ON-LINE PHARMACIES: E-STRATEGY AND SUPPLY CHAIN FOR PHARMACEUTICAL PRODUCTS

Sathi Mahesh
University of New Orleans, 2000 Lakeshore Drive, New Orleans, LA 70148
smahesh@uno.edu, 504-280-6964

Brett J. L. Landry
University of Dallas, 1845 Northgate Drive, Irving, TX 75062
blany@gsm.udallas.edu, 972-721-4067

ABSTRACT

The role of pharmacies in the product and information supply chain for pharmaceutical products is examined and the impact of e-Business practices and new technologies in altering these supply chains is studied in this paper. In e-business strategy, many online retailers have focused on streamlining the logistical process of delivering the physical goods to the customer and aimed to achieve competitive advantage over brick and mortar retailers. This paper argues that the impact of online pharmacies will be greater on the information supply chain than on the physical supply chain for pharmaceutical products and that an effective strategy for online pharmacies will focus on the provision of information to the customer and building net enabled models that offer competitive advantage.

Introduction

The online pharmacy business took off in the dot com boom and many of the high flyers vanished or were absorbed in the crash that followed. Soma.com, drugstore.com, and PlanetRx Inc started at the height of the dot com boom. At that time the market for prescription drugs was $102 billion with an added $104 billion in non-prescription medications, vitamins, health, beauty and other products sold at brick and mortar drugstores (Kalin, 1999). This attracted venture capitalists to fund these businesses which were too early in the game and soon failed to deliver sufficient business to support their operations. While soma.com was purchased by pharmacy giant CVS (Tedeschi, 1999), PlanetRX dropped out of the health and beauty products sector (in favor of drugstore.com) attempted to focus on specialty pharmacy business (Reuters, February 13, 2001) and shut down operations in August 2001. Drugstore.com teamed up with Amazon, later with RiteAid and vitamin retailer GNC. This illustrates the need for online pharmacies to be backed up by either a brick and mortar establishment or to be linked to the pharmacy benefit-management industry as pointed out by Schoenberger (2000).

The business benefits of eCommerce are due to a reduction in operations costs based on improved back-end efficiency, improved inventory management and a reduction in the cost of operations, market expansion through the reduction of geographic barriers, and improved customer service. Zhuang and Lederer (2003) studied the organizational benefits of web based retail outlets and presented a 27 item instrument that measured these five factors. Customers doing business with on-line pharmacies seek cost savings and a large inventory, a suitable customer service system, and excellent online information (Yang, 2001). One approach to cost
savings has focused on arbitraging lower cost pharmaceutical products from Canada in the U.S. This is obviously not a sustainable business model because the Canadian market is one-tenth of the U.S. market. The ability of eCommerce operations to have virtual inventory (Watson, 2001), since they do not need to have local storage at retail sites has been promoted a major source of operating efficiency and cost savings.

One of the arguments in favor of eCommerce is that asymmetry in customer knowledge will be reduced (Bakos, 2001) and global markets will be created. The pharmacy market provides an easily transportable product allowing business to benefit from net based global markets. Canada’s state managed medical system extracts price discounts from pharmaceutical manufacturers which has been exploited by online pharmacies. Quon (2005) compares the prices of 44 commonly purchased brand-name medications at 12 Canadian and 3 major U.S. online pharmacies and shows that customers would save approximately 24% on average. Forty-one of the 44 brand-name medications examined were less expensive in Canada. There is unlikely to be a successful arbitrage model in the long run since price differences between the much smaller Canadian market and the larger U.S. market cannot be sustained with extensive arbitrage.

The influx of new technology can lead to productivity increases and a reduction in price of the product or service. A study by Crawford (2003) discusses the rapid growth and change in this industry and argues the need for access, quality, and cost savings. An economic analysis of the healthcare industry between 1976-1994 classifies investment and expenditure in IT and non-IT capital and labor to show that information technology contributes positively to the healthcare industry (Menon, 2000). The study points out that the slow adoption of IT at hospitals actually benefited them since they had access to more reliable and cheaper new technology.

**Information Supply Chain**

In addition to the impact on the product supply chain, there is the even greater impact on the delivery of information regarding pharmaceutical products. The flow of information between physicians and pharmacists, between drug manufacturers and patients, and between pharmacists and patients will be impacted by eCommerce operations. A Japanese system to share clinical records between physicians’ offices and pharmacies with secure signature recognition and privacy is described by (Negishi, 2003). The study showed that pharmacists spent a substantial amount of time in counseling patients regarding the regimens and significantly eased patient anxiety in over 80% of patients. A work sampling study (Murray, 1988) showed that the introduction of computer support in the prescription writing process significantly changed the type of work done by hospital based pharmacists. While the total output did not change much, pharmacists spent 34% less time filling prescriptions and 45.8% more time in problem solving activities. This shift in work patterns as a result of eCommerce, with a greater emphasis on problem solving over routine processes has been discussed in other research (Landry, Mahesh & Hartman, 2005).

The Internet has become a major source of information for all products and services. A Forrester Research study showed that 46% of adults in the US have used the Internet to research medical conditions and 36 percent of all adults have researched specific medications online. A study to determine the educational needs of community pharmacists in Australia looked at the importance of one topic, cancer care drugs, and showed that a majority of pharmacists (71.3%) reported that
they deliver palliative cancer care services (Hussainy, 2005). Whether a pharmacy is online or in a brick and mortar environment, it is necessary that the business provide suitable drug related information to patients. In an online environment, this can be provided by FAQ pages, intelligent systems that provide answers to queries, and on-line chats with support staff.

How well do online pharmacies provide information to patients? A study to assess response rates and response quality of 64 online pharmacies showed a 51% response rate for specific information requests (Holmes, 2005). This study illustrates a problem with eCommerce sites that announce a program like “ask the pharmacist”. The existence of the link on a site will prompt questions and they must be answered in a professional manner. Unlike in a real world setting where there is a line to see the pharmacist, and the customer needs to invest time to ask the query, the electronic query is made with less effort and will therefore be more frequent. This means that on-line pharmacies need to develop appropriate e-Strategies to handle these queries at a suitable quality of service before posting the link on their sites.

**Online Pharmacy Business Models**

Peterson (2001) surveyed selected pharmacies with a presence on the Internet classified them into clicks and bricks chain pharmacy online extensions, pure click online pharmacies, mail order pharmacies with online sites, and online extensions to independent pharmacies. The study was limited to US based pharmacies and found that there was a wide variability of security levels, privacy management, and interface design. Since that study in 2001, there have been many new developments in the technology and industry competition. Verification of prescription integrity was performed in 2001 using mail or fax transmission of prescriptions, while many online pharmacies had to develop their own drug information web sites. An online pharmacy in the current marketspace needs to develop a partnering strategy that allows it to benefit from a network of strategic partners. Another recent study uses econometric evidence to show that there are two clear classes of online pharmacies. There are rogue websites that typically sell a few medications without valid prescriptions and online pharmacies offering a complete range of drugs, requiring valid prescriptions and providing reliable and abundant information to patients (Arrunada, 2004). The study argues that a certification program for online pharmacies will enhance these professionally operated businesses while the openness of the Internet will make it difficult to shut down the rogue sites. There are many rogue pharmacies, requiring neither prescriptions nor true physician oversight to provide drugs with minimal oversight (Lineberry, 2004). This has provided prescription drug abusers with an alternative to physician shopping, the “old economy” approach to obtain multiple prescriptions for controlled medications.

The rogue sites, like viruses tend to evolve rapidly, moving from an importation approach to arbitrage prices, to the use of cyber doctors to write prescriptions for addictive medications, and the sale of unapproved drugs. Another study classifies online pharmacies into three major categories based on eStrategy. These are pure net sites with no physical retail presence, brick and mortar sites typically made up by teaming an online site with a chain pharmacy, and partnership sites that have come up to allow small, individual operations to provide net based service and enhance their operations (Fung, 2004). On the international front, a study of online drug markets in Europe (Maakinen 2005), shows that there are few online pharmacies in Europe.
It points out that new rulings from the European Court of Justice concerning cross-border practice of pharmacies will set the direction for the future.

This paper studies e-Business strategies for on-line pharmacies that provide customers with medication, for short term (one prescription) and long term (continuing prescriptions over a period of time) therapy. The latter are repeat purchases on a monthly basis that match the commonly used monthly billing cycle for insurance. The online pharmacy is a part of the therapeutic supply chain and organizations should seek to cooperate with related providers such as physicians, insurance companies, pharmaceutical companies and other health care providers. The concept of an extended enterprise, where collaborative relationships exist among supply chain members is most suited to the online pharmacy (Davis and Spekman, 2004). In fact, information technology should be used to more effectively and efficiently integrate different business enterprises.

It should be noted that other modes of delivery for medication could become a “disruptive innovation” (Kenagy & Christenson, 2002), changing the environment in a significant manner. An example of this is the transdermal patch that eliminates the need for multiple pills that are bottled and labeled in the conventional pharmacy. Some medications require a closer control over storage and the delivery process, for example they may require refrigeration which cannot be provided in the online supply chain. In such cases, the pharmacy is positioned at a different location in the supply chain, and on-line approaches may not be appropriate. A complete new innovation that could prove disruptive to all the above strategies is the rapid development of customized therapy based on genetics to create new, individualized medicine. Rather that producing common medication that is provided in standardized dosages to large numbers of patients, this approach will customize treatment for individuals. The current supply chain for products with wholesale and retail inventory will fail in this new market, and a direct link from the manufacturer to the patient will be the preferred supply chain. Online pharmacies in this scenario can offer their services to manufacturers as providers of information, and aggregators of demand, and play a role similar to that of Travelocity / Expedia in air ticket sales or Ticketmaster in concert ticket sales.

Distribution Network Supply Chain Improvements

The traditional supply chain is manufacturer ➔ wholesaler ➔ retailer ➔ customer, typical of most products. In the case of large pharmacy chains the wholesale operation is managed by the chain rather than an independent wholesaler. Let us study the value chain contributions in this supply chain. The manufacturer produces the drug from its component raw materials, packages it in bulk and adds the primary value to the product. The next step in the value chain is the effective distribution of the product, bringing it from the manufacturer to the retail outlet that is in geographic proximity to the end user. A large pharmacy chain adds value by making this process efficient, using inventory signaling from retail outlets to optimize stock levels throughout this chain. At the retail outlet, the pharmacist adds value by matching the prescription to the correct product, seeking out generic alternatives that will reduce costs, and repackaging the bulk product into smaller, matched dosages for the patient. In addition, the pharmacist adds significant value to this supply chain by providing detailed and customized usage information, checking for inter drug interactions, allergies, and contra-indications.
An online drugstore in the mainstream market needs to grow large enough to gain the benefits of large chains to obtain the economic advantages of direct purchases from manufacturers and inventory optimization. It is possible for an online business to gain this market power by specializing and focusing on a market segment, say diabetes related medication. While the cost of last mile delivery will erode much of these gains, there are advantages gained from the customer service perspective, since customers need not make the last mile trip to the local pharmacy, and can obtain the prescription at their residence. The low bulk of pharmaceutical products makes them more suitable for last mile delivery by mail and package delivery services.

**Disintermediation**: In the online marketplace, the supply chain can be radically changed by a direct manufacturer-consumer link, in a manner similar to that used Dell Computers to sell computer hardware directly to the end consumer, disintermediating the wholesaler and retailer. Manufacturers in other markets who have tried disintermediation have returned to their traditional channels due to fears of alienating their retail partners (King, 1999). While the continuous growth of online markets and increasing confidence of users in buying products on the web could alleviate this fear, it is still too early in the process to completely rupture ties with the retail stores, especially in a product where trust is essential for consumer confidence. In addition, trust is an essential ingredient in streamlining the supply chain.

Note that benefits from improved velocity in the supply chain such as reduced inventories are possible only when the participants in the supply chain are cooperative partners. Lin, Sung, and Lo (2005) ran a simulation to show that improved supply chain performance required a high level of trust. New entrants to the online pharmacy market do not have a long standing relationship with established drug manufacturers and this prevented them from having the high trust relationship that is necessary for supply chain efficiencies through improved velocity. The click and mortar strategy for online pharmacies, is supported by the high level of trust between established drug store chains that form the “brick” component of these merged enterprises.

**Channel Reconfiguration**: In addition, the large pharmacy chains have utilized advanced staffing and job design models that have increased the efficiency of their pharmacists and minimized wasted resources. On-line pharmacies which typically gain operations efficiency cannot improve much on the already efficient operations of large chains. They can be far more efficient than small, independent operations where inventory and staff management is less efficient. An additional player in the pharmaceutical supply chain is the HMO/PPO or other health insurance provider. Since a significant part of the cost of the prescription is paid by the insurance provider, and the provider has the economic clout to negotiate group discounts from manufacturers and pharmacy chains, the selection of pharmacies, online or offline will be controlled by the insurance provider. This means that any changes in the distribution channel will arise largely from the benefits that accrue to the insurance providers. The ability of an online site to offer its services on a 24 by 7 basis is a source of competitive advantage for an e-business over a brick and mortar store where the costs of staffing and maintaining a physical facility open around the clock is very expensive. However, since online models have a delivery delay in providing the pharmaceutical product to the customer, the advantage of being “open” on a 24 by 7 basis does not provide any advantage in customer service. A brick and mortar pharmacy that is open 9 to 5 can provide service to a customer before the product is delivered by mail or delivery service from an online source.
Pharmaceutical Information Supply Chain Improvements

The supply of information to the consumer can be improved by an effective e-Business model. The traditional information supply chain has been for the physician to provide the basic information of drug use to the patient, with the pharmacist providing additional usage information at the point of delivery. Patients get usage warnings in a redundant approach that can reduce errors. In addition there is inter-drug interaction and allergy advice that is often provided by the pharmacist. Where are the eCommerce opportunities for online pharmacies? Patients often feel more comfortable interacting about drug usage with the pharmacist during medication pickup than with the doctor. However, many questions may come up during the prescription cycle; for example missed dosages side effects of the medication. Online pharmacies can provide a rich array of information sources from e-brochures that explain the medication and FAQ pages to answer common questions to 24 by 7 on line chat sessions. These tools can enrich customer interaction and improve the delivery of information to the patient. We will now look at information supply chain enhancements and alterations due to eCommerce.

Disintermediation: eCommerce models can benefit from disintermediation, eliminating steps in the supply chain that add more cost than value to the customer. Consider the current paper process. A physician diagnoses a patient’s condition and determines the appropriate treatment regimen. The physician specifies the medication using a paper document which the patient takes to a pharmacy. The pharmacist fills the prescription, adding standard instructions and customized counseling when requested. One important value addition provided by the pharmacist is inter-drug interaction and drug allergies. Often, the pharmacy information system presents possible inter-drug interactions from the patient’s medication list and seeks out possible allergies from patient records. Another value addition step at the pharmacy is the substitution of generic equivalents which cost less and insurance policy management by pill changes (1 40 mg pill rather than 2 @ 20 mg may be cheaper due to the way in which product costs are negotiated between pharmaceutical companies and insurance providers). Finally, the pharmacist adds a layer of redundancy in the system by repeating instructions and precautions leading to fewer errors. Many of these benefits accrue when the pharmacist has more time than the doctor, a situation that is infrequent in chain operations that practice severe cost cutting, and in large business operations, where the pharmacist does not know the patient.

Let us review these benefits and see how an online pharmacy can improve on the services. The use of electronic medical records coupled with a digital prescription system penned by physicians in a PDA alters the first part of the process significantly. The physician decides the medication and treatment regimen, and enters this directly into a PDA. This system can directly be sent to the patient’s pharmacy and it makes no difference if this is located on site or at a remote location. Health care providers were trained on an entrenched manual system of paper records that they are confident of and comfortable with this system. However, the Health Insurance Portability and Accountability Act (HIPAA) mandates standardization of many routine transactions and will make it more likely that they will accept online systems (Shingles, 2001). The Medicare Prescription Drug, Improvement, and Modernization Act (MMA) of 2003 will have a similar effect and strongly encourages online prescriptions (Bell and Friedman, 2005). These legislations support the establishment of standards in the industry, making it easier for online prescriptions to be accepted by computer systems in a wide variety of healthcare organizations. In addition, the elimination of paper prescriptions eliminates errors in
transcription at the pharmacy end of the process. Another selling point of direct electronic entry
by the health care provider is the reduction of errors, which is one of the benefits of an
automated eCommerce process. Boston Medical Center's new clinician order entry system,
which electronically transmits clinicians' orders to the laboratory, radiology, and pharmacy and
its impact on patient safety is a case that illustrates this point (Eskew, et. al., 2002, Noffsinger &
Chin, 2000). If the patient pre-selects the designated pharmacy, the medication can be directly
delivered to the patient, disintermediating the brick and mortar pharmacy from this process.

Problems caused by inter-drug interaction are reduced since the electronic medical records of the
patient are available to the physician who can access the patient’s medications directly from the
consolidated online pharmacy records. Hence electronic medication order entry systems,
coupled with expert systems for automated clinical risk screening and eCommerce systems for
online alerts will enhance the quality of medical practice. Taylor (2005) describes MOXXI-III, a
system that generated alerts leading to 14% of alerted prescriptions being revised. On-line
expert systems act as a backup, and provide better support than a pharmacist who may or may
not review the related records. The extensive use of non FDA approved herbal products
complicates inter drug interaction issues, and if the patient gets these products from the online
pharmacy as well, the physician has access to the complete suite of products being taken by the
patient, leading to better therapeutic regimens. An online pharmacy can provide integrated
patient records to physicians authorized by the patients to review all their prescription and non-
prescription herbal products. The use of generic equivalents and pill modification for insurance
costs are similarly suited to a computerized system and an online pharmacy can accomplish this
task very effectively.

This does not mean that the online model will replace all prescriptions. One of the critical issues
is the acceptance of digital input of prescriptions and electronic medical records by physicians.
The reluctance results not merely from a low level of technology acceptance, but also from the
risks in imposing a layer of new technology on a high risk process. A high-tech system with a
poorly designed interface, for input and with lack of visual feedback can cause many errors,
While there are benefits it will take time for the technology to become reliable, the interface to
be user friendly, and for physicians to accept this new technology. We have seen this acceptance
in the financial sector, in stock trading, banking and airline reservations. The adoption of IT
embedded processes in the health care sector, which is more focused on human contact, and has
a higher risk to individual well being and health, will take time.

In the information supply chain for prescriptions, the physician enters the prescription on paper,
which is then transcribed by a pharmacist and used to fill the medication for the patient. There
are many errors in this process as we have seen in the studies references in this paper. A direct
electronic medical record created by the physician on a PDA will eliminate paper prescriptions,
transcription time and errors. As a further step in streamlining the information supply chain, the
patient’s preferred pharmacy can be provided with the prescription directly from the physician’s
electronic medical records system. In cases where the medication is needed immediately, the
prescription would be routed to a brick and mortar pharmacy, while follow up medication that
can be received a few days later can be routed to an online pharmacy. This can allow online
pharmacies to compete more effectively with the brick and mortar pharmacy.
Channel Reconfiguration: The distribution channel can be reconfigured by eCommerce, offering reduced transaction costs. There continue to be intermediaries, but the new intermediaries are different from the old intermediaries and play different roles. There are two issues that will be dealt with in this section. The first is the communications channel to provide medication information and the second is the packaging and delivery of the product. In the past the physician has the primary provider of information about the medication, with the pharmacist and a secondary provider of related information about side effects and treatment regimen. Online sites provide a different information channel to patients. The drug companies have used direct advertising backed up by online information sites to get patients to “ask” their doctor about specific medication. An online pharmacy, continuously updated and maintained by subject matter experts will challenge the primary physician’s role in providing this information. In addition an online pharmacy site can interact with the patient on an ongoing basis, providing after sales care to patients, in effect supporting CRM for users. Access to an integrated database will allow discounts and delivery savings for medication provided to two and multiple person households. This can reduce the higher last mile costs associated with direct to door delivery from online pharmacies.

Personalization & Versioning: A pharmacy provides medication to the customer and offers a service through the information provided by pharmacists on the therapeutic regimen. An online pharmacy provides the same service combining a physical product with information. The operation of a website to collect customer orders and link it with a delivery system has been streamlined by successful eCommerce providers and offers little scope for competitive advantage. The current approach of online pharmacies has been to create websites with searchable information on drugs and inter-drug interaction, coupled with online support through email. A thorough economic analysis of information intermediaries shows that an eCommerce site can obtain economic benefits by providing multiple versions of its product/service to customers (Bhargava, 2004). Online pharmacies, with large centralized inventory stores with an effective direct delivery mechanism, can store a larger array of pill sizes, offering them a competitive advantage. This will allow physicians to more accurately tailor dosages for patients. An e-Business has interactive, 24 by 7 connectivity with its customers. This allows the e-Businesses to collect rich data from its customers on the performance of products/services after sale. The online pharmacy can be the point of contact for collecting and reporting back to individual physicians and to the drug industry, the side effects and performance of the medication.

New Efficiencies: The brick and mortar pharmacy is organized by geographic location, i.e. patients in a particular area go the pharmacy to pick up a wide range of medication. In the online world with a global marketplace, the e-Business can organize by function, with online pharmacies targeting specific problems. A review of online pharmacy sites shows many sites that focus on patient groups; diabetes, hypertension, chronic pain, etc. The online pharmacy can be effective organized to provide specialize services for this group. This means that they not only provide the medication, but can serve as an infomediary for related services, and offer collaborative tools for support groups (patients and patient families). The information supply chain for the pharmaceutical product, for disease prognosis, and for recovery patterns, as well as new research can be the primary focus of the organization, with the physical delivery of the medication being only the common thread the gathers these individuals to the group.
Summary

This paper studies the impact of online pharmacies and their impact on the supply chains for pharmaceutical products. The efficiencies gained from product supply chain changes using eBusiness approaches are small and it is difficult for a pure click model to compete effectively. This had resulted in mergers of pure click pharmacies with brick and mortar chains creating click and brick strategies that dominate the current marketspace. Many small purely online businesses use unethical models that support illegitimate drug use or focus on temporary global arbitrage opportunities. There is however a huge opportunity for online pharmacies to serve as effective infomediaries in the information supply chain for pharmaceutical products and alter the basis of competition by disintermediation inefficient and error prone steps in this supply chain, reconfiguring the information supply channels, personalizing and versioning the delivery of information, gaining new efficiencies.

REFERENCES

Arrunada, B. "Quality safeguards and regulation of online pharmacies" Health Econ. 2004 Apr;13(4):329-44.
Bell, D. & Friedman, M. E-Prescribing And The Medicare Modernization Act Of 2003; Paving the on-ramp to fully integrated health information technology? Health Affairs, September, 2005.


Yang, Z., Peterson R. T., & Huang L., "Taking the pulse of Internet Pharmacies", *Mark Health Services*, 2001 Summer; 21(2) 4-10.