

## A COMPREHENSIVE FRAMEWORK FOR ONLINE STORE FUNCTIONALITIES

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### ABSTRACT

*Online retailing today is considered as the most prevalent business model of electronic commerce applications. Research related to online stores is plentiful, but there appears to be a lack of broad and flexible frameworks that can be used to capture the functionalities of online stores in a systematic and modular manner. This paper presents such a comprehensive functionality framework in the form of a two-dimension grid, with one dimension distinguished between store functional architecture and another distinguished between store system goals. This framework provides a crucial guidance for the analysis, design, and development of online stores.*

**Keywords:** E-commerce, Online Stores, Information Quality, System Quality, Service Quality

### INTRODUCITON

Online retailing is considered as the most prevalent business model and the fastest-growing retail channel of electronic commerce applications existing today [22, 20]. The design, development, and success of online stores have been rigorously studied, but there appears to be a lack of comprehensive frameworks that can be used to effectively capture the online store functionalities in a systematic and modular manner.

Development and operation of an online store would incur high costs that need to be carefully justified and controlled. Therefore, online store owners need to have a comprehensive view of the stores and be able to systematically identify and refine system goals to achieve store competitiveness and differentiation. System goals have been recognized as powerful drivers for systems development, because they help relate system requirements to the business and organizational needs and enable traceability of design rationale [3]. From the technical perspective, the online store developers need to be able to comprehensively and systematically examine the system goals and determine functional and non-functional requirements that will produce a site design to achieve these goals. Furthermore, from the research perspective, since online stores have frequently been used as a research instrument in e-commerce studies, the researchers also need a comprehensive framework to truly understand e-commerce.

The objective of this study is to develop such a comprehensive framework. Section 2 discusses the functional architecture of online stores. Section 3 presents a synthesis and summary of system goals for online stores identified from related literature. Section 4 illustrates the framework that integrates both functionalities and system goals of online stores. Finally, section 5 concludes with some limitations of the framework.

### FUNCTIONAL ARCHITECTURE OF ONLINE STORES

“Ecommerce” is commonly viewed as “the sale and purchase of products and services over the internet, which includes the sharing of business information, maintaining business relationship, and conducting business transaction by way of internet based technology” [18]. “Online retailing” can be defined as business model of ecommerce that uses Internet-based technologies to “facilitate efficient and effective shopping, purchasing and delivery of goods or service” [33]. Shopping is browsing and searching; purchasing is ordering and paying; delivery is post-sale service.

Several attempts have been made to depict or classify online store functional architecture. Nour and Fadlalla [31] classified the Internet-based virtual markets according to two principal marketing categories: *product* and *delivery*. Rowley [38] viewed online stores in terms of five components of marketing activity: *promotion*, *one-to-one contact*, *closing*, *transaction* and *fulfillment*. Emphasizing the customer’s perspective, Wan [45], added “*service*” as the sixth

component to Rowley's model. Focusing on sales strategies, Kim et al. [20] structured Web-based shopping and electronic commerce into four types: *general-direct-sales*, *general-intermediary-sales*, *specialized-direct-sales*, and *specialized-intermediary-sales*. Analyzing ecommerce websites of Fortune 500, Liu et al. [27] proposed that the functions and features of these websites can be classified into three phases of marketing: *pre-order*, *online*, and *after sales*. From the merchant's perspective, Angehrn [2] formulated a model for analyzing and classifying e-commerce strategies through four virtual business spaces: *information*, *communication*, *distribution*, and *transaction*. Finally, from the viewpoint of website design, Wen et al. [46] argued that the functionalities of online stores can be *informational*, *communicational*, or *transactional*.

The functional architectures of online store found in the literature were mostly formulated in terms of the presence of certain functions from examining the websites. As a result, these models ignore the backend modules (e.g., administration, content management, etc.) of an online store. In summary, this paper suggests that the functionalities of an online store can be categorized into the following seven functional modules with their sub-functional units:

- *Catalog*: Customers are able to navigate product categories within a single or multiple levels of category structure. A list of products will appear depending on a customer's selections through such a product structure. Often the customers are given alternatives to filter products by name, brand, and/or price. The product description page offers the customers additional details of product information such as product review, product comparison, and price comparison. The search feature allows customers to type in the product description and/or item number in order to find the product without having to navigate through the product structure. After the customers type in their interested item/description, a list of relevant items will appear on a page.
- *Marketing*: To increase Internet awareness and competitiveness, online stores are often designed and structured in a way to effectively pursue a Search Engine Optimization (SEO) campaign. As a common strategy of product promotion, new and bestselling products are organized and presented in a fashion to successfully attract visitor's attention. To retain existing customers, coupons or other incentive programs are integrated into the online stores' shopping workflow. Finally, customer's purchasing and browsing history can be collected and analyzed by the online store's data warehousing tools to support other niche-driven marketing campaigns.
- *Communication*: Businesses use various media to communicate with their current and potential customers. Using the Internet technologies, online stores can extend a traditional market space to a powerful virtual community where economic agents can meet to exchange ideas and experiences, influence opinions, negotiate potential collaborations, lobby, and engage in relationships. Web applications such as RSS feed (e.g., new product announcements), discussion board (e.g., FAQ and Help desk), blog (e.g., customer testimonials), and others are being integrated into online stores for this purpose.
- *Transaction*: Each visitor is assumed to be carrying a "shopping cart". Each item that a customer is interested in purchasing can be saved into the shopping cart. During the *shopping* process, the customer can maintain the shopping cart by deleting an item, increasing the purchased quantity of an item, or simply emptying the whole cart to start it over. Previously unfinished cart items can be saved by the online store and rendered to the corresponding customer for his/her next visit. The items in the cart are usually listed in a format including product number, product description, purchased quantity, unit price, sales tax, subtotal, and so. Once the shopping is done, the customer will proceed to the *payment* (i.e. checkout) process where he/she supplies necessary information related to payment, shipping, and discount. If the online store is account-based, it will ask each customer to complete the payment process by creating a personal account or signing in by using an existing account. After the payment process is done, the online store will activate a series of billing actions before approving the transaction. Once the transaction is approved, the online store will send an order confirmation to the customers, close the shopping session, and archives the transaction.
- *Fulfillment*: Products sold online should ultimately be transferred to the buyer. There are two delivery modes. Most of the products can be delivered terrestrially, meaning that the product is physically carried through such means as air, sea, or ground transportation. To deliver products terrestrially, online stores need to provide the order data as well as shipping data to its shipping unit or the outside shippers such as UPS, FedEx, and others. For some types of product, online stores can choose to distribute the products and their auxiliary products/services digitally through the Internet. For examples, software drivers, operations manuals, warrantee information, and so on can be pre-digitalized and offered to be downloaded at the customer's convenience.

- *Support*: Depending on the strategies and policies of the online store's Customer Relation Management (CRM), online stores may allow the customers to maintain their account information and access to other business information such as order status, payment status, delivery schedule, and many others. Customers may also be able to request and process return and/or refund online.
- *Administration*: Many advanced online stores allow the store owners to maintain their product catalog, product information, and promotion choices and policies online. For account-based stores, web administrators are able to deal with the authorization and maintenance of user accounts by granting login privileges, updating account profiles, resetting account passwords, activating/inactivating accounts, and unlocking accounts. Still many online stores are developed as an add-on module to a firm's legacy system. The business processes implemented on both ends need to be integrated and data generated separately needs to be consolidated.

## SYSTEM GOALS OF ONLINE STORES

The increasing significance of online retailing has motivated a number of studies to look for factors that facilitate the success of the online stores. These factors are in fact system goals that can generally be found in relatively established literature in areas such as online consumer behavior, store image composition, technology acceptance model, Internet retail quality, website success determinants, and so on. Research [1, 12, 19] for instance, in these areas commonly employs theoretical or empirical models consisting of multi-dimensional constructs that incorporate the functional aspects of the service process as well as the technical aspects of the service outcome.

Without a unified view, it would be very difficult to reconcile such a considerable number and variety of system goals employed in these models. This paper uses Delone and Maclean's [10, 11] model of IS success as the base framework to synthesize and organize these various success metrics. The Delone and Maclean's model proposes that *Information Quality*, *System Quality*, and *Service Quality* are the three key dimensions that would affect e-commerce success. The Information Quality dimension measures the e-commerce content; the System Quality dimension measures the desired characteristics of an e-commerce system; the Service Quality dimension measures e-commerce services. Using such a unified view, the following sub-sections present a high-level synthesis and summary of the system goals identified and researched in the related literature. The Delone and Maclean's model has been largely applied and satisfactorily validated over the years.

### Information Quality

While availability is not a new attribute of information, the importance of *information availability* as a system goal has grown tremendously due to the criticality of systems that are now operating in the distributed computing environment. This is evidenced by the fact that the dynamic nature of digital shopping interfaces has enabled online retailers to provide consumer information in a directly and timely manner. The information availability of an online store plays a vital role in influencing the attitudinal and behavioral intentions of a consumer. For example, studies [5, 17] have indicated that one of the most important advantages of electronic shopping environments relative to the traditional bricks-and-mortar retail settings is the availability of product and market information that can significantly reduce the consumer's cost of search. Another study [12] suggests that consumers who visit a website with up-to-date information were found to be more willing to revisit the site. In a recent laboratory experiment [42] it was revealed that providing access to competitor price information may result in enhanced long-term preference.

The *organization of information*, corresponding to the effective structuring and display of the website content, is another system goal in this dimension. Online store content should be structured using effective and intuitive taxonomy, naming and labeling. Well-defined categories always make it easier for customers to find what they are looking for. Research [30, 12] has shown that the better the website content is organized and presented, the more likely the consumer will experience a positive association with the website.

The viewpoints towards the *quality of information* are somehow diversified in the literature. Delone and Maclean [11] indicate that the information quality measures that have been used in recent ecommerce studies include accuracy, relevance, understandability, completeness, currency, dynamism, personalization, and variety. In their

own model, however, Delone and Maclean suggest that the quality of the information can be measured in terms of accuracy, timeliness, completeness, relevance, and consistency. Still in another study, for example, [39] argue that information presented on an online store captures the perceptions of consumer regarding the characteristics of the website content as accuracy, comprehensiveness, reliability, relevance, and usefulness. In fact, these measures represent different aspects of the quality of the information.

## System Quality

System quality, in the Internet environment, measures the desired characteristics of an e-commerce system. For online stores such desired characteristics are system goals exhibited through the design features of the store website. While the information is an indispensable element of a successful online store, it is the design features and their quality that deliver the information efficiently and effectively.

The most common measure for design of ecommerce systems is *usability*. With the prevalence of the Internet there has been additional pressure for the design to be usable. Abundant research has already focused on finding and defining the optimal set of attributes that compose usability, but different viewpoints have led to different definitions and standards [14]. This paper does not intend to differentiate what constitutes usability, but rather to identify and discuss individual key usability attributes for online stores.

The *layout* of an online store refers to the underlying website structure which has been found to be a critical factor that would drive consumer elaboration and response in retailing and significantly impact a retailer's overall performance [44]. Griffith [15], for instance, indicates that consumers exposed to a tree structured online store layout perceived the store to be "easier to use, experienced greater elaboration of product related information, and had higher levels of product and brand recall, greater purchase intentions and a more positive attitude toward the retailer than those exposed to a tunnel structure online store layout". For this reason many large commercial websites such as Yahoo and MSN have altered their layouts at one time to give it a new and better look.

In the browsing task the customer is assumed to have incomplete, imperfect knowledge of the contents and its organization, and the browsing process is therefore fundamentally uncertain and iterative. To solve the problem, a successful online store should employ an efficient and effective scheme of *navigability* to enable consumers to find information or products in a way that is meaningful to them. Rosenfeld [37] suggests that superior navigation can be achieved by placing various navigation components, such as global navigation, local navigation, unity navigation, contextual navigation, information links, page numbering, and site map, throughout the site.

Attitude toward the use of an information system is a function of two beliefs: perceived *usefulness* and perceived *ease of use*. Perceived usefulness refers to "the degree to which a person believes that a particular information system would enhance his or her job performance by reducing the time to accomplish a task or providing timely information," while perceived ease of use refers to the degree to which a person believes that using a particular system would be free of effort". In other words, the perceived usefulness pertains to the effectiveness aspect of the system use, while the perceived ease of use pertains to the efficiency aspect of the system use. Both attributes have been largely researched and proved to be two major system goals for the success of online stores [23, 27].

As Internet shopping grows, online retailers will need to explore ways to adjust, manage and manipulate a variety of cues to deliver consumers satisfactory shopping *experience*. Now more than ever, the action of online shopping has become an experience more than a task. A research study of Kohli et al. [21] discovered that the customers' attitudes and beliefs regarding convenience have significant effects on their intention to purchase online. A survey [6] has identified convenience one of the top reasons consumers like to shop on the Web.

Another important success factor of online shopping is *playfulness* (i.e. pleasure or enjoyment). Empirical studies have shown that a satisfied customer not only comes from an extrinsic reward of purchasing products or services but also from personal and emotional reward from purchasing-derived pleasure or enjoyment [12]. An e-commerce

study [28] provides evidence that embedding background music properly in the online shopping cart may generate a positive attitude toward the website.

Today's ecommerce activity is basically a function of *interactivity* between customers and the site. Interactive tools might have favorable effects on the quality and the efficiency of purchase decision [17]. Interactivity also promotes involvement. Chiagouris and Long [8] indicate that low-involvement shoppers and high-involvement shoppers don't react the same way, and the online retailer cannot treat them the same way in terms of tactics. For instance, low-involvement shoppers who rated a website entertaining were also likely to rate it favorably.

In a physical retail store there is a salesperson to guide the customer during the search process and helps him find the best product that suits his needs. In online stores such sales personnel are not available, thus making the mechanisms to search an essential system goal. A successful online store should incorporate friendly and powerful *search capability* that enables consumers to locate the product they want more efficiently and effectively. Parra and Ruiz [34] reported that search tools can transform the way online shoppers create their consideration sets to be smaller, more stable, and more homogenous. Lin et al. [25] suggest that the design of online store should include both keyword search and browse search. By combining both searches we allow full search coverage and more maneuver space for the customer to search for an item in the best way he thinks or accustomed to.

*Personalization* has become one of the central focuses of attention for web-based systems. Lin et al [25] argue that a personalized search facility can be integrated into the store design to increase long-term relationship with the consumers and the store's long-term benefits. Ardissono et al. [4] developed a B2C system to personalized the presentation of the catalog and elicit information about the user's needs in order to actively suggest alternative products for the consumers.

The ability to compare may increase variety-seeking behavior and motive in the online context [36]. Kohli et al. [21] argue that *decision support* can be effective for the design and choice phases of online consumers' decision-making process. Thus, understanding the online consumers' decision-making process plays a central role in an online store's ability to satisfy the consumers' needs. An online shopping store can provide decision support capabilities for searching, comparing, and finally recommending a product to the customers.

The *technology* of e-commerce decides what can be offered to customers, but only customers determine which of those technologies will be accepted [18]. De Wulf et al. [12] also argue that the extent to which the technology simplifies the site and makes the visit successful can be evaluated on both reliability and progressiveness. Reliability refers to the end user's perception of the adequate technical functioning of the web site; progressiveness means that a website employs state-of-the-art technologies. According to media richness theory, interactive multimedia applications provide capabilities richer than text and photographs of traditional brochures or catalogs.

## Service Quality

Service quality is one of the three critical factors in IS effectiveness, alongside the *system quality* and the *information quality*. Gefen [13] views service quality as a subjective comparison between expected and actual quality of service provided to the customer. Yang [48] suggests that service quality in online environments may be an important factor contributing to success or failure of e-commerce business. In fact, for online stores with heterogeneous offerings and "self-service" technologies facilitating customer-business interaction, service quality may be one of the most important differentiators. In light of this evidence the online companies may need to shift the e-business focus from e-commerce (i.e., the transactions) to e-service (i.e., the support that occurs before, during, and after the transaction) [33].

Zeithaml [49] defines electronic service quality (e-SQ) as "the extent to which a Web site facilitates efficient and effective shopping, purchasing and delivery". Thus, service quality of online shopping sites can be conceptualized as the overall support provided by the online retailers to customers in the pre-, during-, and after-sale functions. In the context of e-commerce, successful web sites must attract and retain customers, make customers feel that the site is

trustworthy and reliable to conduct business in the virtual environment, and generate customer satisfaction with online interactions. The review of the extant literature on the service quality dimension in e-commerce systems points to the following categories of system goals -- *trust*, *security*, *privacy*, *reliability*, *fulfillment*, and *recovery*. *Trust* refers to the confidence in the retailer's honest and dependable service. *Security* is the system's protection from unauthorized use, fraud, and financial loss. *Privacy* is the protection of personal information from unauthorized parties. *Reliability* is the function of performance consistency and dependability. *Fulfillment* is the delivery of products (or services) as promised by the vendor. And, *recovery* is the handling of customer's problems, issues and concerns. Next, we will examine each of these service quality goals in greater detail.

*Trust* has been studied frequently as an outcome variable in online environments and was found to be a key to the effective functioning of ecommerce applications [12]. Chen and Dhillon [7] also argue that the web site's infrastructure is a source of trust in the vendor's competence, integrity and benevolence. For online vendors, the web site is the primary channel for communicating and building relationships with customers. Thus, vendor's structural assurances on returns and security policies, testimonials of existing customers, availability of contact information, and third-party privacy assurances, may help build trusting relationships with customers.

In the empirical study of web trust, [35] found that *trust*, as a "structural assurance" in the ethical and socially appropriate behavior of the online store vendor, has a direct influence on customer's behavior in using the web site. Web trust has a moderating effect on customer satisfaction with the site's content and format. It also impacts customer's perception of the site's usability in terms of usefulness and ease of use. Finally, in a theoretical paper on an e-Business model ontology, [32] emphasize the importance of developing and maintaining the "relationship capital" in the virtual world that lacks face-to-face interactions. Customers' trust and loyalty are important aspects of this "relationship capital". It is generally considered to be less expensive for online stores to instigate the existing customers to purchase their products/services than to acquire new customers. Consequently, online stores must develop policies and support services to leverage customer's trust and loyalty. This "relationship capital" may be built through good performance history, by posting explicit policies of security and privacy on company's web site, and engaging in proactive resolution of customer problems, issues, and complaints.

Closely related to *trust* are the system goals of *security* and *privacy*. Customer's perception of security and privacy issues may affect their voluntary use of e-commerce systems and their satisfaction with the systems [16, 29]. The perception of *security* refers to customer beliefs that the web site is safe from internal and/or external intrusion. Customers purchasing through an online store must be assured that the web site is so reliable that the security of both ordering and credit-card payment are treated with utmost care and appear important to the store. Web site's security, as viewed through the lenses of customer service, may involve both managerial and technical measures to protect against unauthorized access, as well as the loss, destruction or disclosure of sensitive data [40]. For example, online stores that display the McAfee SECURE Trustmark certify that they pass a rigorous, daily security scan for hacker testing, links to malicious web sites, browser exploit codes, and privacy of customer e-mail addresses.

The perception of *privacy* in the e-commerce context refers to customer's ability to maintain the confidentiality of their information throughout (and post) the e-transaction cycle. Significant amount of e-commerce income may be lost due to customers' concerns over lack of privacy when purchasing online through "self-service" technologies. Tsai et al. [43] discovered that providing accessible privacy information reduces the information asymmetry gap between merchants and consumers and leads consumers to purchase from online retailers who better protect their privacy. The same study also revealed that consumers tend to be willing to pay a premium to purchase from more privacy protective websites. Confidentiality has been the primary goal of information assurance, because there has been and continues to be a desire for systems to be "trusted". By controlling access to information and preventing unauthorized disclosure, a system has achieved confidentiality [12]. Smith and Shao [41] refer to customer's ability to retain the maximum amount of privacy and control over their personal information as "consumer-centric privacy". They suggest that online companies must use technologies to protect individual privacy by enabling anonymous communication channels, minimizing the amount of personal information required to complete an e-transaction, and using third-parties to certify the trustworthiness of the site. For example, the sites displaying the TRUSTe seal certify compliance with federal and state requirements for ensuring data privacy.

Another system goal of e-service quality is *reliability*. This goal refers to vendor's dependability, consistency of performance, and technical functioning of the site [9]. More specifically, the web site is considered to be reliable when it is available to customers at any time and when all of its features, functions, and utilities function properly at all times.

The final system goal of e-service quality is *recovery*. This goal refers to the web site's handling of customers' concerns and problems related to any aspects of their interaction with the online store [33]. Even though most of the e-tailing transactions do not involve human agents, when something goes wrong during or after the sale transaction is concluded, customers may seek either person-to-person or virtual support from the site via direct contact. Effective service recovery may have a positive impact on customer loyalty and increase positive word-of-mouth communication [24]. Parasuraman et al. [33] indicates that this system goal is very much related to *responsiveness* which refers to quick and effective handling of problems and returns through the site. Liu and Arnett [26] found that quick response to customer problems, assurance to solve problems and issues brought up by the customer, empathy towards customers and their issues, and follow-up on customer concerns constitute the service quality factor associated with web site success.

In summary, the service goals of *system quality* in the e-commerce context include *trust*, *security*, *privacy*, *reliability*, and *recovery*. In the next section we will delineate a conceptual framework of online store functionalities and outline tactics for using the proposed framework.

## THE FRAMEWORK

Based on the identified online store functionalities and system goals, a framework in a 2 x 2 grid format (see Table 1) was developed, with the horizontal axis distinguished between store functionalities and the vertical axis of the matrix distinguished between system goals. In the framework each interaction represents a distinct and unique perspective and a space of opportunities for developing functionalities to meet system goals. Each interaction can also be considered as functional scenario where use cases can be developed.

The use of the framework is simply a two step process. The first step is to systematically identify system goals in the three quality dimensions of the DeLone and Maclean's model of IS success (i.e., information, system, and service), followed by the identification of store functions to be created to achieve these system goals. For example, assume an online store intends to increase its *fulfillment* quality in the *Catalog* module, it can develop an "Inventory Notification" function to instantly notify customers when the inventory is back in stock. The online store may choose to enhance the quality of its *ease of use* and *interactivity* by creating rich user interface through AJAX technology in the *Catalog* browsing. Once the *Catalog* module is examined, the online store moves to *Marketing* module, and so on until it comprehensively goes through all the modules to identify all its system goals and functionalities that would best represent the its interest and technological competency.

## CONCLUSIONS AND LIMITATIONS

This paper suggests that the identification of online store functionalities can be done in a systematic and modular fashion through the use of a comprehensive framework. The framework is a two-dimension matrix, with one dimension distinguished between store functional architecture and another distinguished between store system goals. This framework provides a crucial guidance for the analysis, design, and development of online stores. Further works are encouraged to apply and evaluate the framework in the industry.

There are two limitations that need to be addressed. First, the framework only reflects a scope of functionalities that is limited over time. Thus, the framework needs to be monitored as technology advances, website design paradigm shifts, or marketing competition changes. Second, no effort was made to integrate other online functionalities (e.g., backend integration, logistic operation, etc.) needed to interact with those in the framework.

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# Issues in Information Systems

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SYSTEM GOALS		FUNCTIONALITIES						
		Catalog	Marketing	Communication	Transaction	Fulfillment	Support	Administration
Info. Quality	Availability							
	Organization							
	Quality							
System Quality	Layout							
	Navigability							
	Usefulness							
	Ease Of Use							
	Convenience							
	Playfulness							
	Interactivity							
	Search Capability							
	Personalization							
	Decision Support							
	System Capacity							
Service Quality	Technology							
	Trust							
	privacy							
	Reliability							
	Recovery							

Table 1