

Computer Technology Based Electronic Commerce Systems: Architectural Framework, Business Models and its Limitations

Divya Sindhu¹ and Saurabh Sindhu²

Assistant Professor, Department of Computer Science, CRM Jat College, Hisar – 125001, Haryana
Corresponding Author : Divya Sindhu1

ABSTRACT

Electronic commerce (E-commerce) facilitates trading in products and services such as information services, financial and legal services, using computer technologies such as websites, internet and e-mail. E-commerce is the buying and selling of goods and services or the transmitting of funds or data over an electronic network. It is a contemporary business methodology which addresses the needs of organizations, merchants and consumers to cut costs, while improving the quality of goods and services along with increase in the speed of service delivery using computer network. Electronic commerce draws on technologies such as mobile commerce, electronic funds transfer, supply chain management, internet marketing, online transaction processing, electronic data interchange (EDI), inventory management systems and automated data collection systems. Modern electronic commerce typically uses the World Wide Web for at least one part of the transaction's life cycle, although it may also use other technologies such as e-mail. Moreover, E-commerce also facilitates the farmers about the up-to-date market information on prices for farm commodities, fertilizer and pesticide inputs, and consumer trends related to trading of farm produce using computer networks such as the internet and online shopping web sites. E-commerce system could also be developed for providing informed decisions about the public or industry requirement of particular crops and commodities as well as about best time for marketing of the farm produce. Architectural framework of E-commerce includes the synthesizing of various existing resources like DBMS, data repository, computer languages, software agent based transactions, monitors or communication protocols to facilitate the integration of data and software for better applications. E-commerce business models can generally be categorized into seven categories, i.e., Business-to-Business, Business-to-Consumer, Consumer-to-Consumer, Consumer-to-Business, Business-to-Government, Government-to-Business and Government-to-Citizen. Though E-commerce offers many advantages to customers, business, society and nation, there are still some areas of concern that need to be addressed. The limitations of E-commerce include security, lack of privacy, tax issue, product suitability, cultural obstacles, high labour cost, legal issues and huge technological cost. In this article, E-commerce architectural framework and models will be discussed with reference to present scenario to provide expert knowledge to the consumers, businessmen and farming community about the transmission of funds or data, buying and selling of goods and/or information and legal services over the network.

Keywords: E-commerce, Computer technology, E-mail, Consumer, Business, Websites, Internet

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I. INTRODUCTION

Electronic commerce is involved in trading of goods and services or the transmitting of funds or data using computer networks such as the internet. These business transactions occur either as business-to-business, business-to-consumer, consumer-to-consumer or consumer-to-business. It has applications in diverse fields such as online delivery of digital content and online shopping web sites for retail sales direct to consumers. It also includes remote banking, electronic trading of shares, supply chain management, public procurement and providing or participating in online market places, which process third-party business-to-consumer or consumer-to-consumer sales. Moreover, E-commerce

deals with direct consumer marketing and gathering and using demographic data through web contacts and social media, online shopping, advertisement, marketing of agriculture products, Marketing to prospective and established customers by e-mail or fax and engaging in pretail for launching new products and services.

Electronic commerce also provides better markets resulting from informed decisions about future crops and commodities and best time and place to sell and buy goods [1, 2]. It also provides up-to-date market information on prices for commodities, inputs and consumer trends. Systems could be developed for betterment of markets resulting from informed decisions about future crops

and commodities as well as about best time and place to sell and buy the goods. Modern electronic commerce typically uses the World Wide Web for at least one part of the transaction's life cycle, although it may also use other technologies such as e-mail. Electronic commerce has also played significant role in import-export business. Importers can now make enquiries about the products, their manufacturers, quality, price, terms and conditions through use of internet. Exporters can also make enquiries about suitable customers. Payments can be made by electronic modes including internet money transfer.

II. CHARACTERISTICS OF E-COMMERCE

These are some characteristic features of E-commerce that must be understood carefully before we implement E-commerce in our organizations [3]. Following are few important features of the E-commerce:

- E-commerce is a concept in our business that is aligned with our presence on the internet.
- The E-commerce is a part of the policy about how we run our business. It is a technology that is expensive to implement and it should be seen as an investment.
- The E-commerce allows us reach to market and sale our products through website and collect information from our customers.
- The additional information like the location of the customers could be collected and compiled.
- E-commerce allows us to process credit card information of our customers and take care of cyber cash from our customers.
- E-commerce can be fully integrated solution or just a front end to a business. Whenever, we consider implementing E-commerce in our business, the flow of information from our website into our back office operations may also be considered.
- E-commerce acts as information gathering and dispensing device to conduct the business. It not only allows us to advertise market and sell the products but also keep track of accounts receivable and payables. It provides technology and support to business.
- The decision of implementing E-commerce is dependent on the choice of making day to day business transaction online. During implementation of E-commerce, we need to work with sales, marketing finance, technical support, customer service, information systems network about administrations and support staff, E-commerce framework and architecture.

III. ARCHITECTURAL FRAMEWORK FOR E-COMMERCE

Architectural framework of e-commerce includes the synthesizing of various existing resources like DBMS, data repository, computer languages, software agent based transactions, monitors or communication protocols to facilitate the integration of data and software for better applications. E-commerce system may also be thought of as consisting of many layers, each layer providing a service. Each layer has a specific function and can be described separately. The lower layers support the upper ones. They provide us with a logical means of discussing the architecture of E-commerce systems. Each layer has a function and supports the layers above it. The bottom layer is physical layer, which consists of physical infrastructure such as cables, wires, satellites, mobile phone system etc. Their common function is that they provide the communication infrastructure for E-commerce. The emergence of wireless communications has enabled the use of mobile. The architectural framework for E-commerce consists of six layers of functionally or services as follows:

3.1. Application Layer

In the application layer services of E-commerce, it is decided that what type of E-commerce application is going to be implemented. There are four types of distinguished E-commerce applications which include C2B E-commerce (Consumer to Business E-commerce), B2B E-commerce (Business to Business E-commerce), C2C E-commerce (Consumer to consumer E-commerce) and G2E E-commerce (Government to Employee E-commerce).

3.2. Interface and Support Services

The second layer of the architectural framework is interface layer. Interactive catalogs and directory support services are the examples of this layer. Interactive catalogs are the customized interface to customer applications such as home shopping. Interactive catalogs are very similar to the paper-based catalog. The only difference between the interactive catalog and paper based catalog is that the first one has the additional features such as use of graphics and video to make the advertising more attractive. Directory services have the functions necessary for information search and access. The directories attempt to organize the enormous amount of information and transactions generated to facilitate E-commerce. The main difference between the interactive catalogs and directory services is that the interactive catalogs deal with people while directory support services interact directly with software applications.

3.3. Information Brokerage and Management Layer

This layer is rapidly becoming necessary in dealing with the voluminous amounts of information on the networks. This layer works as an intermediary that provides service integration between customers and information providers, given some constraint such as low price, fast services or profit maximization for a client. For example, a person wants to go to USA from India, the person checks the sites of various airlines for the low-price ticket with the best available service. For this he must know the URL's of all the sites. Another aspect of the brokerage function is the support for data management and traditional transaction services. Brokerages may provide tools to accomplish more sophisticated, time-delayed updates or future-compensating transactions.

3.4. Secure Messaging Layer

In any business, electronic messaging is an important issue. The commonly used messaging systems like phone, fax and courier services have certain problems. If the phone line is dead or some how the number is wrong, you are not able to deliver the urgent messages. In the case of courier service, if you want to deliver the messages instantly, it is not possible as it will take some time depending on the distance between the source and destination places. The solution for such type of problems is electronic messaging services like e-mail, enhanced fax and EDI. The electronic messaging has changed the way the business operates. The major advantage of the electronic messaging is the ability to access the right information at the right time across diverse work groups. The main constraints of the electronic messaging are security, privacy and confidentiality through data encryption and authentication techniques. Messaging layer includes the following i.e., digital encryption standard (DES), advanced encryption standard (AES), public key encryption (PKE), digital signature (DS) and electronic data interchange (EDI) protocol.

3.5. Middleware Services

The enormous growth of networks, client server technology and all other forms of communication among unlike platforms is the reason for the invention of middleware services. The middleware services are used to integrate the diversified software programs and make them talk to one another. Middleman services layer consists of the following: value added networks, digital signature, electronic payment schemes, E-payment, electronic cash (E-cash) and hosting services.

3.6. Network Infrastructure

This layer is also known as information super-highway in which the data flow from sender to receiver is noticed. We know that the effective and efficient linkage between the customer and the

supplier is a precondition for E-commerce. Network service layer includes E-mail, WWW (World wide web), HTTP (Hyper Text Transfer Protocol), HTML (Hyper Text Markup Language), XML (Extensible Markup Language), SE (Search Engines) and SA (Software Agents).

IV. E-COMMERCE BUSINESS MODELS

E-commerce business models can generally be categorized into the following seven categories [4] that includes (i) Business-to-Business (B2B), (ii) Business-to-Consumer (B2C), (iii) Consumer-to-Consumer (C2C), (iv) Consumer-to-Business (C2B), (v) Business-to-Government (B2G), (vi) Government-to-Business (G2B) and (vii) Government-to-Citizen (G2C).

4.1. Business - to - Business

A website following the B2B business model sells its products to an intermediate buyer (Fig. 1) who then sells the product to the final customer [5]. As an example, a wholesaler places an order from a company's website and after receiving the consignment, sells the end product to the final customer who comes to buy the product at one of its retail outlets.

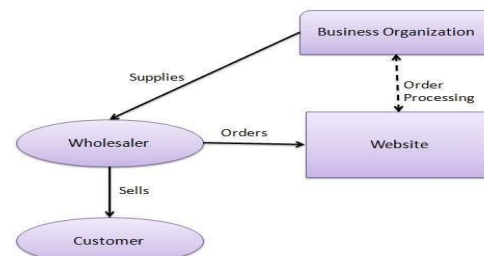


Fig. 1. Business - to - Business model

4.2. Business - to - Consumer

A website following the B2C business model sells its products directly to a customer (Fig. 2). A customer can view the products shown on the website. The customer can choose a product and order the same. The website will then send a notification to the business organization via e-mail and the organization will dispatch the product/goods to the customer. For example, Amazon is the largest bookstore in the world (at www.amazon.com), with 50% of the book market share. After gaining a reputation in the bookstore, Amazon expanded the offerings to music, video, gifts and auction.

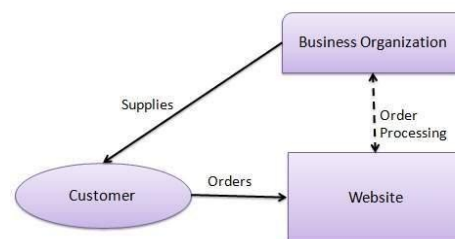


Fig. 2. Business - to - Consumer model

4.3. Consumer - to - Consumer

A website following the C2C business model helps consumers to sell their assets like residential property, cars, motorcycles etc., or rent a room by publishing their information on the website (Fig. 3). Website may or may not charge the consumer for its services. Another consumer may opt to buy the product of the first customer by viewing the post/advertisement on the website. Thus, the deal is finalized through the website without an actual meeting.

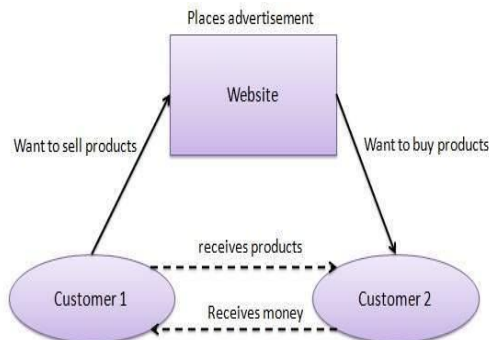


Fig. 3. Consumer - to - Consumer model

4.4. Consumer - to - Business

In this model, a consumer approaches a website showing multiple business organizations for a particular service (Fig. 4). The consumer places an estimate of amount he/she wants to spend for a particular service. For example, the comparison of interest rates of personal loan/car loan provided by various banks via websites. A business organization who fulfills the consumer's requirement within the specified budget, approaches the customer and provides its services.

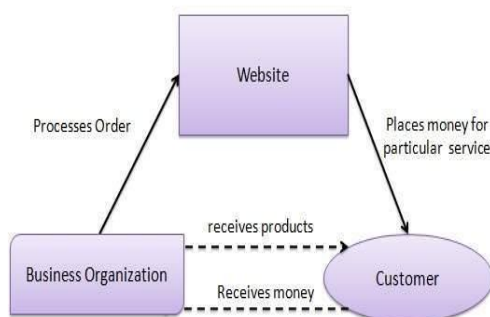


Fig. 4. Consumer - to - Business model

4.5. Business - to - Government

B2G model is a variant of B2B model. Such websites are used by governments to trade and exchange information with various business organizations (Fig. 5). Such websites are accredited by the government and provide a medium to businesses to submit application forms to the government.

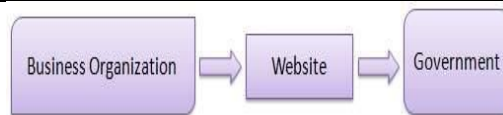


Fig. 5. Business - to - Government model

4.6. Government - to - Business

Governments use G2B model websites to approach business organizations (Fig. 6). Such websites support auctions, tenders, and application submission functionalities. In G2B models, it reduce the time to fill out export forms, enable businessmen for online tax filling and business organizations can comment on rules and regulations of the government.

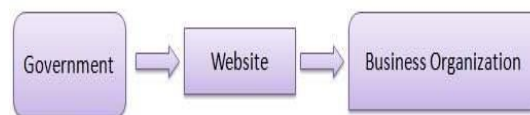


Fig. 6. Government - to - Business model

4.7. Government - to - Citizen

Governments use G2C model websites to approach citizen in general (Fig. 7). Such websites support auctions of vehicles, machinery or any other material. Such website also provides services like registration for birth, marriage or death certificates. The main objective of G2C websites is to reduce the average time for fulfilling citizen's requests for various government services. Citizens may communicate their opinion on wide range of government proposals and policies through the internet.



Fig. 7. Government - to - Citizen model

V. BENEFITS OF E-COMMERCE

E-commerce is proved to be highly cost-effective for business organizations as it cuts down the cost of marketing, processing, inventory management, customer care etc. It also reduces the burden of infrastructure required for conducting business. The information related to the customers could be collected and managed efficiently, which in turn will assist in developing efficient promotional strategy. E-commerce has abolished time restrictions on business activities because with this you can execute business transactions 24x7. The time factor significantly turns into the increment in sales as well as profits. The benefits of E-commerce can be further subdivided into benefits to organizations, benefits to customers and benefits to society.

5.1. Benefits to organisations

E-commerce provides following benefits to the organisations:

- i. E-commerce expands the market place to national and international markets. The company can easily and quickly locate more customers, the best suppliers and the most suitable business partners across the globe. E-commerce caters to the demands of national as well as international business simultaneously and brings your business activities out of geographical boundaries [6]. With E-commerce, even small businesses get the access to the global market.
- ii. E-commerce reduces the cost of creating, processing, distributing, storing and retrieving paper based information.
- iii. It provides organizations with an ability to create highly specialized business.
- iv. It allows reduced inventories and overheads.
- v. E-commerce reduces the time between outlay of capital and the receipt of products and services.
- vi. E-commerce initiates business process and re-engineering projects by changing processes. The productivity, sales, knowledge of workers and administrators can be increased significantly.
- vii. E-commerce lowers telecommunications cost as the internet is much cheaper medium of communication.

5.2. Benefits to Customers

E-commerce provides following benefits to customers:

- i. E-commerce enables customers to shop or to do other transactions 24 hours a day and 365 days a year.
- ii. E-commerce provides many choices to the customers. A customer can choose from many vendors and products.
- iii. Due to the competition in market, E-commerce provides customers with less expensive products and services. E-commerce gives customers an opportunity to look for cheaper and better quality products.
- iv. With E-commerce, consumers can search the specific product or service they require and can even find the direct manufacturer from where they can purchase products at comparatively less price.
- v. Shopping online is time saving and convenient. In addition to it, you also get to see the reviews of other consumers that will help you in making beneficial purchase decision.
- vi. Relevant information about the product is delivered to the customers within seconds.
- vii. E-commerce allows the customers to participate in virtual auctions.

5.3. Benefits to Society

E-commerce is useful to society in the following ways:

- i. E-commerce facilitates the delivery of public services like health care, education and distribution of government social services at a reduced cost and improved quality.
- ii. E-commerce allows people to spend more time at home rather wasting time in shopping.
- iii. E-commerce allows some articles to be sold at cheap prices, this way, less affluent people can buy more and increase their standard of living.
- iv. E-commerce enables the people of developing countries to buy products and services that are not otherwise available to them.

V. LIMITATIONS OF E-COMMERCE

Though E-commerce offers many advantages to customers, business, society and nation, there are still some areas of concern that need to be addressed [7]. The following are some of the limitations or disadvantages of E-commerce.

6.1. Security

The biggest drawback of E-commerce is the issue of security. People fear to provide personal and financial information, even though several improvements have been made in relation to data encryption. Certain websites do not have capabilities to conduct authentic transactions. Fear of providing credit card information and risk of identity limit the growth of E-commerce. In case of B2C E-commerce, the security and privacy issues are of the most concerns. Careful design of security policies is needed to make sure the safety of customer information.

People fear to operate in a paperless and faceless electronic world. Some of the business organizations do not have physical existence. People do not know with whom they are conducting commercial transactions. This aspect makes people to opt physical stores for purchases. As the seller and buyers are not face to face, the customer hardly trusts a seller. This is a limiting factor in implementing the E-commerce systems.

6.2. Lack of privacy

Many websites do not have high encryption for secure online transaction or to protect online identity. Some websites illegally collect statistics on consumers without their permission. Lack of privacy discourages people to use internet for conducting commercial transactions.

6.3. Tax issue

Sales tax is another bigger issue when the buyer and seller are situated in different locations. Computation of sales tax poses problems when the buyer and seller are in different states. Another factor is that physical stores will lose business if web purchases are free from tax.

6.4. Product suitability

People have to rely on electronic images to purchase products. Sometimes, when the products are delivered, the product may not match with electronic images. Finally, it may not suit the needs of the buyers. The lack of 'touch and feel' prevent people from online shopping.

6.5. Cultural obstacles

E-commerce attracts customers from all over the world. Habits and culture of the people differ from nation to nation. They also pose linguistic problems. Thus, differences in culture create obstacles to both the business and the consumers.

6.6. Legal issues

The cyber laws that govern the E-commerce transactions are not very clear and vary from country to country. These legal issues prevent people from entering into electronic contracts. Many legal issues regarding the implementation of E-commerce are yet to be resolved.

6.7. Technical limitations

There is a lack of system security, reliability, standards and some communication protocols. There is insufficient telecommunication bandwidth. The software development tools are still evolving and changing rapidly. It is difficult to integrate the internet and E-commerce software with some existing applications and databases. Vendors may need special web servers and other infrastructures, in addition to network servers. Some E-commerce software might not be compatible with the existing hardware of the organization. Certain software used by vendor to show electronic images may not be a common one. Due to lack of standardized software, it may not be possible to browse through a particular web page. Insufficient telecommunication bandwidth may also pose technical problems.

6.8. Huge technological cost

The cost of developing an E-commerce solution can be very high [8]. Highly talented and technically qualified workforces are required to develop and manage the websites of the organization. Since internet provides a lot of job opportunities,

business organizations have to incur a lot of expenses to retain a talented pool of employees. If it is developed by the programmers of the organization, lack of experiences can result in delays. Thus, the main benefits of implementing E-commerce are intangible. This way, it is very hard to qualify them for the customer satisfaction. It is difficult to merge electronic business with traditional business. Technological infrastructure may be expensive and huge cost has to be incurred to keep pace with ever changing technology. It is necessary to allocate more funds for technological advancement to remain competitive in the electronic world.

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