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# Characteristics of System Requirements for Electronic Commerce

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*Abstract*--This paper outlines some critical characteristics of requirements for developing a system designed to support electronic commerce. The characteristics are based not only on traditional user and organizational needs and goals, but also on specific requirement issues that arise in developing network systems and applications for electronic commerce. We then illustrate how an commercial electronic commerce system satisfies the proposed characteristics. A longer version of the paper is available.

## Introduction

The advent and proliferation of the Internet and electronic commerce have placed new demands upon systems analysts. Old problems must be addressed in new ways, and a powerful tide of new problems must be addressed as well (Berg and Tien, 1995). Systems designed for electronic commerce are in many ways fundamentally different than traditional business systems. Thus, since the systems themselves are different, we must address new requirements demands that are now upon these new systems. We believe electronic commerce requirements are important enough to be included as a separate layer in an electronic commerce design framework (Shaw and Yadav, 1997).

Our current research builds upon the framework of Shaw and Yadav by detailing some specific characteristics of requirements necessary for a successful electronic commerce system. This paper highlights some of the main points of our ongoing research. We begin by describing some relevant background literature in the fields of electronic commerce and requirements determination. We then propose some sample electronic commerce requirements characteristics and illustrate these characteristics using a successful commercial electronic commerce system. We conclude with some directions for future research in this area.

## Background and Motivation

The field of electronic commerce represents a relatively new area of research for business and organizational researchers (Applegate, 1996). Accordingly, the body of literature dedicated to electronic commerce is quite small compared to that of other, more established fields (Shaw and Yadav, 1997). While the issue of requirements analysis is certainly not new to researchers, the topic has yet to be properly addressed in the context of electronic commerce.

Many systems analysts feel that the most important stage of systems analysis is the requirements definition (Barlow, Bentley, and Whitten, 1994). In electronic commerce, requirements determination becomes especially important because new service and productivity requirements must be introduced into large complex legacy systems of today (Berg and Tien, 1995). Recently, Aldred and others presented requirements for a multimedia communication architecture (Aldred, 1995). We have considered the requirements proposed by these various authors and synthesized a set of characteristics that are inherent to electronic commerce system requirements.

## Characteristics of Electronic Commerce System Requirements

Many typical system requirements are common to many different types of systems. For example, portability and user-friendly interfaces are fairly common requirements; however, the fledgling field of electronic commerce presents new and unique requirements that have certain necessary characteristics and

features to go along with those of traditional requirements. Many issues are already addressed by the OSI model for networks; however, we shall consider the following characteristics as issues above and beyond those addressed by the OSI model. Indeed the issues addressed by the OSI model are important; however, they must be extended for the unique requirements of electronic commerce. For example, consider the following example characteristics of system requirements that are unique to electronic commerce applications:

- multiple modality in the user interface --- in EC, the user dictates to the system what type of interface is required, i.e. which web browser, etc.; thus the system must be able to support many different interfaces
- support for various standards --- different companies, consortia, and working groups are all backing different standards for EC protocols, so this lack of standardization must be addressed by the system designer
- stringent security and authentication controls --- a successful EC system must be secure in its transactions and be able to authenticate senders and receivers
- scalable technology --- EC popularity is increasing at an exponential rate and systems must be built to plan for future expansion and upgrade even more than a traditional IS
- real-time interactive transaction processing --- an EC system must support online transaction processing, like many traditional IS; however, an EC system must provide real-time two-way data interchange between the system and the user, unlike traditional IS
- error-free data transmission --- in a traditional telecommunications system, certain error rates can be tolerated; in contrast, an EC system must have faultless data transmission, because the slightest error can corrupt a transaction

We will expand on some of these issues in the following paragraphs.

The first characteristic of requirements necessary in all electronic commerce systems is the capability to adapt to different user interface environments imposed by the user. For example, a web page designed as the interface for electronic commerce transactions must be able to support various World Wide Web browsers such as Microsoft Internet Explorer and Netscape Navigator. The system would be inadequate if, for example, the interface used HTML extensions supported by only one browser without making provisions for users who might not have a browser capable of handling such extensions. In addition, some users prefer a strictly text-based interface, because of bandwidth restrictions, etc. A successful EC application must be designed to handle such cases.

A successful electronic commerce system must also be able to deal effectively with the many different standards and technologies available for electronic commerce. For instance, some payment systems support the SHTTP protocol, while others support SSL, a competing technology (Applegate and Gogan, 1996). This desired flexibility will be enhanced with the use of open specifications (Aldred, 1995), thus allowing independent extension and conformance to the specifications of the system. The flexibility desired in an electronic commerce system is crucial because of the current lack of standardization in electronic commerce. This lack of standardization is the reason that support for different standards is a much more important characteristic in an electronic commerce system than in a traditional system.

Stringent security and authentication procedures must be present as well for a system to be successful in electronic commerce. Users will be unwilling to do business via an EC system unless they are completely satisfied of its security. This fear of insecure transactions is one of the biggest obstacles to widespread electronic commerce today (Ahuja, 1997). Management is unwilling to commit assets to help build insecure systems, and users are unwilling to use them. Consequently, unless an EC system has very stringent security controls and authentication procedures, the system will not be successful.

The fourth characteristic of requirements for a successful electronic commerce system is scalability. With the advanced state of technology increasing at an exponential rate, systems analysts and designers must ensure that new systems can easily upgrade to new technology and are capable of handling increased

capacity as organizational needs grow. In electronic commerce specifically, the potential for a significant increase in future usage is tremendous. As electronic commerce grows and matures as an industry, the demands on the systems will grow as well. Consequently an electronic commerce system has to satisfy scalability requirements that are above and beyond those of traditional systems.

We have considered several characteristics that are inherent to electronic commerce systems and applications. Some of these characteristics of requirements might also be necessary for some traditional, non-EC systems; however, we have demonstrated that designers must pay extra attention to these issues in electronic commerce applications. In the next section, we will illustrate our requirements by showing how they were evaluated and satisfied in the implementation of a successful commercial electronic commerce system.

### **Illustration of the EC Requirements**

We show that most of our requirement characteristics are present in electronic commerce systems development in business today. To show that our electronic commerce requirement characteristics are indeed applicable to today's business environment, we will illustrate how some sample requirement characteristics were implemented by one electronic commerce company. We apply our characteristics to a case study of Open Market, Inc., an electronic commerce software company based in Massachusetts (Applegate and Gogan, 1996).

The first characteristic of requirements for electronic commerce systems, multiple modality in the user interface, is a key issue for Open Market. Their systems are designed to support practically all the different kinds of popular Internet browsers. Open Market does not want to limit its clientele to those users who prefer one specific type of browser or interface. They generalize so that they may expand their customer base.

Also easily seen from Open Market is the importance of building systems that are capable of supporting multiple standards while standards debates rage in different arenas around the globe. Because of debates over standards, both the SSL and SHTTP protocols are supported by Open Market's payments software. Open Market believes that this multi-protocol support is vital to successful systems.

The case shows that the third characteristic, tight security, is probably the primary concern for Open Market. The company is concerned with making its products attractive to customers by demonstrating and quantifying the increased benefits that can come from the use of highly secure transactions in electronic commerce. Open Market emphasizes a layered approach to security so that customers can have a level of security that will meet their exact specifications.

Another of the four characteristics we have discussed, scalability, is also a key issue for Open Market. Members of design teams take care to build systems that can continue to grow and function as organizations grow. They know that the electronic commerce market has the potential for rapid expansion, and thus systems must be designed to handle the expansion.

### **Conclusions and Future Research**

We have presented a set of requirement characteristics to be used in developing electronic commerce systems. The requirements will be of use to practitioners and researchers alike. Practitioners can use the characteristics as general starting points for the analysis and design of electronic commerce systems.

The proposed requirement characteristics present new challenges for research in electronic commerce as well. To illustrate some future research opportunities, we offer some potential research topics that should be examined in detail:

- How can an organization adapt the characteristics to its specific needs?
- How do the characteristics change from industry to industry?
- How do the characteristics impact other areas of electronic commerce, i.e. the other layers of the Shaw and Yadav framework (Shaw and Yadav, 1997)?

We continue to rigorously investigate such topics.

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