An analysis of the virtual value chain in electronic commerce

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Keywords

Electronic commerce, Value chain, Marketing mix

Abstract

In electronic commerce, businesses require to integrate two kinds of activities – ones that are embedded into the physical value chains and the others that are built through information into the virtual chain. Although the relative importance of these two kinds of chain depends on the characteristics of the products and services, their integration, nevertheless, plays a critical role in the success of e-commerce. In e-commerce, more and more value chain activities are conducted electronically, therefore, businesses should understand the implication of the virtual value chain activities. The virtual chain offers a number of distinct advantages over the physical value chain. Some of these advantages lie in forging alliances between customers and manufacturers, advertising products and services selectively with effects of audio, video, and graphics, and saving time and money in efficiently processing customer orders and enquiries. Besides, e-commerce offers flexibility in option pricing and customization of products and service, by reducing the constraints of time and space.

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Introduction

Recent advances in the field of computer networks and telecommunications have increased the significance of electronic commerce. Managers and academic researchers are predicting the huge potential of the latest networking technologies in conducting businesses. It has been widely argued that marketing through the Internet and World Wide Web provides transaction specific efficiencies to all the stakeholders. The customers get benefits due to lowering of search cost, while the manufacturers get the benefit of the economy of production, because they can attract more business from the customers by providing their products and services at a lower cost. Also, by capturing customer specific information, the Internet and World Wide Web can offer the opportunities for the customization of products and services.

Electronic commerce (e-commerce) refers to conducting business electronically. It includes buying and selling of information, products, and services via computer networks (Kalakota and Whinston, 1997, p. 1). However, the above concept of e-commerce is very narrow, as several researchers argue that the Internet offers huge potential in building communities of interests, forging alliances, and transforming public attitude towards technology.

Although electronic data interchange (EDI) and electronic fund transfer (EFT) have been around since the early 1970s, they were limited in their effects to encompass a whole set of marketing factors because of their high cost and technological complexity. However, recently, the rapid diffusion of the Internet and World Wide Web has made conducting business over the Internet much more popular. These new media offer the advantages not only of low cost, but also provide the ease with which they can support different marketing activities.

A recent US Department of Commerce report estimates the electronic business is growing exponentially. In the year 2002, the value of goods and services traded via the Internet is likely to exceed $300 billion, and is likely to exceed $1 trillion in the year 2005. Seeing such an optimistic prediction, it is safe to predict that e-commerce has a huge potential in delivering business activities through the Internet and WWW. Although it is unclear to predict whether e-commerce will become a substitute for the traditional

marketing or will be used to complement the traditional way of doing the business.

Rayport and Sviokla's (1995) discussion on the virtual value chain provides an important line of thinking about e-commerce. However, we seek a better understanding of the roles of the virtual value chain. We aim at extending Rayport and Sviokla's (1995) discussion and offer a detailed view of the virtual value chain and explain how, in e-commerce, businesses can gain a number of advantages by performing virtual value chain activities. We argue that performing both the physical value chain activities and the virtual value chain activities is important; however, in e-commerce, more and more activities become information based and performing them electronically becomes far more important than conducting these functions physically. In the following section, we explain the concept of the physical value chain and the virtual value chain, next we address some of the advantages of the virtual value chain in products, place, price, and promotion, known as the four Ps of marketing. Later, we show how the virtual value becomes effective in developing customer intimacy, and forming new forms of digital intermediaries. Finally, implications and conclusions follow.

Framework

The basic premise of conducting a traditional business rests on the concept of the physical value-chain of the firm (Porter, 1985). Porter (1985) argues that the value chain uncovers the strategically relevant activities through which a firm conducts its business. A value chain consists of five core activities: inbound logistics, operations, outbound logistics, marketing and sales, and services; and four support activities: firm infrastructure, human resources management, technology development, and procurement.

Porter's (1985) conceptualization of the value chain was primarily targeted toward manufacturing firms, in which the value of activities is mostly concerned with the physical flow of material, i.e. acquiring raw material, manufacturing products, distributing products, marketing products, and installing or repairing the products for customer use.

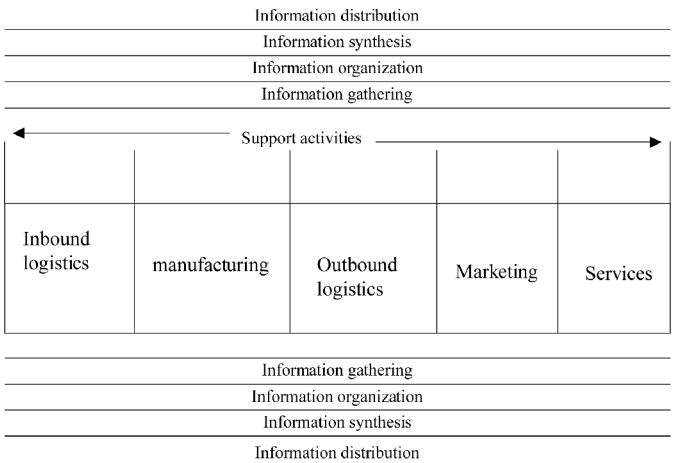
In the present digital age, a majority of firms are planning to conduct their business electronically, in which "information" becomes the main medium through which business transactions are exchanged. The extent to which e-commerce will affect the marketing of products and services will depend on the amount and the value of information that flows through the value chain.

The value that can be realized through e-commerce will be partly determined by the extent to which different value chain activities of a firm are interconnected with suppliers, manufacturers, and customers, allowing simultaneous flow of information about multiple transactions to these parties. For example, by placing an order with payment option form on the Internet, customers can quickly customize their orders. The information can be routed directly to the manufacturers and suppliers in real-time (Greis and Kasarda, 1997). The transactions created in real-time not only will increase the competitive intensity with regard to speed and efficiency of the business, but also will place a heavy demand on organizations to manage customers' information for their future use. By tracking customer information, a firm becomes aware of customer preferences and tastes, and also can make targeted efforts in meeting those demands earlier than its competitors.

In e-commerce, information is not viewed as a by-product of the strategic activities performed around the physical value chain, rather it begins to play a strategic role in itself. Therefore, strategic activities in the virtual value chain are performed with and around information. This is well explained by Rayport and Sviokla (1995), with the concept of a "virtual" value chain. According to them, a virtual value chain consists of "gathering, organizing, selecting, synthesizing, and distributing of information" (Rayport and Sviokla, 1995). Therefore, it becomes imperative that businesses integrate virtual chain activities with physical activities for offering customized products and services, as shown in Figure 1. While virtual value chain activities provide information access to customers, suppliers, and manufacturers and make a large part of the transactions transparent, physical value chain activities make it possible for them to be realized by fulfilling customer orders and assembling final products and services.

Although e-commerce transactions are performed with and through information, the need for performing physical activities cannot be

Figure 1 Research framework



Source: Adapted from Porter (1985) and Rayport and Sviokla (1995)

completely eliminated, because a number of back-end activities are still performed physically. This is because a number of back-end activities require acquiring tangible material, tools, and technologies and physically using them. For example, a book or a manual can easily be captured, codified, and downloaded electronically. However, for writing a book or a manual, groups of writers or engineers physically need to visit the site of their inspiration and experiment with a number of alternatives before perfecting their crafts. Therefore, in e-commerce, though a number of activities can be replaced electronically, there still remains a need to perform some basic functions physically. Therefore, in e-commerce, the success will depend on the ways the physical value chain and the virtual value chain activities are matched and integrated.

Information intensity and e-commerce

In a value chain, both material and information flow. In the physical value chain, information is considered to perform a support function, while in the virtual value chain the role of information becomes strategic. For example, publishing a newspaper is considered to be an information intensive process, because the value of the newspaper is inherent in its information content rather than the paper on which the information is printed. The virtual value chain will play a vital role in e-commerce, though in no way will it eliminate the physical value chain activities completely. The reporters and journalists will still need to track the news and they will still be required to stay close to the scene where they can find a good story, though many of the physical activities, such as organization, and distribution of news, can be carried out electronically. On the other hand, in manufacturing a computer, both the physical and virtual chains will play equal roles. For instance, because of the modularity and standardization of computer systems, customers can order a computer of their choice with regard to RAM size, hard-drive capacity, clock speed, and software compatibility, yet the final product still remains a physical product that will require all of the usual activities of the physical value chain that need to performed. Similarly, in a service industry, such as a hair salon, hair grooming requires physically servicing the clients. In other words, information flow in this kind of service is minimal between the hairdresser and the clients. The virtual value chain activities, therefore, play a minor role in the hair grooming service. However, if a hairdresser begins to make use of the Internet, the hairdresser can set customer appointments electronically, besides storing information about customer preferences on their hair-style and the choice of their hairdressers.

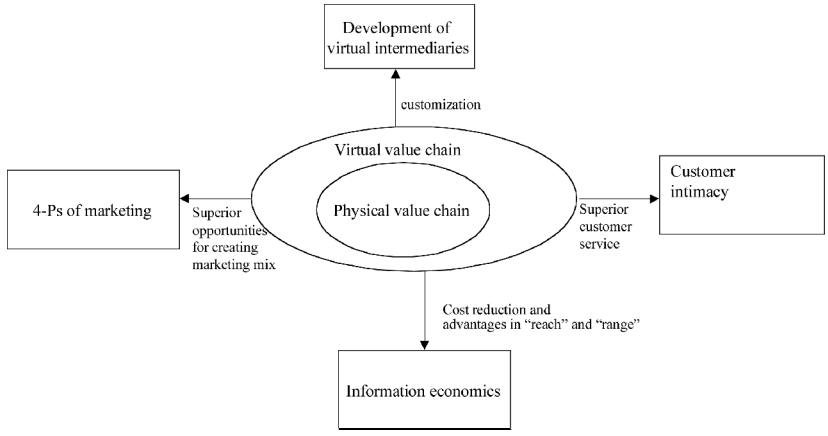
The main argument so far that we are making is that, depending on the characteristics of products and services, the relative importance of a virtual value chain and the physical value chain will be different; however, for successful operation of e-commerce, the integration between the virtual value chain and the physical value chain becomes critical.

Below we describe how the virtual value chain offers value-added services to customers and how manufacturers and suppliers can take advantage of the virtual value chain (see Figure 2).

Information economics in the virtual value chain

The virtual value chain is an important determining factor for the success of e-commerce. Its impacts are likely to have dramatic effects on e-commerce because of "information economics". Information economics dictates the value of information, which is distinct in many ways from the economics of physical products. Information can be shared among communities of stakeholders, such as suppliers, customers,

Figure 2 Transformation of value-added services through the virtual value chain



and firms, yet it may not be diminished, as it does not follow the rules of traditional economics with regard to supply and demand. Not only can multiple copies of the same information be created, but also all these are likely to cost a fraction of the cost of the original document (Slater, 1998).

Electronic networks, employed for e-commerce, offer the advantage of "reach" and "range" in collecting, organizing, and analyzing activities built around the virtual value chain. Because information is stored and manipulated digitally through computers, electronic networks can also offer the advantages in mixing, matching, bundling, and unbundling of information contents from different sources.

Also, a virtual chain is easy to redirect and manipulate in the context of the changing environments. For example, a firm may offer a quick tour of its Internet site to customers by taking them step-by-step through procedures and may redirect its customers to other affiliated sites. Similarly, manufacturers may provide the option of bundling and unbundling of their digital products for customization purposes. Similarly, the information used in the virtual value chain itself can be complemented with sound, music, and other multimedia sources. Similarly, information can be organized in different formats for easy understanding and visualization of the digital activities to customers and employees.

The effect of the virtual value chain in the four Ps of marketing

Traditionally, each business has made its strategic marketing decisions based on the four Ps – product, place, price and promotion. In the following section, we will show how the virtual value chain can impact on these traditional four Ps of the marketing.

Product

A virtual value chain can provide a number of options to customers to customize products and services. For example, customers can order through a credit card and download the required pieces of information. Or the firm may itself obtain the information from its suppliers electronically, which then can be automatically loaded to the customers' computers. Also, a virtual value chain can be used to enhance the product and service offerings by providing additional information about the products and services. Moreover, for digital products and services, the virtual chain provides the possibility of quick customization of products and services. For example, a student can pick a site from where he/she can pick research articles, magazine stories, and music video clips, published and created by different publishers and companies, and make a one-stop payment, instead of subscribing to many journals and videos.

Place

The virtual value chain offers the advantage of location and time, by offering just-in-time access to different value chain activities. The delimitation of space and time can offer advantages to customers as they can directly download the digital products and services into their computers. At the same time, the manufacturers can gain advantage in limiting most of their activities through the Internet. For example, hundreds of Fed Ex and UPS

personnel can work on other mission-critical activities, while customers can directly check the location of their package by filing the required information through the Internet.

Subscription and distribution in the digital products can be handled automatically, with a varying degree of manual control. For example, listserv software gives a number of options. The process can be set up in such a way that subscription is automatic and a new subscriber is added automatically to the mailing list and billed automatically by a software program.

Price

The virtual value chain offers different options on products and services to customers. The extra value obtained by the customer can be billed at a different price option also. In the simplest, mass produced products, a flat price may be appropriate. However, when customers may order from different sources' store-fronts to customize their choice, the Internet company, which is responsible for assembling this choice, may charge different prices. In case of digital products, these options can also be extended with regard to "time" and "place". For example, during the peak-hour, when most of the customers are likely to log on the site, the company may charge a premium price to minimize the Internet traffic. During off-hours the company may reduce the price of the products or services to keep the optimum Internet traffic on the site. Similarly, the customers may have the option to obtain the product through the regular post-office mail at a different price from when they directly download the product/service. The price variations can also be employed on the need of the product or the service. For example, a customer who wants to search and read a particular piece of information is likely to pay less than a person who will download and print the information. Similarly, a customer who wants to review only the summary of the information is likely to pay less than a person who needs the complete information. Similarly, a customer who needs immediate access to new pieces of information is likely to be charged a higher price than a customer who can accept some delay in accessing the information.

Besides, a virtual value chain makes it easier for customers to compare the prices of similar offerings by different companies. Not only can customers obtain the price of the offerings, but also they can understand the prices charged for add-on features. With this information, customers can quickly customize their selections in products and services (Sinha, 2000).

Promotion

The virtual value chain offers several venues to advertise products and services. For example, a virtual value chain can make visible how its activities are carried through. This information is often used by customers and suppliers for building a long-term relationship with the firm. The information used in value chain activities can also be organized and placed for quick viewing. Besides, information contents can be enhanced through audio, video, and graphics to catch the customers' eyes. In some cases, a company may advertise discount offering to customers; however, to ensure their discounts they may be required to proceed through different links, which may provide some key information about the company, its products, and services. Besides, many Internet site may lead customers to other sites which may provide the products or services that the customer needs immediately, yet the firm may not yet be ready to sell it.

Besides, each firm can build a store-front, advertising its products and services that can directly be ordered by filling an order-entry form. The ability to quickly modify a virtual value chain provides the firm with an opportunity to selectively advertise its products and services, through its store-front and communities of links.

Virtual value chain and customer intimacy

Dell Computer, Amazon.com, and E-trade have captured the public's attention, as these companies are able to enhance customer value. In a physical setting, capturing customer related information is not easy; however, in a virtual setting, customers are willing to provide personal information, if it is not misused and employed to enhance customer values (Turban *et al.,* 2000). By mining customer information, a company can build and forge long-term relations with its customers and can e-mail them if any product or service of their choice becomes available in the company. For example, if a past customer

enters the Amazon site, the Internet can automatically inform the customer of new merchandise or products that can serve his or her purpose. Table I illustrates some of the ways through which a company can employ a virtual value chain in building a long-term relationship with the customers.

A virtual value chain activity that runs across customers and suppliers can be supplemented through customer feedback, interests, and concerns. The process of gathering customer feedback often raises the quality of the products and services launched by a company, and this happens at a very low price in comparison to the cost of the traditional marketing surveys. This is especially true in the area of digital distribution of products and services (Bock and Senne, 1996, p. 141). For example, many software companies can distribute their software to customers through online. In some other cases, these companies provide access to customers to freely download the Beta version of the software from their site and assemble their feedback, concerns, and interests for testing it against possible bugs in the program.

Virtual value chain and information intermediaries

A virtual value chain can play a major role in disintegrating many physically based intermediaries while bringing forth new kinds of information intermediaries. These intermediaries can play a vital role in mixing and matching the needs of different customers, customizing the products, and connecting to the customers for meeting their long-term demands. In other words, for a customer, the first link in the virtual value chain becomes the interface with the site of an information intermediary. By dealing with the information intermediary, the customers can do one-stop shopping of several products and services, which are generally marketed by a number of different companies. However, an information intermediary can assemble the products and services from different companies and sell them to customers by bundling or unbundling these products or services. For example, in financial services, Microsoft, Intuit, and E-Trade are assisting customers in providing different kinds of products and services offered by different financial companies. For example, by logging into Quicken Web Site, customers are presented with a variety of financial services to find the best rates on CDs, loans, mortgages, and checking and saving accounts. They can get quick tips on tax, financial, and retirement planning. Through Quicken, they can also access providers like Charles Schwab and Ameritrade for online trading (Hagel and Singer, 1999, pp. 222-3).

Similarly, several intermediaries are putting their storefront to auction a wide variety of products and services. These intermediaries do not own these products and services, but provide a common forum from where the transactions between the manufacturers and customers can be exchanged easily. The

Table I Virtual value chain activities in e-commerce

Tools	Marketing product/services
E-mail	Streamline distribution operation
	Distribute information products
EDI	Automate order-entry and inventory support services
	Share knowledge on product designs for collaboration
World Wide Web	Track competition by monitoring competitors' Web sites
	Provide support information
	Allow people to check their order status
	Automate support services
	Share information in interactive forms
	Promote products and services with essential features and catalogues about the products and services
	Deliver information-intensive products
	Obtain customer feedback and comments about companies' products and services
Mailing lists and newsgroups	Set up feedback systems to generate ideas or test new products
	Networks with potential buyers

intermediary may provide the support services and payment security in exchange for a commission, based on a percentage of the sales conducted through the intermediary's site.

In auctioning of goods and services, intermediaries increase the reach and range of interaction with customers and owners (Schneider and Perry, 2000, pp. 322-3). If an auctioneer can increase the reach and range of its products and assemble reasonably good quality products, a higher number of bidders are likely to raise the price of the goods, making a profit for both auctioneer and its clients. Another advantage of auctioning through the intermediary is that it reduces the overhead costs associated with storing and assembling all the goods and products under one roof before they can be auctioned. In e-commerce, the actual physical location is not important, as long as people can bid through the Internet by viewing the products and specifications online.

Implications and conclusion

Even though a majority of companies can make their presence in information space by developing their home pages and listing important information about their products and services, this is only a single facet of the firm's capability that can easily be imitated by other firms. The main role of a business in e-commerce should be to realize the full potential of the virtual value chain and integrate with the physical value chain. Though the relative importance of the physical value chain and the virtual value chain varies depending on the characteristics of products and services, it is important that firms do not relegate either of the activities. The back-end supporting physical activities are as important as the front-end digital activities.

Although for physical products, the virtual value chain plays a minor role, it can still change the dynamics of competition by increasing the flow of information between customers, suppliers, and manufacturers. For example, a customer order that is entered through the use of standard specific Internet form need not be entered again by the manufacturer in a computer; rather the order entry system can be directly integrated with the inventory systems of the supplier. This process helps in delivering the physical products quickly to the customers and thus creates a better image of the company in the customers' eyes. For example, in the case of Saturn, GM offers a site for customers to order a car of their choice. As a result, Saturn has created an image of "no-nonsense bargaining" in setting the price of the car. Similarly 1-800-flowers is a multimillion-dollar company in Long Island, New York that conducts a large portion of its business on the Web.

In addition, using a virtual chain, a business can provide related information and updates about products and services quickly to its past customers. Traditionally, businesses have paid less attention to the value of information than products and services. However, with the revolutionary growth of the Internet and the value of information, information has become as important as products and services (Hagel and Singer, 1999). In some instances, the value of products has been replaced by information contents. For example, reference material and music CDs can be replaced through information in the Internet, which users can access and download in their computers.

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