

Building DSS Model for E-commerce to Enhance Customer Services

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Abstract

E-Commerce has the potential to improve efficiency and productivity in business activities. E-commerce today is no longer technological issue, but is also a business issue. A decision support system (DSS) is “an interactive information system that provides information, models and data manipulation tools to help make decisions in semi-structured and unstructured situations. Ecommerce involves a number of forms, varying level of cost and complexity, depending on business need, this paper presents the e-commerce by integrating with Decision support systems for building DSS model for e-commerce. It further highlights some critical issues in ecommerce, suggestion future strategies for e-commerce to Enhancing Customer Services.

Keywords: *Decision Support System(DSS), E-Commerce, Customer Services, DSS Model, ERP, CRM, SCM, FRM.*

1. Introduction

A decision support system (DSS), used in e-commerce, is a term used to describe any computer application that enhances the user's ability to make decisions. DSS possibilities improve the use of e-commerce in terms of customer satisfaction. DSS is an interactive analytical modeling process, where users are exploring possible alternatives and not demanding pre-specified information. They are using the decision support system to find the information they need to help them make a decision. [1]

Web-based DSS have reduced technological barriers and made it easier and less costly to make decision relevant information and model driven DSS available to managers and staff users in geographically distributed locations. Because of the Internet infrastructure, enterprise-wide DSS can now be implemented in geographically dispersed companies

and to geographically dispersed stakeholders including suppliers and customers at a relatively low cost. [2]

E-Commerce is a process of integration of all company's processes, activities and services toward buying and selling of products and exchange of information and funds with the company's partners via computer networks and electronic technologies, E-commerce can be defined from following perspective. [3]

One of basic features of efficient e-commerce is correct definition and description of all internal and external processes. All the management activities and decision making has to be targeted to customers' needs and requirements. The optimal and most exact way how to obtain and find optimal solution of e-commerce system and its procedural structure is modelling and simulation. Organizations developing e-business and e-commerce solutions consider business modelling as a central part of their projects. The latest theoretical and practical experiences are testaments to how great strategic advantage for organizations doing business is creation and use of new e-business and e-commerce models. [4]

Enterprise Resource Planning (ERP) system integrate all information and processes of an organization into a consolidated system that addresses how people and organization access, gather, store, summarize, interpret and use information, ERP systems have risen up to the expectations of industry. ERP systems is an information system that manages, through integration, all aspects of business including production planning, purchasing, manufacturing, sales, distribution, accounting and customer service. It allows seamless integration of information flow and business processes across functional areas within a company. [5]

Customer relationship management (CRM) model is the model that integrates management of customer

groups, establishment and management of marketing companies. Thus in summary it is possible to state that customer relationship management is: [6]

- Multimedia that guarantees the integration of all technological resources used in a company and activity fields related to customers ;
- First of all, it is business strategy meant for development of customer relationship; and its results optimize profitability, income and meeting the needs of customers ;
- Meant for maximum personalized satisfaction of customer's needs.

2. Decision Support in E-commerce

A decision support system (DSS), used in e-commerce, is a term used to describe any computer application that enhances the user's ability to make decisions. DSS possibilities improve the use of e-commerce in terms of customer satisfaction. DSS is an interactive analytical modeling process, where users are exploring possible alternatives and not demanding pre-specified information. They are using the decision support system to find the information they need to help them make a decision. [1]

Decision-making models are illustrated as sequential activities similar to workflows. A decision workflow represents the depiction of the sequential mental activities performed by the decision maker starting with the discovery of the need for a decision and ending with the execution of the chosen alternative. Purchase decision-making processes can therefore be modelled as a workflow, following sequential activities. [7]

Web-based DSS have reduced technological barriers and made it easier and less costly to make decision relevant information and model driven DSS available to managers and staff users in geographically distributed locations. Because of the Internet infrastructure, enterprise-wide DSS can now be implemented in geographically dispersed companies and to geographically dispersed stakeholders including suppliers and customers at a relatively low cost. [2]

3. DSS Model for E-Commerce Based on ERP

DSS Model for E-Commerce Based on ERP Enterprise resource planning software is an integrated business suite that helps manage multiple business applications and operations from a single platform. This type of software shares similar data models and covers the end-to-end processes.

Ecommerce platforms can consolidate visibility for HR, finance, distribution, manufacturing orders, customer service and supply chain processes into one robust business suite with ERP.

ERP relates to ecommerce in a number of other ways besides analytics and reporting. Online retail is a multistep operation, and ecommerce platforms of any size can track order fulfillment, shipping and manufacturer inventory through robust ERP software too. In essence, ERP is a platform that houses all important information in a single, user-friendly location. Businesses invest in ERP to increase internal visibility, improve customer relations and grow the company. ERP relates to ecommerce platforms in that it can integrate with your existing structure and shed further insight into all business operations. [8]

4. DSS Model for E-Commerce Based on CRM

Ecommerce CRM may be a term that you have recently come across online. A CRM system is something that allows you to store, manage and use customer relationship data to improve your business in specific ways.

A customer relationship management system is a central location or piece of software that you can use to store customer details, accounts, information, and leads that can then be leveraged for future sales opportunities. Small and large businesses will benefit from some ecommerce CRM systems in that they firmly place client data in the 'cloud' - which means that it can be accessed by multiple people, anywhere, at any time, from any number of mobile devices. For the mobile developer who has spent time, energy and money building a responsive mobile e-commerce website, CRM is more important than ever. Using select CRM practices and processes, sales on an ecommerce website with integrated CRM will help

you better understand your cross-channel customers, and what makes them buy from you. [9]

5. Building DSS Model for E-Commerce

Through of knowledge of customer service problems, we can build a model of DSS using e-commerce to increase the effectiveness of customer service, the whole model architecture consists of four tiers. These tiers are a client tier, an e-commerce tier, a web services tier and a database tier. Each of these tiers will be explained separately.

5.1 Design Philosophy

The philosophy of the proposed e-commerce model that consists of Collection interrelated functions: product presentation, order entry, electronic payment, order fulfillment, customer service, product support, data acquisition, and data analysis. How these functions interact with each other and with the system users.

The model also provides little guidance as to how the functions of an e-commerce system are organized, that is, how they interact with one another and with the system users. For example, does the electronic payment function interact directly with the product presentation function?

This model does not include functions, such as inventory control, that are necessary for the full operation of the enterprise because these functions are present whether or not the organization has an e-commerce system, and thus we consider them to be outside the system. Nevertheless, an e-commerce system interacts with many of these functions.

5.2 Various Flows used in the Design Stage

These flows provide a clear picture of the model. They gave all information needed to understand how the e-commerce model works. These flows are used to describe the status and processes of the system. The flows include Data Flow Diagram (DFD), Goods Flow and Money Flow.

5.2.1 Data Flow Diagram (DFD)

Data Flow Diagramming (DFD) is a means of representing a system at any level of detail with a graphic network of symbols showing data flows, data stores, data processes, and data sources/destinations. [10]

Therefore, DFD is used to give a good understanding of the model developed before starting the implementation. It helps understanding the flow in which the system will follow. The following figure (figure 1) shows the level of the DFD. It shows the main agents in the system, buyer and seller. Both of them should register at first. Then a seller will be able to upload products to the system whereas a buyer will be able to order products.

Business organization uses websites or portals to offer information about product, through multimedia clippings, catalogues, product configuration guidelines, customer histories and so on. A new customer interacts with the site and uses interactive order processing system for order placements. On placements of order, secured payment systems comes into operation to authorize and authenticate payment to seller. The delivery system then takes over to execute the delivery to customer.

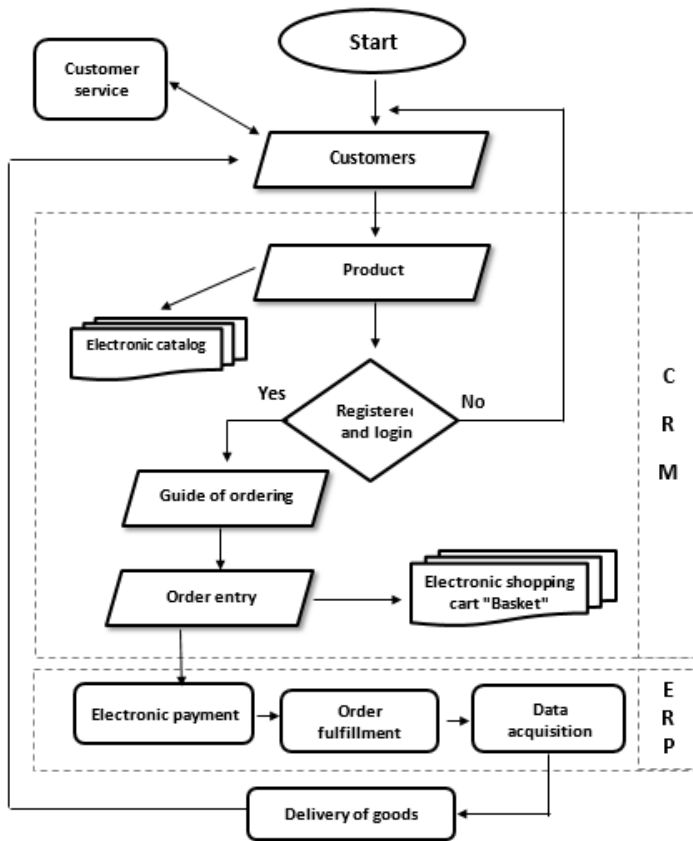


Fig.1 flow chart of DSS model of e-commerce

5.2.2 Goods/Services Flow

A seller provides goods and a buyer consumes them. This is a basic idea of the relationship between goods and both a seller and a buyer. The same idea is applied when dealing with an e-commerce system. However, the interaction between sellers, buyers and goods is done electronically on the Internet.

Figure 2 shows goods and services flow. In the figure, both a buyer and a seller meet each other in the system. A seller is responsible for providing products to the system whereas, a buyer browses all products to find the desired product. Then, a buyer orders the product using the system. Then the seller will deliver the product to the buyer.

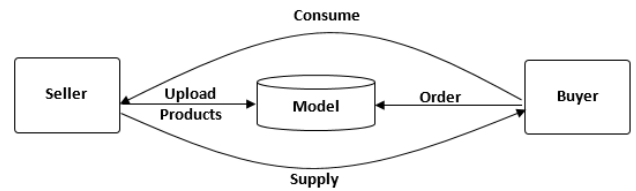


Fig.2 Goods Flow

5.2.3 Money Flow

At first, both a buyer and a seller must have accounts in the money institute (the bank). After that, a buyer can use the e-commerce system to find the desired products. Then, the buyer can order the wanted products. To perform the payment process, the e-commerce system communicates with the bank's system using web services. The web service used to fulfil the payment is provided by the bank.

These methods will be provided by all information needed to perform the payment correctly. The information includes the buyer's account number, the seller's account number and the total amount of money needed to be paid. Then, the bank will transfer the money from the buyer's account to the seller's account.

Finally, the bank sends a message to the e-commerce model to let both the seller and the buyer know that the payment has been done successfully.

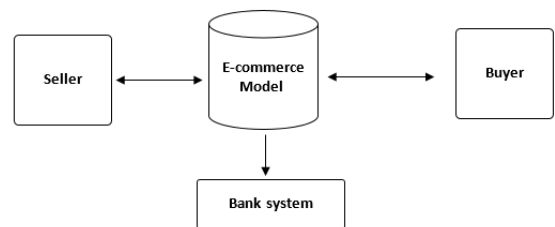


Fig.3 Money Flow

5.3 Parameters for describing model

The Customer tier in the model represents any of the web pages that are included in the system and also that interact with anyone of the web services published and provided by the service provider. Therefore, the browser represents the client in this model. The customer is responsible for sending requests to the

service provider and also getting responses from the service provider as well. The interaction between the client and the web service will be via the e-commerce tier.

The e-commerce tier is the main part of the model. This tier deals with all tiers. Therefore, the Customers services tier will be accessed through the e-commerce tier. When a customer performs any function in the system, the e-commerce tier will check if the model provides a CRM to a web service for the performed function or not. If the model provides a web service for the performed order, the system will interact with the ERP to decide which web service will match the performed function.

Several Customers services tier have been provided with the system. These are register web service, query web service, order web service and payment web service. Each of these web services contains functions that perform specific jobs. When any order gets called by the client via the e-commerce tier, it interacts with the database the information passed to it or to return information by querying the database or to delete from the database depending on the information passed to it.

The database tier is responsible for handling all information in the system. The model database stores products' information and all users' information including sellers, buyers, and their transactions with the system. Whereas, the database is responsible for dealing with all financial information such as the account number, customer name.

6. Applying Proposed DSS Model for E-Commerce (Case Study)

The e-market place part is represented by the User Interface which is the web pages implemented in the model, this part includes most of the functions that the user of e-commerce model needs; such as finding products, ordering products, payment services, and so forth. The other two parts, the web services part and the database part, work in the backend of the model to support the e-marketplace part. Some functions included in the e-marketplace part were implemented

using web services. Finally, the database part is used to deal with all information needed in the model.

6.1 Data Collection

The main objective of this model is to support customer service in the electrical and electronic appliances sector in Egypt, which is the data collection that serves the proposed model in the knowledge of customer opinions in the service provided to them.

For survey, there are different sources available. The most commonly used sources for collecting data are questionnaire, interviews and direct observations. In this paper the method of questionnaire is selected as the main method of collecting data. Because questionnaire in the most suitable method of this paper. We are trying to find out the Customer opinions on the quality of service provided to them through e-commerce.

A survey list was prepared for the customers of Toshiba Elaraby as one of the companies engaged in the sale of electronic and electrical devices in Egypt to identify the nature of use and problems that guide customers when using e-commerce, it included five groups as follows:

- The first group: includes statements concerning the characteristics of the sample
- Group 2: Includes statements related to site content.
- Group 3: Includes statements related to use and interaction.
- group 4: Contains statements concerning privacy and safety.
- Group 5: Includes phrases about attracting attention

6.2 Customer Requirements

Through the use of survey list technique with a number of customer to find out the feasibility of the use of electronic commerce to enhance customer service; has concluded that the results of Essential Customer Requirements from E-commerce Customer Service:

1. Ease of Access, many a times, websites tend to overdo their web design. This essentially means that there could be too many things happening at once on your page, which distracts the customer .
2. Technical specifications, it is difficult to understand the technical specifications available on the site for electrical and electronic devices without a specialized presence
3. Availability of Multi-Channel Customer Service, there should be more than one way that the customer can get in touch with you, according to their convenience. Whether it is email, phone support or live chat, try to provide as many contact options to the customer and ensure that the representatives are always available to answer their queries.
4. product recall, the site does not contain product recall information
5. Communication, being proactive with your customers and initiating communication with them is the first step towards building a loyal customer base. Social media tools such as Twitter and Facebook will help you in getting closer to your target audience.
6. participation, Restrict the role of the customer to watch only without the participation in mentioning the advantages or disadvantages of any product
7. Solve Problems Themselves, a ready list of FAQs and an easily accessible knowledge base on the website is a must have for every online business. Even when customers have an option to interact with you, they might prefer relying on their own research.

6.3 Applying Proposed DSS Model

DSS model for e-commerce are developed to support business activities. Customers (buyers) have their own requirements and corporate managers have to find all the ways, methods and resources to meet their needs and requirements. Great emphasis must be placed on all management control systems and systems to support the decision-making processes.

The proposed model can be analyzed in Figure 4 to the flow chart as following form to understand and explain the conduct operations from the beginning of the customer is logged to the completion of the procurement process and the architecture used is called multiple-tier client server architecture. The advantage of this architecture is that it is easy to change web services and add new web services to the system without affecting other tiers.

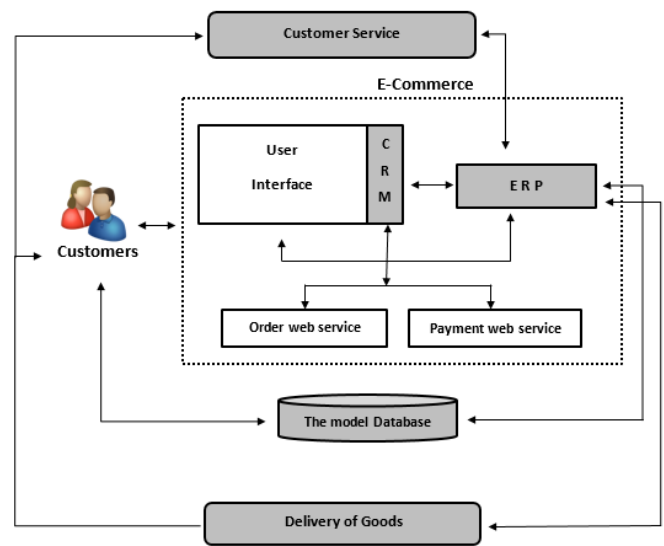


Fig.4 Proposed DSS Model for E-commerce

E-commerce model deals with aspects pertaining to the e-shop's operation. Most of these aspects are back-office concerns, such as product management, order processing and marketing, which are handled by the e-shop staff. Business management features can involve different stakeholders from both inside and outside the company. An internal stakeholder is the e-shop management; external stakeholders are suppliers and third parties providing gateway services. illustrates the top-level details of the business management feature.

The basic elements of the proposed model can be described as follows:

Product Presentation: The product presentation function provides the customer with information about the product through the user interface (browser). The information presented can include:

1. Product advertisements, including product descriptions and features.
2. Detailed product specifications
3. Sample product presentations (e.g., music clips, software demos, book chapters)

This function can include additional features such as language selection, product search, and customization for customer preferences. The function is linked to the electronic catalog, which is a database of information about products. It may also be linked to the enterprise's inventory system to ensure integrity between the data in the electronic catalog and the inventory database.

Order Management: The order management feature, illustrated in detail, deals with the workflow that describes the complete lifecycle of an order. The order workflow combines order handling and order processing activities to complete the business transaction. Order handling is responsible for “paperwork” activities; it performs four tasks:

1. creates the order when a request is submitted by the customer,
2. stores the order in the database for future processing and viewing,
3. updates the order status as it is being processed, and
4. closes the order once it has been fulfilled.

Order processing carries out the steps needed to fulfill the order, which requires communication between stakeholders. Order processing performs four tasks:

1. checks for product availability with the fulfillment center,
2. verifies the payment information,
3. sends a request to the fulfillment center to dispense the goods or have the service performed,
4. makes arrangements for the payment.

The order entry function allows a customer to place an order for selected products. Information about each product ordered is added to the electronic shopping cart, which is a database of orders in process.

Electronic Payment: The electronic payment function provides the capabilities for the customer to pay for the order and thus complete the transaction; Payment options may include credit card, debit card, COD, check (before delivery), and invoice (after delivery).

Order Fulfillment: The order fulfillment function provides for the delivery of the product to the customer. The delivery can be digital for products such as music, software, and information. Only physical delivery is possible, however, for many products such as apparel, electronics, and manufacturing components.

This function is linked to the enterprise's inventory system so that the inventory database can be updated when the order is fulfilled. For physical delivery, the function is linked to the enterprise's warehouse and shipping systems.

Customer Service: The customer service function provides assistance to customers who have problems or questions related to the purchasing process. This assistance may be needed before, during, or after a purchase, as illustrated in the following examples:

1. Before purchase: questions occurring during use of the product presentation function, such as product features or use
2. During purchase: assistance with the use of the order entry and electronic payment functions.
3. After purchase: questions about order fulfillment such as order tracking; questions about exchange or return.

Data Acquisition: The data acquisition function captures data during the customer interaction with the system. Some of the acquired data, such as customer identification and credit data, is stored in the enterprise's customer database. Much of the acquired data, however, is stored in a separate data warehouse. This data includes customer preferences and purchasing decisions.

Customer preferences data could be acquired from the product presentation function. A customer could explicitly indicate his/her preferences by entering them into the system, or the system could track the customer's product searches to identify preferences.

Customer purchasing decisions would be acquired from the order entry function when a customer places an order for specific products. The data acquired by this function would typically be used for marketing research purposes.

6.4 Results

Almost all requisite data for the decision making support in e-commerce comes from CRM and ERP systems. Business intelligence is closely related to data warehousing. Data has to be processed (data selection, data analysis, data clearing etc.) and sent in right time and in required form to the competent person usually acting in management system. Obtained data are basis for decision making support at all levels and kinds of management.

The model is supported by various web services that perform most of the jobs needed in the e-commerce model. These web services will be invoked by the model when the user, buyer or seller, wants to perform any function provided by the system. These web services are register web service, query web service, order web service and payment web service. These web services can be described as follows:

Register web service: The register web service is designed to allow users of the model to register themselves with the model. Users will not be able to use the model without registering. Some other web services like order web service require the user name and the password to allow the user to use the service. Hence, the importance of this service is very high.

Order web service: The order web service is designed to allow buyers to order products from different sellers. Therefore, this service will handle the order operation and provide the buyer with the order information.

Payment web service: The same as order web service, the payment web service is designed to be used by the buyer. This service allows the buyer to pay for the products that they have ordered from sellers.

A study of the proposed model and presentation of the model's website had the following results:

User interface quality:

1. Convenient to use the Web site
2. Attractively displayed of information on the Web site
3. Visually attractive Web sites
4. My search effectiveness is increased by using the Web site

Information quality:

1. The information of products or services that it sells on Web site is facilitates
2. Up-to-date products and services information must necessarily provide by the Web site
3. The relevant products/services information is provided by the Web site
4. An easy to understand information is presented by the Web site

Notion of security:

1. To ensure the safe transmission of its users' information, the Web site has a mechanism
2. To ensure the data I send cannot be modified by hackers, the Web site has sufficient
3. Financial risk will not occur by purchasing on the Web site
4. The Web site provide safe electronic payment

Notion of privacy:

1. Personal data protection laws Committed the Web site
2. Only user's personal data that are necessary is collected by the Web site
3. Without my consent, the Web site will not provide my personal information to others
4. When sending my personal information to the Web site, I feel safe
5. The privacy of the users is really concerned by the Web site

E-customer satisfaction:

1. The Web site performance meets my anticipation

2. Sufficient experience is having by the Web site in marketing their products and services
3. To offer the products and services, the Web site knows their users well enough to adapt with their needs
4. To carry out its activities successfully, the Web site have enough resources

E-customer belief

1. The promises and commitments he assumes always fulfill by the E-product/service
2. Giving the private information and the credit card number to the E-product/service provider is a problem
3. The Web site act opportunistically (e.g. gaining money unlawfully).

7. Conclusion

This paper provided a proposed model for decision support systems using e-commerce to increase the effectiveness of customer service, belief and loyalty. Based on the discussions throughout this paper, it can be concluded that customer satisfaction and consumer belief will be influenced by E-commerce service quality and also the mediator that will influence customer loyalty in using the website as a substitute for traditional purchases.

E-commerce models are fundamental aids of online shopping. These systems are focused on customer needs and requirements. E-commerce model are large systems and produce a huge amount of data collection particularly data related to the behavior of customers. Data has potentially great value for management and decision making support. Data must be accepted, processed and appropriately presented using appropriate tools. Only modern software tools can provide data quickly and with the required quality. Modern software tools for processing large data collections are BI and DSS systems. Development of ecommerce systems places increasing emphasis on the need to create models of these model.

Decision support system plays an important role in application of E-commerce. Benefits of e-commerce adoption include improved customer service, better inventory control, and lower marketing and distribution costs, reduced cycle time, increased market reach, and reduced operation costs. Other benefits include global connectivity, high accessibility, scalability, interoperability, and interactivity.

The fast expansion of low cost Internet access and related services has certainly been the main driver of this new business revolution and offers many SMEs the opportunity to venture into e-commerce at a price they can afford and at a level they can relate to. Effective use of a Website can provide increased levels of customer service and by simply using the Internet; it can act as a valuable information source. Thus we can conclude that DSS will have major impact on all types of business decisions.

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