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A Framework for Planning E-Business Information Systems: A Research Proposal

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Abstract

E-business rests upon the foundation of a class of information systems that we call E-business Information Systems (EBIS). These systems are different from traditional client-server systems in the sense that they are based upon the ubiquitous Web technologies and are highly scalable. In this research we look at two dimensions and three sub-dimensions each of EBIS, namely, information integration and timeliness of information and develop a framework for planning for such systems. We will develop a detailed planning methodology based on the principles laid out in the framework. This methodology will identify key design and evaluation criteria for different types of EBIS applications. It is further proposed that the methodology will be validated through retrospective analysis of the processes used in organizations that have developed different types of EBIS and through action research where the methodology will be used in EBIS projects.

Key Words: E-business Information Systems, Information Integration, Timeliness of Information.

Introduction

E-business/e-commerce has been defined differently by different authors. One definition that fits the scope of this research is to define it as "the complex fusion of business processes, enterprise applications and organizational structure necessary to create a high-performance business model" (Kalakota, 1999). We will focus our attention on the fusion aspect of business processes and enterprise applications, i.e., how do E-business information systems (EBIS) help in achieving integration of business processes and applications.

Starting with the use of the Web by businesses just a few years ago, great improvements have been made in enhancing the interactivity of web sites, so much so that more and more of the web sites of companies are now turning into "portals" that serve as gateways to the organization's entire information systems. Such sites are enabled by a new breed of information systems, known as E-business Information Systems (EBIS). Hence, planning for E-business, besides other things, entails planning for EBIS. Developing a framework to plan for EBIS is the focus of our research.

EBIS and Information Systems Planning

EBIS systems basically entail employing the Internet technology and the capabilities of a Web browser to create systems that enable intra-enterprise and inter-enterprise applications. This use of Web-based applications to manage information is a substantial improvement over traditional information systems and conventional uses of the Web technologies because such applications have the potential to substantially expand the scope and the opportunities of an enterprise. Organizations need to recognize the need to employ EBIS in pursuing enterprise objectives in an integrated and enlarged information space by removing constraints imposed by diverse computing platforms, networks, and applications. Many scholars have discussed how the Internet and the Web technologies can be employed in functional areas such as manufacturing, marketing, and logistics. In a survey of the 100 companies a third of the respondents said that they use the Internet in 10% to 25% for their business critical applications (Baer, 1998). This is an impressive figure for the use of the Internet as a platform for developing business applications.

In the recent past, a few frameworks for EBIS planning have been put forth. For example, the Industry Framework for E-business (Kalakota and Whinston, 1996) identifies the significance of technologies in E-business. The Hierarchical Framework of E-business (Zwass, 1996) offers an E-business architecture with three meta-levels of infrastructure, services, products, and structures. While the Kalakota and Whinston framework supports E-business technology planning, the Zwass model focuses on supporting a firm's understanding of E-commerce environment. (Raghunathan and Mandev, 1999) developed a firm level framework for E-commerce from an information systems perspective, where the focus is on aligning E-business information systems to business and information systems strategies. None of these frameworks however focus adequately on the question that we think is seminal to EBIS planning, i.e., the role of the Web technologies as agents of enterprise integration.

Classification of E-business Information Systems

As discussed in the previous section, E-business information systems rely upon the enterprise integration capabilities of the Web technologies. Behind all E-business portals runs a technology that has the potential to integrate different enterprise systems, databases, workflows, and other transaction processing systems of a

firm. However, to organizations that are actively deploying EBIS, some of these technology issues are a major impediment to more wide-scale use of e-business. In particular, the challenges of integrating legacy business applications into an e-business system prove formidable to these organizations (The Delphi Group, 1999). Due to easy scalability of the Web technologies, these systems also have the potential of scaling to extended enterprise systems as evidenced by the rise in popularity of Web-based supply chains. In this area also issues like webifying existing ERP, customer relationship management, and procurement systems remains a challenge. Notwithstanding the practical issues of connecting diverse systems through the web, information integration is one important functionality that EC information systems must possess.

Another dimension of these systems is the timeliness of information, or, what has been referred to as the half-life of information. Certain E-business information systems, like those for on-line newspapers, travel and stock trading portals, must exhibit high timeliness of information, i.e., information must be updated in almost real-time. Some other systems, on the other hand, need not support such a high degree of timeliness of information. For example, in a web-based procurement system, information need not be updated as frequently as on an on-line stock trading portal.

As shown in table 1, we use these two dimensions to classify different EBIS applications

Table 1. EBIS Classification Framework

Information Integration	III	IV
H ↑	• We-based supply chain systems • Web-based new product development systems • Web-based procurement systems	• We-based travel and hotel reservation systems • On-line stock trading systems • Auto and chemical exchanges
	I	II
↓ L	• Web-based document management systems • On-line music systems On-line video games	• On-line news papers, e-zines, Web-radios

L← Timeliness of Information→ H

The above classification is not granular enough to lead to a concrete framework to plan for EBIS and needs to be further refined. Information systems can be classified under three broad categories – namely, systems that are geared towards automating internal processes of an enterprise, those that automate the inter-enterprise processes, and systems that are geared towards a firm's customers. The first category of systems is the oldest and has been in existence since the beginning of the use of computers to automate organizational business processes. Inter-organizational systems are more recent. Although American Hospital Supply Corporation, using mainframe technology, successfully experimented with automating inter-organizational processes as far back as in the 1960's, such systems became popular only with the advent of computer networks [Neumann, 1994]. The notion of customer-oriented information systems was popularized by authors like Ives and Learmonth who developed a customer resource life cycle model to plan for customer-oriented organizational information systems [Ives and Learmonth, 1994]

Based upon the above three categories of information systems, there are three distinct areas that firms can target in their quest to develop integrated information systems, namely, integration within the enterprise, inter-enterprise integration, and integration of organizational processes with customer processes.

Similarly, the question of timeliness of information has different dimensions to it. Information can be updated instantaneously, almost instantaneously, or, it can be delayed until some new event happens (for example, when a new version of the information is ready to be put up on a Web-site). Real-time information updates will be necessary in situations like EBIS for news papers, for stock market quotes, or those that monitor time-sensitive information like airplane flights and hotel reservations. Nearly real-time information updates will be appropriate for EBIS for inventory management. On the other hand, web sites for MP3s, on-demand video, and on-line computer games can delay update of their content until they are ready to provide a new song, video, or computer game to their customers.

Expanding the framework of Figure 1 along these additional dimensions, we get a three by three matrix of Figure 2. Each of the nine cells of the figure is populated with illustrative examples of applications in each category.

The Planning Framework

In this research we will develop a detailed planning framework based on the EBIS classification laid out in the preceding section. For example, each of the nine cells of figure 2 points towards a generic classes of EBIS

application which has its own typical key design criterion and information flows. We will map the above cells to designs, information flows, and systems requirements appropriate to the applications in that cell. Furthermore, we will validate the framework through both retrospective analysis of the processes used in organizations that have developed different types of EBIS and through action research where the methodology will be used in EBIS projects and the effectiveness of the methodology and its limitations will be evaluated. Such projects will be undertaken in collaboration with consultants who are engaged in EBIS applications development in organizations.

Table 2. A Taxonomy of EBIS

Temporality → Integration ↓	Real-time	Nearly Real time	Delayed
Internal Integration	Desktop Video-conferencing, real-time account updates	Concurrent manufact-uring, inventory systems	Phone-books, HR applications
External Integration	Desktop Video-conferencing, real-time funds transfer, hotel, airline, car-rental reserv-ation systems	Supply chain systems	Rules and regulations, tariffs, rates, routes
Customer Integration	e-brokerage, hotel, airline, car-rental reservation systems	On-line banking	Music, video, computer game, medical information portals

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