transaction fees, e-distributors make their money from markups [Baumgartner et al. 2001].

Figure 3 below summarizes and illustrates the evolution of B2B exchanges through all three waves. While not all factors of their evolution are considered here, the key drivers of change are included. B2B Exchanges have evolved from technology-centric business models to customer- and pain-focused ones over the three aforementioned waves. For obvious reasons, a key evolutionary factor in any new industry is a migration towards higher value creation by solving real problems and saving time as well as money. For B2B exchanges, value for all participants is created through the degree by which an exchange supports existing and enhanced business processes. Better support of processes simply yields higher value. As a result, there is a direct correlation between the complexity of business transactions and amount of value creation by exchanges. As stated, exchange business models have evolved towards better support of immediate customer problems and away from early Internet-centric technology visions. We see

four phases of value creation by exchanges in order of their increasing value contribution: (1) creation of market transparency, (2) enabling of better and faster communication, (3) support of trade execution and (4) enabling of business process execution beyond trades. As figure 3 shows, B2B exchanges have evolved from mere information access providers to cost cutting and finally enhanced quality. These three waves certainly and inclusive in that the second wave has also benefited from advantages of the first and so forth.

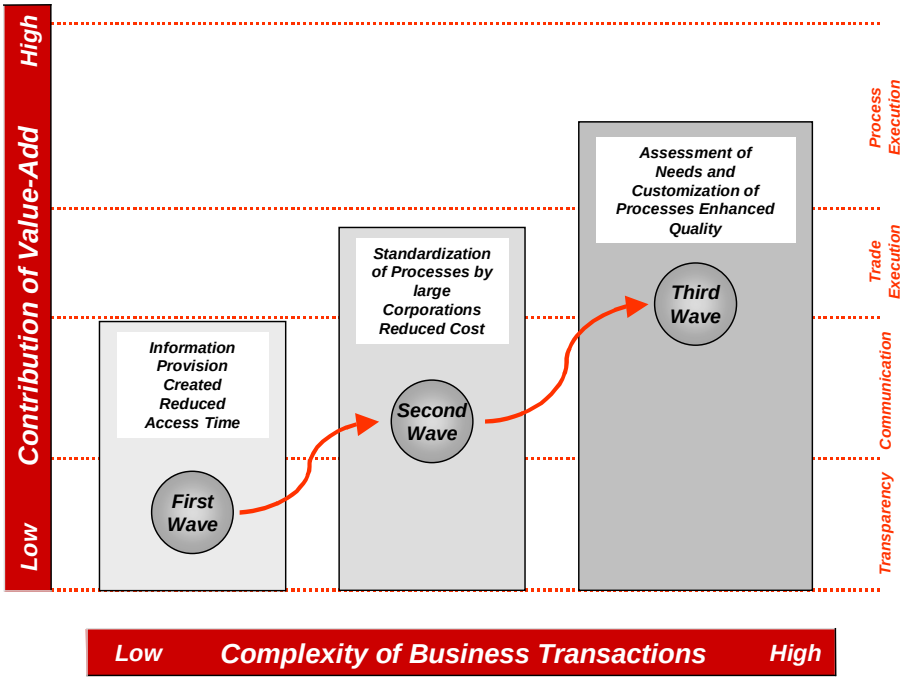

Fig. 3: Evolution of B2B Exchanges

Assessing E-Marketplaces: A Closer Look

The three critical criteria to assess e-marketplaces are value proposition, user experience, and technology execution [Cuny and Richardson 2001]. The best practices for e-marketplaces include making changes based on research and tests of participant's experience; assessing policies on dispute resolution, data control, and transaction transparency; and evaluating if the marketplace is ready for new technologies, such as wireless, or fine tuning the enterprise application integration (EAI) tool to extend the back-office systems to customers, suppliers and other business partners over the Internet.

According to a McKinsey study by Hansen et al., (2001) only B2B marketplaces that collect and exploit information not available elsewhere, can provide anything more than short-term purchasing benefits. The sooner buyers act on this insight, the more chance they will have to shape and reshape their marketplaces without losing ground to competitors. Winning B2Bs must focus on their transaction capabilities in industries dominated by commodity products and large numbers of highly fragmented buyers and sellers, avoid concentrated industries, and hold on to their equity. Hicks (2001) reports that successful independent e-marketplaces have conformed to the prevailing business practices in their industry rather than attempt to push radical changes. For example, as is customary in their fields, Altra Energy in the energy field and Arbinet in the telecommunications capacity trading field allow buyers and sellers to remain anonymous through much of a transaction.

The Global Trading Web Association, a group of 44 providers and users of electronic services to 250,000 companies in more than 100 countries, has some powerful backers from Fortune 500 companies including General Motors, Citigroup and Deutsche Telekom. Although it was created by Commerce One, powered by their own suite of exchange software, it is moving towards interoperability across e-markets by not only ensuring compatibility with other leading platforms such as Ariba, Oracle, and SAP but also creating trust (comprising security and privacy) in business relationships that will cause inter-marketplace trade. This open system could serve as an international standard for buyers and sellers to use, and in doing so will create an ambitious global B2B network of strategic

marketplaces and key players. The investment bank CSFB recently became the first company to complete multiple transactions across several exchanges in the Global Trading Web system.

Among the key barriers to entry in a B2B marketplace are industry/domain expertise, backend integration, follow-up service, and a strong two-sided value proposition (i.e., a benefit to both buyers and sellers such as aggregation techniques that aggregates both buyers and sellers to enable the hub reach critical mass). Buyers, investors, and marketplace executives each define value differently. Hansen et al., (2001), Sawhney (2001) and Kerringan et al., (2001) describe four ways that B2B marketplaces create value.

First, they expand everyone's market reach. This has significant value in fragmented industries, such as electronic components, health care, and life sciences, where buyers and sellers may face considerable difficulty in finding each other. For instance, Chemdex maintains a register of 2,200 suppliers and more than 26,000 users of life sciences materials. Second, B2B marketplaces generate lower prices for buyers by enabling them to reach more suppliers or the most efficient supplier as well as precipitating increased price competition and, in some cases, access to excess-inventory stocks. For example, FreeMarkets estimates that its customers have experienced savings of 7 to 10 percent for commodities and 7 to 25 percent for custom purchases.

Third, B2B marketplaces cut the cost of the buyers' operations such as the cost of B2B procurement processes, order-tracking, inventory-management, and reordering processes. For example, an exchange called e-Steel, automates the transaction process for approximately 2,200 buyers and sellers that leads to cost and time efficiencies. Finally, these marketplaces provide unique, high-value-added content such as identifying industry best practices. For example, Ecountries.com, a B2B publishing and e-commerce service focused on the global economy, uses Dun & Bradsheet's Eccelerate to enable users to verify a counter-party's identity and corporate status and to make credit decisions in real-time; SiteStuff, a property maintenance exchange monitors materials, repair, and operations spending per building and compares these costs with those of average and best-run buildings of the same type and size; and Neoforma.com singles out and profiles hospital medical departments with the best floor plans, equipment, and stock of materials. The next section describes the new concept of event management and introduces an example for the application of wireless technologies to create event management capabilities within business processes. It is our aim to demonstrate that the next wave in the evolution of B2B exchanges in figure 3 above is one that better supports business processes and allows B2B exchange participants to go beyond the execution of trades.

Event Management

We believe that exchanges and collaborative commerce will likely merge into one approach over time, that collaboration requires event management and that event management relies on real-time information. Real-time information would be incomplete and of little value if it only originates from within the four walls of a given company or set of companies. Rather, event management relies on information that can originate at any point in a supply chain and thus on wireless technologies that touch the fringes of each participants supply chain and overlap between participants.

Event management in the context of this paper needs to be clearly differentiated from marketing and promotional activities that are sometimes also referred to as event management. The two concepts have nothing in common but their name. Event Management can be understood as the ability to react to extraordinary circumstance in a structured and predetermined manner. In this regard event management reaches beyond the more common "firefighting" approach that many executives are forced to take today. The ability to react to a circumstance as it arises could be facilitated by the application of wireless technology. The combination of wireless and information technologies allows for immediate communication with employees or assets that were previously inaccessible. Here a second and equally important aspect is that of feedback loops enabled by event management. It is obvious that the application of wireless technologies to enable event management leads to the generation of richer and more granular data. This data can be used to provide many sources of organizational learning and to allow for predictive capabilities when combined with the probabilities that certain events will happen. Through the application of data warehousing and data mining technologies, event data becomes useful and necessary information that results in better business processes and fewer surprises over time.

In its very essence, event management is a software technology that relies on three basic components: rules, notifications and events. As new events are reported to the event management software, they are checked against pre-defined business rules and, should they leave preset boundaries, a notification is sent to users. Imagine your spouse is waiting with dinner for you in the evening. Further, your car is equipped with a GPS (Global Positioning System) receiver and also with a wireless modem that communicates information. The GPS receiver constantly monitors your position on the road and communicates it back to a central computer that your spouse also has access to. If you are using an event management technology, the software is able to predict when you will come home fairly accurately based on your position, current traffic conditions, the distance between you and your house and also

based on how long is has taken you to drive home in the past. As soon as conditions such as traffic or an overly long distance are detected which indicate that you will be late, your spouse would be notified and would also receive a "best-bet" prediction by how much you will be late. Further, you spouse would know about the delay as soon as you do. Before we describe event management in more detail, we need to investigate the dependence of event management on wireless technology because it can obviously not reach beyond four walls without it.

Today, the application of wireless technology has become pervasive and has already enabled a multitude of novel solutions for enterprise management in general and supply chain management in particular. In their very essence, wireless technologies allow the application of information technology in places that were previously inaccessible to them. They also provide data streams virtually instantaneous rather than delayed. For information managers this means that they can extend their own reach beyond the immediate environment of their information networks and even beyond its fringes. For production and material managers the implications are just as far reaching in that they are now able to receive more accurate, granular and timely data streams. This information allows faster and better decision-making, much more agile contingency responses and greatly improved planning and optimization results. For transport and distribution managers the implications of wireless technology lead to enhanced asset utilization, faster reaction to breakdowns, reduced cost and the ability to provide better customer service. For sales managers it leads to the much-enhanced ability to collect, process, store and disseminate information about customers and their individual preferences.

Figure 4 provides an abstract yet also simplified view of how event management works. Event management uses information flows originating outside of the immediate extended value chain. There are input information flows show on the top of figure 4 (α and β) that represent events as they happen in reality and output information flows on the bottom (γ and δ) that represent the communication of decision-making results. A simple example in transportation is the breakdown of a truck. Today, most drivers do not have mobile phones and thus, cannot easily communicate with dispatchers. They need to locate a pay phone in most cases, call a dispatcher and relay all breakdown related information to him. There is substantial latency until events such as "truck broke down" are communicated and also a considerable amount of synchronization involved. For example, once the dispatcher knows that the truck will be delayed, he will have to notify material planners, production planners, production managers, warehouse personnel and possibly customers of the delay. Naturally, all further communication such as getting status updates is equally arduous and cumbersome.

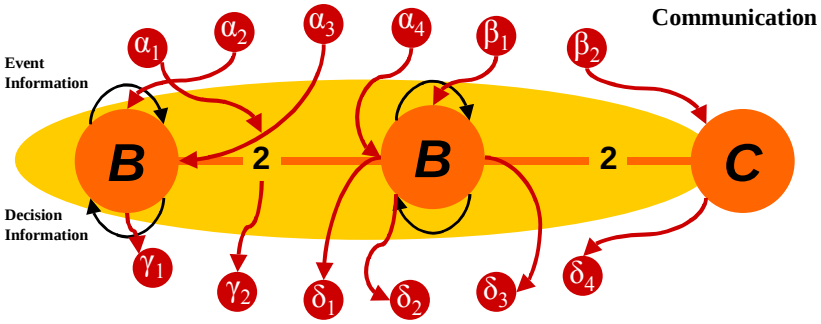

Fig. 4: Event Management Enables Information Processing at the Fringes

Had an event management system been in place, the truck driver would have used a wireless device to communicate his breakdown immediately. His message would have been instantly relayed to the dispatcher, but also to all other people who need to be involved and who may be affected by a delayed shipment of material. Based on communicated information such as the severity and extend of the breakdown, the dispatcher would have had the necessary information on hand to make a decision about what he should do next. He could have spoken to the production manager, who is already informed about the recent developments and would have been able to determine how important the shipment is in terms of keeping the production lines running. Based on this information, the dispatcher could have sent out a new truck, could have sent immediate assistance or could have called for mechanical help instantly. Overall, the decisions would have been based on factual knowledge of the situation and action could have been taken immediately.

In summary, the application of wireless technology enables improved – streamlined and more efficient – operational business processes and enhanced strategic capabilities to better serve customers. Event management can

now be defined as the ability to monitor, simulate, control and measure business processes and to notify its stakeholders of unforeseen occurrences.

The Wireless–enabled Exchange

As described in the previous section, wireless technology enables event management. Event management enables collaboration and, as we will show here, collaboration is an essential part of future exchange capabilities. As outlined above, there are few true exchanges and that the currently predominant e-marketplaces have not yet moved beyond offering simple procurement services. Further we have shown that the ability to execute is a pivotal ingredient of future exchange capabilities. Figure 5 below illustrates a framework to better understand the evolution of exchanges over the next few years:

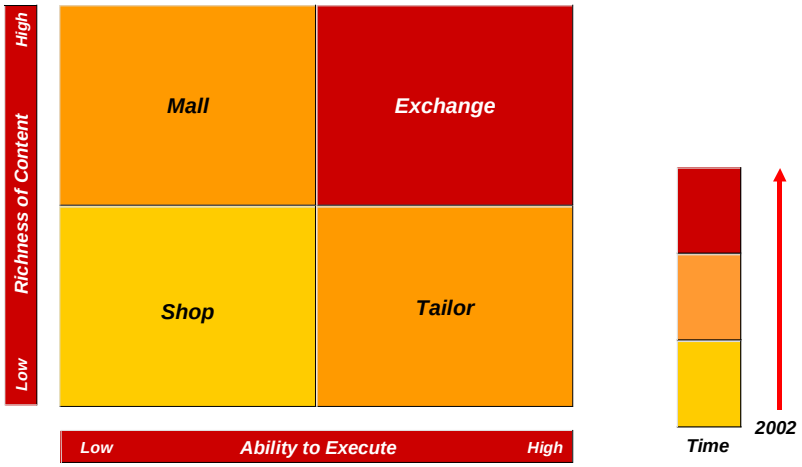

Fig. 5: Framework for the Evolution of E-Marketplaces

The timeline in figure 5 shows where we are today. The vast majority of E-Marketplaces has not evolved beyond a very limited ability to execute and few content features. In this paper, we aim to show that both: the ability to execute and the richness of content are key strategic success factors for private and public exchanges. While there are likely cases where one of the two abilities may suffice, we also aim to show that a combination of both can create substantial competitive advantage and can even lead to market domination.

As the figure 6 on the left shows, three positions are possible for E-Marketplaces and Exchanges in the future. By enhancing the ability to execute, E-Marketplaces (or "Shops") evolve into "Tailors", who provide highly custom-built applications, features and functionality. Tailors are characterized by the ability to execute transactions such as allowing dynamic pricing (e.g. based on spot markets or based on actual demand as it evolves), the ability to perform price negotiations or the execution of post sales services for transactions that were handled by the participants. We have named them tailors to cater to the fact that their applications will have to be customized to meet specific industry, company or department needs. Transactions such as a price negotiation will not occur unless there is a large degree of adoption to both: the negotiating parties and the natural processes as they occur between human beings.

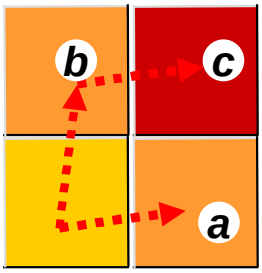

Fig. 6: Evolution

The second possible evolution away from the pure "Shop" model entails increased use of content to add value. As the study by Hansen et. al. (2001) has shown, exchanges that provide readily available information do not possess a competitive differentiation to other forms of information supply such as publicly accessible or private databases, newspapers or other forms of media. Richness of content naturally originates from the breadth or depth of knowledge that an E-Marketplace provides. Whether there is a specialization for one or the other is irrelevant as long as industry and customer-specific needs are fully being met. Some industries such as biomedical equipment, pharmaceutical or aerospace obviously require depth of information while others such as auctions require breadth of information and knowledge.

The third possible evolution could take an E-Marketplace via richness of content from "Shop" to a true "Exchange". This form is characterized by a vast richness of content and also by a high ability to execute. Not coincidentally the high values for both characteristics lead to the insight that future exchanges not only enable, but also truly host business processes. Processes contain information, material and financial flows. Exchanges enable all three; yet directly touch the flow of information and potentially financial resources. Material flows will be handled in separate business processes. Hence we can argue that future exchanges are likely enablers of collaborative commerce applications between different parties. Current collaborative commerce applications are still characterized by a high degree of interdependency between those parties who actually interact. The most common form of information sharing is the flow of information via EDI and lately XML. True exchanges as we have defined them in this paper allow for extended collaborative business processes that may transcend those entities a company has dealt with in the past and may broaden the reach of collaboration to anyone who has the ability to participate.

A striking characteristic of "Exchanges" is that the ability to execute naturally depends on the features and functionality that are offered to customers. If business processes are to be executed, then the exchange has to support not only the ability to communicate and retrieve information but also the ability to act upon information that the exchange provides. As in most business processes, decision-making takes on a pivotal role. Yet, decision-making can only occur when decision makers perceive the provided content as relevant, accurate, reliable and current. Naturally, decisions within business processes are solely based on events and resulting, the accurate and reliable supply of relevant and current events becomes a key requirement for "Exchanges" as they are shown in figure 5.

There are various sources of relevant, accurate, reliable and current information. Yet, without the required richness of content it will be impossible for E-Marketplaces to evolve into "Exchanges". The necessary information to execute business processes can be provided through the exchange directly or through third party providers such as knowledge bases or content managers. An event management system as we have described it in section 3 of this paper is one other source of such information. Especially in regard to the timeliness of information, there are few alternatives to the application of wireless technology to collect, store, process and disseminate process-critical information.

For instance, SolutionCentral, a digital exchange for IT training and events, is developing a wireless application to alert IT professionals of any class changes and exploring ways to notify attendees of schedule, location, and speaker changes. Its business model is based on revenues from 3 sources: collecting transaction fees for signing up members for training classes, selling subscription based InfoCenters, which are content-rich, branded micro-sites to training providers and syndicating its content to highly trafficked sites [Cuny and Richardson 2001]. Another example of a wireless-enabled exchange could easily be established for Covisint, the joint venture between Ford, GM and DaimlerChrysler. When each automotive manufacturer orders parts through the exchange, their purchase order is stored on the database and can also be handed off to a supply chain event management system. The system then sends the order details to the predetermined logistics provider who in turn informs the event manager of when he intends to pick up the ordered parts. The driver picking up the parts carries a wireless device with him and scans parts in at the dock while he picks them up. Once he has completed his task, he wirelessly transmits the information back to the event manager where a multitude of business rules is applied to filter through all information and to determine possible exceptions such as shortages, overages and zero-quantity shipments. This information is then immediately sent to the automotive manufacturer in the form of a report and is also handed over the exchange database for later retrieval. Based on the provided event information the material planner at the automotive plant can now make decisions as to whether he needs to expedite missing parts of the order in a second shipment or whether he has sufficient time to order from the same or a different supplier who participates in Covisint as well.

Tracking the Transforming Future of Exchanges in the Digital Economy

At the dawn of the new millennium, business-to-business (B2B) e-commerce was regarded as the e-business model with the greatest potential for growth and profits. Yet many once-promising B2B exchanges have now gone out of business, downsized, or changed their business model. The B2B models have evolved from extranet to exchange to e-marketplace to meta-markets (market to market). What does the future hold for B2B exchanges? B2B is about connecting the existing buyer and sellers. It is not a disintermediation play. It is about intelligently implementing Internet technology to improve business processes. Wise and Morrison (2000) provide an overview of the new B2B models such as mega-exchange for maximum liquidity and common transaction standards, specialist originator for complex/relatively expensive products, e-speculator for products with high degree of product standardization and moderate to high price volatility, solution provider for products whose cost is a small portion of overall costs and product-related issues impact other costs, and sell-side asset exchange for assets with high fixed cost and a relatively fragmented supplier and customer base.

As the new economy frenetically spawns new business models, multiple online- exchange integration, e-to-e, could create dynamic marketplaces, which will require organizations to overhaul strategy and planning efforts to create more collaborative, externalized, and process- versus event-oriented practices. In the long term, ITEs will evolve, and the technology will enable suppliers to differentiate their models on multiple criteria such as quality, warranty services, and time of delivery. Exchange-based hubs will evolve to include futures and options. The evolution of digital exchanges will next be focused on adding systems and services that actually tackle the main elements related to procurement that occur before and after the actual selling moment occurs – order management, electronic documentation, electronic bill presentment and payment, electronic customer relationship management (eCRM) and logistics. Some form of a hybrid between private and public exchanges will evolve in the post-capitalist, digital/knowledge economy. The new frontier in e-marketplaces is in providing whole solutions to a problem. This includes the online catalog, the e-financing of the purchase and the e-logistics via a technology standard that integrates the various hardware and software platforms.

Independent of how exchanges will evolve in detail, they will likely develop in the direction of broader and better business process support because that is the one place where new value can be created. In addition, it can serve as a clear differentiator between competing B2B exchanges. Tying back to figure 3, which illustrates the evolution of B2B exchanges during their first three waves, figure 7 below considers the new ideas and thoughts presented in this paper to show that the next wave of evolution will allow for more, better and faster support of business processes. We believe that the availability and ubiquity of wireless technologies allows for enhanced collaboration. In addition, event management technologies may well provide the basis for the efficient automation of some communication flows between exchange participants. The fourth pillar and wave in figure 7 below mark the ability to adapt to changing outside conditions based on real-time information. In addition, information origination, processing and dissemination are pushed beyond the four walls and can now occur virtually everywhere.

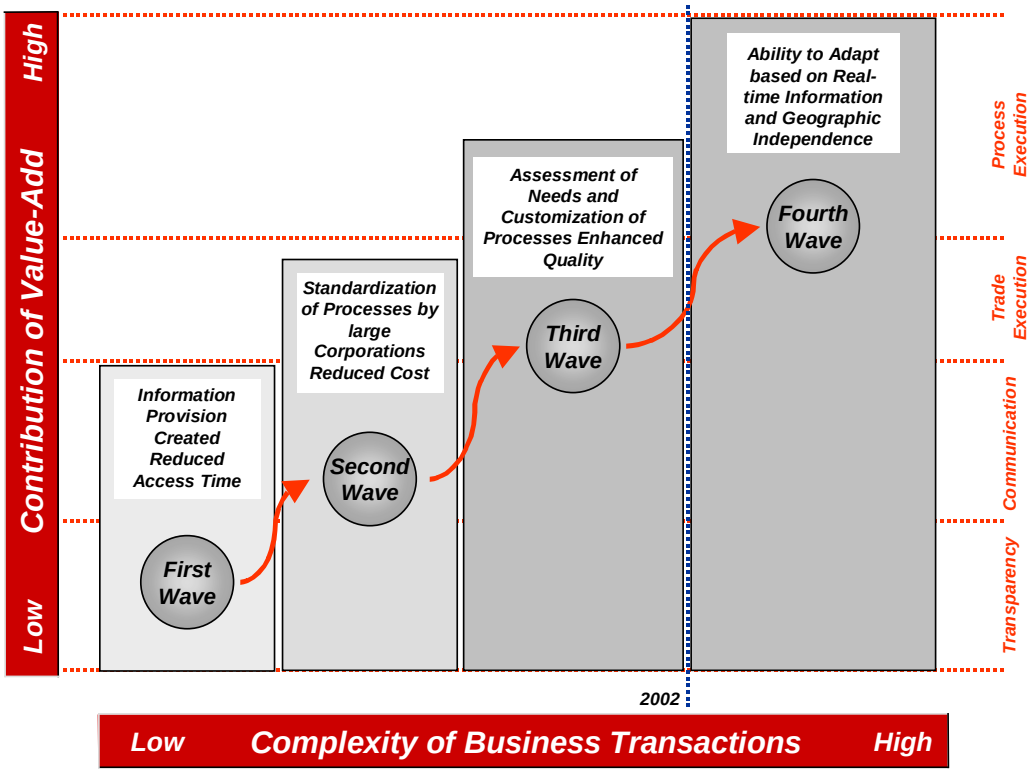

Fig. 7: Evolution of B2B Exchanges beyond their current state

Conclusion

Overall, it has been our aim to show that today's exchanges are just the beginning of what is in the art of the possible. We have presented the following arguments: (a) that exchanges and collaborative commerce will likely merge into one approach over time, (b) that collaboration requires event management and (c) that event management relies on real-time information. This real-time information would be incomplete if it only came from within the four walls of a given company or set of companies. Rather, event management relies on complete information and thus on wireless technologies that touch the fringes of each participants supply chain and overlap between participants. The digital economy now demands that organizations work together to rapidly—and to continually—implement new business strategies in fast-evolving markets. The Darwinian imperative of 'adapt or die" has become 'constantly adapt in different ways or die." In summary, exchanges that evolved from pure information providers to true enablers of collaboration will make strong use of wireless technology. The exchange of the future has little choice but to be a wireless-enabled exchange. Only those able to keep abreast of this new paradigm of constant change and rethink the nature of B2B e-marketplaces from information to execution, can compete—and thrive—in today's fast-changing digital economy.

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