OPRE 6366. SCM : 6. E-Commerce

1 Introduction

A common person's understanding of e-commerce is business applications of internet. Albeit this definition is sufficient for most of our discussion, it does not include the use of e-mails, intranets, etc. If e-commerce was only internet related, it would be called i-commerce rather than e-commerce. Thus we need a broader defintion such as applications of information technology to business. We will limit the scope of information technology to computer related uses. For example, we do not consider a phone call as a use of information technology. This limitation of the scope can be argued to be arbitrary. However it is broad and clear enough for our discussion.

Although our definition of e-commerce has some internet-independent content, internet certainly will be at the core of our discussion. Then we see it fit to briefly examine how internet was born. The idea of Internet was first concieved by the Department of Defense. The idea was to construct a communication network that can operate even when phone lines are destroyed in a war. Internet has a communication protocol called TCP/IP (Transport Control Protocol/Internet Protocol). This protocol works exactly like the US post office: It gets packets from sources looks at the addresses on those packets and routes these packets to their destination. Only differences are that these packets are packets of data of various lengths, and the protocol may split your packet into smaller packets and unite them back into the original just before delivery to the destination. In 1980's National Science Foundation was in charge of the development of internet and e-mails, file-transfers and remote-logins were possible among the connected nodes — mostly universities. Internet has become more common after 1990 when public access was allowed. Then the development of HyperText Transfer Protocol (HTTP) and HyperText Mark-up Language (HTML) took place. Next browsers (mosaic, netscape) were written to process HTML files. After a short while businesses realized that internet is a very strong communication tool. Since then internet has revolutionarized the business processes to the extent that people are talking about an informational revolution taking place and comparing it to the industrial revolution of the last century. Internet has achieved this by making information cheap to obtain and distribute. A commercial internet connection costs are $3000 for server hardware and software, $650 per month for shared T1 connection. The price for a personal connection is about $20 per month for dial-up connection. Moreover, prices are falling. It is true that many aspects of our lives have changed with internet let alone business practices. However, we aim only to look at internet based business practices, strategies and challenges.

2 Information Technology: $\Re\epsilon\alpha\delta$ Chapter 13 of Chopra

3 Commercial Applications of Information Technology

3.1 Internal information flow

Intranets make information publishing and distributing inside companies easier, faster and cheaper. Using an intranet, Morgan Stanley estimates that it saves about $500,000 for each information publishing process.

3.2 Business to business interaction

Company web pages provide rich and accurate information on customer preferences from which customer profiles are built. They also free up sales work force.

Cisco accepts about 80% of orders online, saving D250 M per year. At Cisco's site (cisco.com) customers can find detailed product and technical information. Customers can view a product, watch a video of the product manual. While ordering products they can check the compatibility with other products. For example when buying a LAN switch and a power cord, a list of compatible cord's depending on geographical location is listed. Besides all these services, customers enter their own orders. This practice minimizes errors related to rekeying an order by sales people.

At General Electric plastics web site (geplastics.com), customers can learn about new technical developments in plastics, in addition to placing an order. This information helps customers to innovate new products. Customers are also encouraged to report discoveries using GE products (called the Tech Tip of the Week). GE shares these ideas with other customers to promote its sales.

3.3 Effective use of resources

With the current IT capabilities, companies can access abundant information cheaply. Availability of that information makes simpler supply chains a reality. A striking example is Amazon (amazon.com), one of the first virtual companies. Amazon has an inventory of several million books (more than 10 times a very large bookstore). Since Amzaon eliminated retailers and storage at the downstream of its supply chain, it minimizes the finished goods inventory costs, transportation costs and spoilage costs. Accumulation of all the demand at a single warehouse (risk pooling) reduces the variability of total demand, which pulls stock levels further down. All these savings are passed to customers, hence providing a clear proce advantage.

Amazon can also create customer profiles and can announce new books or special offers to specific customers depending on such customers' interests. This is a cheap but very effective marketing approach. Amazon lets customers rate products and write reviews about them. In a way, customers create value for each other without Amazon's input. Eventually Amazon benefits from this customer created value. Such practices are examples to the fact that e-commerce not only simplifies and expedites previous supply chain operations but also makes entirely new strategies implementable.

4 Business Transactions

All business transactions require several steps, each of which are affected by e-commerce. These categories are listed below.

4.1 Search

From buyer's end this is searchnig for a product. Internet facilitates the search procedure for buyers. Without internet a customer must make several phone calls to inquire about products and/or visit shops to see the products. Internet provides a fast and even a logical (attribute based) search capability. Ease of search increases customer awareness of available products and is likely to decrease the effectiveness of traditional (non-web based) marketing techniques. This is because the information dissemination aspect of marketing is not as necessary as before; customers can find out about products themselves without being told about them.

Another practice made extremely popular by internet is auctions. Customers can list the specifics of a product and ask several vendors to bid through an auction mechanism. Auctions remove almost all the frictions in a trade and makes it possible for a trade to be entirely based on price, quality and product specications. In a sense then auctions lead to lower brand loyality, at least nowadays it is easier to switch from one brand to another. However there still are factors such as trust and influence that keeps some level

of brand loyality.

Auctions are used in various processes ranging from people buying-selling used text books, to states buying electricity from utility companies, and to GM buying steel from foundries. One of the hottest subjects in e-commerce now is expanding capabilities of auction protocols and making those protocols fairer. Especially for auctions of commodoties that are not easily quantifiable, finding protocols is hard. For example think about protocols for electricity auctions vs. used car auctions; used cars have many attributes some are not even quantifiable (such as the feel of the wheel, smoothness of the drive, etc.).

We must note that internet auctions and exchanges are pretty new concepts. The current business model is not necessarily the ideal one. It can be argued (see [1]) that current models have the following flaws:

1. Focus on Price Only: Many exchange models focus on the price of the product and overlook at the other characteristics (quality, service, etc.) of the product. For many buyers quality and service are as important as price. Moreover, buyers have the flexibility to trade off price against quality or service. Since a large number of current exchange models are based on bidding on a single (price) dimension, they cannot accomodate trading off product characteristics. Overfocusing on price also puts long term supplier relationships into a danger. Especially JIT philosophy preaches reducing uncertainties in the SC by establishing long term relationships with suppliers. Clearly, auctions and exchanges work gainst long term relationships.

2. Only Buyers Benefit: Exchange models bring together many suppliers and force them into a fierce price competition. Although this may eradicate arbitrage opportunities and provides a transition towards competitive markets, suppliers may sufer. Especially the suppliers which provide good quality and good service products can have reducing sales. Exchange models need to be modified so that exchange induced savings can be shared with suppliers.

3. Too Many Exchanges: Building exchanges and putting them up on the market rapidly is very popular nowadays; it is hard to keep track of what exchanges are available. The value generated by exchanges grows with the number of users. Echanges have positive congestion externality. However, since there are (will soon be) too many exchanges, each exchange will end up with a few users. It is not hard to expect a Darwinian evolution for exchanges; the ones with a few users will have fewer users in time and will retire from the business world.

[1] argues that exchange models will evolve in order to overcome these flaws. Four directions are outlined for such an evolution:

1. Bid Evaluation: The problem with multi-dimensional bidding is actually in the evaluation of such bids. Price is the easiest product characteristic to evaluate. However, quality, feel and service are harder. Standardization of these characteristics will be the first step in evaluating these bids. However, that is not sufficient. Also, easy to understand and transparent methods are required for evaluation.

2. Exchanges as Speculators: Transaction costs at the exchanges are low and are going down towards zero. Then how should we expect the people running the exchanges make some profit? Exchange owners may become speculators using their information about the market to make profits.

3. Solution Provider Exchanges: In the competitive environment of exchange business, some exchanges may want to provide additional information or service to increase the number of users (positive congestion externality of exchanges). They can inform customers about new technical developments in their specific industry, provide simple software (free of charge), tell about new business opportunities, make suggestions to troubleshoot operational problems, etc.

4. Suplier Asset Swaps: As we mentioned before, exchanges are forcing suppliers to a fierce competition and are cutting into their profit margins. Exchanges can also help suppliers if they create an

environment for suppliers to temporarily swap assets to increase efficiency. Assets such as manufacturing capacities, containers, trucks or truck capacities can be swaped. Actually this is a version of outsourcing where outsorcing is very temporal and in small quantities.

4.2 Pricing

After finding a desirable product, the customer must decide on how much to pay. This is the pricing process. In most traditional transactions prices are fixed, but that is not the case in auctions. Auctions let the buyer or the seller find the best deal. For example, Andersen Consulting's BargainFinder was so succeful in locating the minimum price CD's over the internet that now some music stores does not allow its access to store databases. There are various auction protocols, two of them are English and Dutch auctions. In English auction, the price starts low and the highest bidding customer wins. In Dutch auction, price starts high and drops until one of the customers are willing to pay that price. Post season discounts at retailers constitute an example of Dutch auction.

Broadly thinking, one can consider dynamic pricing policies of service companies as an example of pricing with e-commerce. For example, airlines increase a ticket's price until 1-2 days before the flight or until the ticket is sold. This is not an English auction for price is increased by the seller not by the buyer. However, airline companies know that people buying tickets just before the flight are business travelers and will pay more. When flights are undersold, airlines provide disounts. Such dynamic pricing policies become implementable with cheap and fast information exchange for which internet is to be acknowledged.

4.3 Shipments

Once the customer finds a product and agrees with the seller on the price. The product must be delivered to the customer. E-commerce increases the coordination among the parties involved in delivery operation. For example, GlobeRanger (www.globeranger.com) uses wireless technology to locate products in the supply chain. By tracking the products in real time, problems in the supply chain becomes visible instantly and diagnosis becomes easier. Up-to-date and accurate knowledge of supply chain becomes inputs to for planning models, hence avoiding making wrong decisions with the wrong inputs — the garbage in, garbage out concept.

Internet can be used to directly deliver a product: Currently, it is possible to download software, music, newspapers, films and airline tickets.

4.4 Payment and settlement

The next step in business transaction is making the payment. Electronic payment is vital for e-commerce success. The most important aspect of payment is security. During a transaction, buyers and sellers are exchanging confidential information, such as account numbers and credit card numbers. Although such exchanges are secured by data encryption, the risk of exposure of confidential data cannot be entirely eliminated. However some exposures are possible even with traditional payment methods. Considering the speed and the low transaction cost of electronic payment along with the speed demanded by the current economy, it appears that electronic payment will become more common. There are companies specialized in making electronic payment secure and low cost, see www.cybercash.com. Minimization of the risks pertaining to electronic payments is still an unresolved issue.

4.5 Authentication and security

Perhaps a bigger problem than the risk of confidential data exposure during the transactions is authenticity of buyers and sellers. Internet buying is different than traditional buying, in the sense the interaction of the

buyer and the seller is very limited. Thus, somebody can easily make up a web site and claim to be selling a product. The buyer cannot directly tell if this seller is real or fake. In addition, the quality of products traded and the conformity of trading parties to agrements are also challenging issues. One solution is establishing trusted third parties (certificate authorities) to issue public keys (encrypted codes) to individuals and firms and verify their authenticity during transactions.

Here are some points buyers should pay attention for a secure e-commerce transaction:

1. If your browser indicates that a web site cannot be authenticated, you probably should not involve in a transaction with that site.
2. Check to ses if the seller really exist: check for seller's postal address, toll-free numbers, e-mail addresses.
3. If in doubt about a site, consult with company evaluation sites such as bbb.org, bizrate.com and truste.org.
4. Spend time to clearly understand the conditions of the transaction. People tend to ignore the issue of the ownership of the information exchanged during transaction. Such information is valuable because it can be used very effectively for customer profiling. Decide if you would mind your personal/company information ending up in the hands of third parties?
5. Record your transactions. Save/print transaction numbers, confirmation numbers, details about the product/service you purchased, etc.

4.6 Trade context processes

Standardization: Buyers must be able to evaluate a product/service before buying it. This is a big but surpasable challenge for e-commerce. E-commerce sellers have only sound and picture capabilities to introduce their products/services. Although both sound and picture transmission capabilities are improving rapidly, in many cases they are not sufficent to define features of a product/service. To overcome these industry specific standards and measures (were) are developed: hardness for gemstones, teturn on investment for financial products, delivery time for pizza hut, gpa for students. These measures provide accurate ways for evaluation, e-commerce customers are more likely to rely on these measures while purchasing. Thus, expecting more and finer standards/measures in the future cannot be an overspeculation.

Legality: This is very interseting aspect of e-commerce where technology is leading the law (as ususal). At minimum a legal definition of an e-commerce contract is needed. Such a definition should include when the contract becomes binding; Is it when the customer presses the accept button or when the seller recieves that information. These two times may be couple seconds different because of data transmission speed on the internet. A more fundamental problem is what sets of laws apply to a transaction if the transaction is across states or across countries. A pragmatic solution is to specify the locality (such as California state) whose laws and courts will have jurisdiction over the transactions. A more fundemental solution is having an internationally recognized organization (say world trade organization) step in and devise cyber laws and perhaps cyber courts. Last year a positive step was taken by the US House which made electronic signatures legally binding, but there is much more to be done that requires commmitments from industries and the government.

Reputuation: A good reputuation is hard to build and easy to shatter. Companies with good reputuation wants to keep it that way by fullfilling their commitments. This permeates a trust based relationship among tradding partners. Internet by facilitating the flow of information can help customers to evaluate sellers. If customers are not satisfied, they can easily voice their opinion through dedicated web pages and e-mail lists.

Now companies must be more careful about their reputuation because covering up blunders is becoming harder everyday.

5 E-Commerce Strategies

Excessive information about products/services is eleminating some of the competitive advantages used by the traditional economy. Consider information asymmetry: It used to be that everybody went to real estate companies to buy/rent houses because gathering information about all the houses is very time consuming. Actually real estate companies were profiting from having such information. This is no more the case, individuals can easily search for such information over the internet even from another city. For example, the author found his last apartment in Dallas with a 45 minute internet search in New York.

Another strategy is taking advantage of proximity. Many retailers attracted customers by locating next to them. Consider supermarkets, such as Albertsons or Kroeger, nobody wants to spend hours on grocery shopping so they tend to go to a close by supermarket. This is the case although it is known that there may be better deals around. In this case supermarkets are competing by providing convenience. However, e-commerce can bring better deals along with convenience, such is the case of Amazon. Repeating Amazon strategy for groceries is not quite straightforward because groceries are not as standardized as books or CD's. However, there are online grocery companies operating with Amazon model. In summary, e-commerce is eleminating some competitive advantages used in traditional economies so it is necessary for companies who rely on such advantages to realign themselves towards new strategies through which they can add value to their products/services.

5.1 Value adding with scale

Doubtlessly e-commerce is forcing more globalization for economy, local markets are reduced down to one cyber market. This increase in the scale of the market provides unique opportunities for companies to increase the scale of their operation and to provide price discounts. Since discounts are more visible (thanks to price search software agents) and price is arguably the best standardized aspect, customers are likely to put more weight on the price while contemplating a purchase. However, not all companies together can apply this scale strategy because markets united but did not grow. Then we should expect some companies applying scale strategy with success and driving other companies out of business. Because of this reason, we will perhaps see fewer companies in each sector.

Another reason for fewer companies is mergers. Mergers are also based on the principle of exploiting scale advantage. It is generally the case that a merger can provide, through synergies of cooperation, efficiency in costs, werkforce requirements, etc. In traditional economies achieveing such synergies were difficult, because we did not have the infrastructure to run big companies efficiently. However, developments in information technologies and fileds like supply chains are providing us with such infrastructure. Hence, running big companies is becoming somewhat easier.

5.2 Value adding with coordination

The main theme of supply chains is building synnergies via coordination. A strategy is integrating supply chain with marketing function. For example, when supply chain inventories become excessive (for whatever reason) special promotions (discounts, coupons) can be used to clear out the inventory. Another example is coordinating sales function with inventory management; Sales people keep track of inventory levels that can be shipped to customer within due date and call this availabale to promise (atp). This avoids sales people committing to deliver large lots with very close due dates. The principle is that if you cannot deliver on time, do not promise it. A very popular strategy in supply chain management is information sharing;

Passing downstream information to upstream quickly so that upstream facilities can adjust for downstraem demands before they are materialized. This helps upstream facilities to provide better dervice (delivery performance) and downstream facilities get what they ask for quickly. It is a win-win situation. A similar concept is retailer managed inventories at distribution centers. Such practices require trust between involved parties and may not be applicable always due to confidebtiality reasons. Above we mentioned several other examples of coordination: GE asking customers for suggestion fortheir products' innovative uses, Amazon asking customers to write book reviews.

Internet opens up new doors in terms of coordinating means of business, especially by providing flexibility in structuring work groups and lower restructuring costs. Consider a traditional company that organizes from top down with its directors, managers and workers. When there is a task to be done, it must be allocated to a group of people; Managers will arrange for cross departmental budgets, deliverables, milestones, status meetings, reviews, approvals, deadlines, deadline extensions. This is hard, especially when the task requires expertise of several departments, or an outsider agency. Managers spend countless hours of meeting time to position their work force by bringing in outsiders and people from different departments together. However, internet can facilitate such an undertaking. It is a means of easy communication among group members and lets people work at different locations synchronously. It provides a lot of flexibility in bringing in people temporarily into work groups. For example, United Technologies Research Labratories organize work groups by tasks. For United Technologies it is very important that researchers can be assigned to different groups frequently and with ease. Actually many reasearchers handle several projects at once. Another example is the development of Linux operating system which started as a 21 year-old University of Helsinki computer science student Linus Torvalds's hoby. Since he made the source code publicly available on the internet, many people accross continents sitting at their homes have examined the code, cleared out the bugs, added extra functioanlity, etc. Such an international, dedicated, expert work group can only be constructed using the internet. Although the development of Linux was a hoby and people did not pursue any monetary gain, this flexible work group has important lessons for the business. Because of complicated nature of business tasks and scarce availability of skills to handle these tasks, internet looks to be a good solution to utilize scarce skills most efficiently. Internet can start up a new concept: temporary companies built for specific tasks. Actually this shift has occured in the film industry before internet. In the 50's big Hollywood studios were like today's companies; They were providing all the means, screenwriters, actors, cameramen, director, for the production. That has changed, now temporary production companies are established for each movie and they are dissolved once that movie is finished. With internet, we might expect to see a similar trend in other industries.

5.3 Brand management

There are many web pages added to internet every day, besides there is traditional media such as newspapers and tv, these are all competing to attract fragmented customer attention depending on age, income, ethnicity, education level, gender, etc. A succesful marketing strategy must first group customers according to their interests and then market to each group with a special and customized marketing strategy. Amazon does that by linking books of the same subject together. Then those books come out under the heading "people who bought this book also bought the following". For example, if you want to buy Leviathan (by Hobbes), Amazon remembers that somebody bought both Leviathan and Social Contract (by Rousseau) and promotes Social Contract as well. Internet makes such a creative marketing strategy possible.

On the other hand, fast flow of information can be troublesome for companies. As we pointed out above, covering blunders are more difficult. For example, it was users who first found out the flaw in pentium chips. Although Intel first wanted to downplay this, customer pressure (many informed via internet) was big and Intel had to replace those chips. As a result, internet can be a useful tool to promote products to customers, but also at the same time it can be a strong tool for customers to pressure companies.

5.4 Push-Pull Supply Chains

In the early days of industrial revolution, pushing products downstream in supply chains with no regard to demand was the norm. In contrary, in the early days of the information revolution, pulling products from upstream supply chains only after demand is observed was popular. For example, the online grocery store Peapod.com (of Skokie, Illinois) started with an entirely pull supply chain. The idea was to operate with no inventories and no storage facilities. Recently, it has been observed that the cost of pure pull strategy outweighs its benefits. Unfortunately, this observation happened at the expense of the demise of several online grocery stores and many more .com businesses. At the same time, venture capitalist — not customers — paid for the cost of pull strtegies.

Nowadays, companies are turning to push-pull strategies as a synthesis of pure push and pure pull. The portion of supply chains where downstream demands can be forecasted with relative accuracy are being managed with a push strategy. The rest is operated with a pull strategy. A good example is the demand for components vs. the demand for finished products. Component demands, benefit from variance reduction by aggregation, have lower variability and are easier to forecast. Then, push strategy is used for component manufacturing and storage. Since the demand for finished products is hard to forecast, pull strategy is used in the supply chains starting from component inventories: components are withdrawn from component inventories only after seeing the demand, then components are assembled and delivered to customer. This is exactly Dell's business model.

Many companies sell multiple products, some with steady demand and some with jumpy demand. It is easy (hard) to forecast the demand for the former (latter). Then steady demand products are manufactured and delivered with a push supply chain whereas a pull-like supply chain is more appropriate fore jumpy demand products. An example of this idea is Amazon's current supply chain where best sellers are pushed all the way until the customer while eclectic books are kept at the central warehouse. That is why, book delivery times are different from one book to another, they generally exibit an inverse relationship with popularity.

6 E-Business: $\Re\epsilon\alpha\delta$ Chapter 14 of Chopra

7 Conclusion

Concluding briefly, we have outlined many aspects of business transactiions that are affected by internet and developments in information technologies. We have also laid out several challenges and provided some ideas to overcome those challenges. Although those ideas are of speculative nature, the fact remains that business is evolving rapidly with internet and so should the companies. After all it is always the fittest that survives. Lastly, we summarized SCM strategies that are gaining importance with wide use of information technologies and the internet.

8 Exercises

1. With this exercise, we will find out cheapest airline tickets out of DFW. There are several web sites that allows you to search for tickets but you need to specify the departing airport, the arrival airport, date and approximate time of the desired flight. Given this information two web sites qixo.com and farechase.com currently search 20 different sites at once and report the price information. Among the sites searched are CheapTickets.com, AmericaWest.com, OneTravel.com, ual.com (United Airlines), LowestFare.com, HotWire.com, TravelDiscounts.com, Travelocity.com, TravelNow.com, AirfarePlanet.com, Uniglobe.com, TravelScape.com, Expedia.com, TravelSelect.com, MrCheaps.com, nwa.com (Northwest Airlines), Yahoo.com, ata.com (American Trans Air), Orbitz.com, Continental.com (Continental Airlines).
   a) Find the cheapest flight from Dallas-Ft.Worth Airport to New York City's La Guardia or J.F.Kennedy

Airports such that it departs from Dallas after 5 pm on June 1 and arrives in Dallas on June 4 by 11 am.
b) Can you find a cheaper ticket if it were possible to depart on May 31 after 5 pm? Why would you expect to find a cheaper ticket?
c) Suppose that you searched for a ticket entire night (until 12 am) but could not find one. Then came your roommate and she run the same querry on the same web sites and found a ticket. Can you logically explain how could this happen?
d) Would you buy the cheapest ticket right away. If not, what other criteria would you consider in buying a ticket?

2. Go and visit some of the *.com ticket providers listed above to get some idea about their services.
a) Can these web sites replace (human) travel agents? How can travel agents stay competitive, can you think of any areas that they can add more value?
b) In your opinion, will 20 *.com's listed above survive all together in the market or will some *.com's go bankrupt? Can you relate your discussion to the concept of creating value by increasing the scale efficiently?

References

[1] R. Wise and D. Morrison (2000). Beyond the Exchange: The Future of B2B. Harvard Business Review, Nov-Dec: 86-96.