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Current Information Technology Infrastructure for E-Business

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Abstract

The e-business application can be considered as a new generation of computer information systems in the Internet era that needs the support from a solid information technology infrastructure including strategic objectives, physical components, and operational management. A survey was conducted to investigate some current practices and its implications of the information technology infrastructure existed in thirty organizations from ten different industries located in California. These organizations reported that they have implemented two or more e-business applications using the different types of the network operating systems and network security protections. The most used e-business development method is still the traditional in-house development method that offers the best management planning and controlling strategy to align the overall business and information technology objectives together. The system integration, email system management, and customer relation management have gained their importance in the routine operating functions at the information technology department.

1. Introduction

The constant improvement of the powerful and inexpensive microcomputers and the advancement of the distance networking communication technologies have pushed the birth of the Internet. On the other hand, the invention and usage of Hypertext Markup Language (HTML), Hypertext Transfer Protocol (HTTP), Transmission Control Protocol and Internet Protocol (TCP/IP) have produced the World Wide Web (WWW) [1] [2]. Consequently, the combination of the Internet and WWW has established a special environment for a new communication system that enables the individuals and organizations to create, transfer, locate, and view multimedia documentation between locations without any time and distance limitation [3] [4].

The individual and organization have quickly recognized the potentials and captured the benefits that could be offered by that new Internet and World Wide Web

communication system. Those individual and organization have then developed the Internet economy or electronic economy (e-economy) that utilizes the enormous capability and power of the Internet and World Wide Web communication system to conduct different types of business named electronic business (e-business).

An e-business not only can offer the individual and organization a brand new channel of conducting business through the electronic network, but also can increase the efficiency and effectiveness of the routine operations to gain competitive edge in this information era. Meanwhile, like any traditional computer information system, a winning e-business application definitely requires the support from a solid information technology infrastructure that includes strategic objectives, physical components, and operational management [5] [6] [7] [8].

The major objective of this research paper is to present some preliminary survey results of the information technology infrastructure that have been utilized by a sample of the thirty organizations located in California. The sample has ten different types of the organizations including consulting, education, government, manufacturing, health, pharmaceutical, real estate, retail, service, and utility.

2. The Survey

An appropriate questionnaire was developed in an attempt to determine some answers related to the current information technology infrastructure for the organizational e-business applications. Specifically, the present practices of the following questions were to be sought:

1. How many and what types of organizations are utilizing the e-business applications?
2. What types of the e-business applications are being implemented in the organizations?
3. What types of the network operating systems are being installed for the e-business applications in the organizations?

4. What types of the e-business security implementations are being employed by the organizations?
5. What types of the development methods are being adopted for the e-business applications in the organizations?
6. What types of the functions related to the e-business are being supported by the information technology department in the organizations?

A three-page questionnaire was mailed to a sample of randomly selected organizations that are located in the three areas including Los Angeles, Silicon Valley, and Sacramento of California. Thirty properly completed questionnaires have been returned by the responding organizations that provide the data source for the analysis and discussion presented in this paper.

Users of The E-business Applications

On the questionnaire, the organizations were asked to indicate their total annual revenue, total number of employee, and the number of years using a network. The summarized results are presented in Table 1. It is interesting to note that the total annual revenue of the responding organizations ranges from eight million dollars to twenty six billion dollars, and the total number of employee ranges from thirty five individuals to one hundred and thirty thousands. These two statistics imply that the e-business applications are used in the big business organizations as well as in the small ones.

Table 1: Characteristics of the Responding Organizations (n=30)

Characteristics	Low Value	Median Value	Average Value	High Value
Total Revenue (millions)	\$8	\$1,000	\$5,765	\$26,000
Total Employee (thousands)	0.035	4	20.89	130
Year of Network Use	2	12	12.92	35

The only usage difference of these two types of organizations is indicated by the number of years using a network. The big business organizations have started the network communication as long as thirty-five years ago that is way before the creation of the Internet. On the contrarily, the small business organizations could enjoy the inexpensive network communication is solely due to the birth of the Internet. It is not surprising that the average number of years using a network is around thirteen years that is closely equal to the number of years for commercial usage of the Internet. The Internet does

level the playing ground in terms of telecommunication for the business organizations regardless of their size.

Table 2: Types of Organizations Using the E-business (n=30)

Industry	Number of Using E-business
Consulting	6
Education	2
Government	5
Manufacturing	6
Health	1
Pharmaceutical	1
Real Estate	1
Retail	1
Service	3
Utility	4

The survey asked the responding organizations to specify their primary business activity. Table 2 presents the industry background of the organizations that have implemented the e-business applications. The sample has ten different types of the organizations including consulting, education, government, manufacturing, health, pharmaceutical, real estate, retail, service, and utility.

E-business Applications

The responding organizations were asked to indicate every type of their e-business application. Table 3 summarizes the current practices of the various e-business applications implemented by the responding organizations.

Table 3: E-business Applications (n=30)

Application	Number Responding	Percentage Responding
Intranet	30	100%
Portal	16	53%
Business-to-Business	15	50%
Business-to-Customer	23	77%
Customer-to-Customer	5	17%
E-mail	28	93%
Electronic Data Exchange	17	57%
Others	3	10%

It appears that the e-business applications being most widely used are Intranet, e-mail, and business-to-customer. The e-business applications such as electronic data exchange, portal, and business-to-business are also used by more than fifty percent of the responding organizations. Whereas, the only e-business application named customer-to-customer appears to be not as widely used by the responding organizations.

Apparently, every responding organization has installed more than one ebusiness application. The three most important intensions of the e-business applications are to increase the organizational productivity, to facilitate the organizational communication, and to create a sales channel. The less popular intensions of the ebusiness applications are to exchange information between business partners and to establish a online gateway for the Internet users. The least usage of the e-business application is building a public auction market on the Internet.

Network Operating Systems Used for the E-business Applications

The questionnaire, also, asked the responding organizations to identify the names of the network operating systems installed to run their e-business applications. Table 4 illustrates the statistics of network operating systems used for the e-business applications in the responding organizations.

It is not surprising that the Windows NT developed by Microsoft is the most popular network operating systems used by ninety seven percent of the responding organizations. The Unix created by AT&T is the second popular network operating systems that have been used by seventy seven percent of the responding organizations. The less popular network operating systems include Linux, Sun Solaris, and HP-UX.

Table 4: Network Operating Systems Used for E-business Applications (n=30)

Network Operating Systems	Number Responding	Percentage Responding
Window NT	29	97%
Unix	23	77%
Linux	11	37%
Sun Solaris	14	47%
HP-UX	8	27%
Others	6	20%

There are two interesting facts related to the two popular network operating systems that dominate the market. First, the criteria used by responding organizations to purchase the network operating systems might include the factors such as the software performance records, the amount of support, and the availability of skillful experts.

Second, the responding organizations might have separated networks for their different e-business applications since they install more than one network operating systems to fulfill the special requirements.

Security Implementations for the E-business Application

In the questionnaire, the responding organizations were asked to indicate the types of the security implementation that have been installed for protecting their ebusiness applications. Table 5 provides a summary of the types of the security implementation for which the responding organizations have used.

The responding organizations do emphasize their network security, data integrity, and information privacy since they have installed more than one security scheme. It appears that the firewall is the most commonly used security method to block the intruders and unauthorized users from accessing the extranet and/or intranet applications. More than fifty percent of the responding organizations utilize the private key and public key as a safeguard measurement to scrambler the data and information during the message transmission between the sender and the receiver.

Table 5: Security Implementations for the E-business Application (n=30)

Security Implementation	Number Responding	Percentage Responding
Firewall	27	90%
Electronic Signat ure	10	33%
Private Key and Public Key	16	53%
Secure Electronic Transaction	11	37%
Digital Certification	8	27%
Other	4	13%

The security methods such as electronic signature, digital certification, and secure electronic transaction are less used by the responding organizations. This result may imply that the nature of these three methods is not for the purpose of safeguard the network. The electronic signature and digital certification that involves a payment to the third party are especially for the safe transmission of an important documentation and/or sensitive information. Whereas, the secure electronic transaction is mainly for the financial transactions between the business organizations and customers using a secured private network.

Development Methods for E-business Application

The responding organizations were asked to identify the e-business application development method used in their organizations. Table 6 provides a summary of the development methods that have been utilized in implementing some of the e-business applications in the responding organizations.

The responding organizations overwhelmingly favor in-house development method over the other two development methods named outsourcing and off-the-shelf package in every types of the e-business applications. Apparently, the responding organizations consider every one of their e-business applications as a vital and strategic computer information system. Therefore, the organizations need to have an internal team with profound business knowledge and information technology skills to plan, create and control their e-business applications in order to achieve its predetermined objectives for competitive advantages.

Table 6: Development Methods for E-business application (n=30)

Type	In-house	Outsourcing	Off-the-shelf Package
Web Page	26 (87%)	6 (20%)	4 (13%)
Electronic Data Interchange	14 (47%)	5 (17%)	2 (7%)
Intranet	27 (90%)	4 (13%)	4 (13%)
Business-to-Customer	18 (60%)	5 (17%)	2 (7%)
Business-to-Business	13 (43%)	3 (10%)	2 (7%)
Customer-to-Customer	4 (13%)	1 (3%)	1 (3%)
Call Center	11 (37%)	3 (10%)	8 (27%)

The outsourcing development method is slight over the off-the-shelf packages that have been used by the responding organizations in every category except the call center. This result indicates that most of the responding organizations have their own special requirements in the e-business applications. These special requirements cannot be fulfilled by a generalized off-the-shelf package. On the other hand, the e-business application in a call center is related to the call distribution system that can be provided by a prepackaged private branch exchange telephone system for more efficient operation and less investment risk.

Functions Supported by Information Technology Department

The responding organizations that have an information technology department or division were asked to indicate the functions performed by their information technology department in the current information era. Table 7 presents a summary of the types of the tasks executed by the information technology department in the responding organizations.

Table 7: Functions Supported by Information Technology Department (n=30)

Functions	Number Responding	Percentage Responding
Technical System Development	28	93%
Technical System Maintenance	28	93%
Off-the-shelf Package Evaluation	25	83%
System Integration	27	90%
Outsource Contract Management	21	70%
Customer Relationship Management	22	73%
E-business Development	20	67%
E-business Maintenance	20	67%
E-mail system Management	27	90%
Database Management	28	93%
Data Warehousing/Data Mining	22	73%
Network Management	25	83%
Internal User Support	25	83%
Other	3	10%

The five functions including technical system development, technical system maintenance, system integration, e-mail system management, and database management have been selected as the most commonly performed tasks in the responding organizations. This result indicates some interesting points. First, the traditional functions such as system development, system maintenance, and database management are considered by ninety three percent of the responding organization as their routine duties. Second, the only function related to the e-business application is e-mail system management. Where the information technology department takes the responsibilities of managing the operations of e-mail server, controlling the storage area, and preventing the virus, etc. Third, the responding organizations do not adopt the new development policy to replace the old information systems. On the contrarily, the responding

organizations emphasize the system integration approach to merge the old and new computer information systems by using open standard and middleware.

The off-the-shelf package evaluation, network management, and internal user support are ranked by eight three percent of the responding organizations as the next group of most commonly performed tasks in their information technology department. It is interesting to note that the majority of the responding organizations are not likely to use the off-the-shelf package for their e-business applications as illustrated in the previous Table 6. On the other hand, the information technology department of the responding organizations does often perform the off-the-shelf package evaluations for other types of computer information systems as indicated in the current Table 7.

Seventy three percent of the responding organizations have reported that the customer relationship management, data warehousing, data mining, and outsource contractor management have become part of the routing operations performed by their information technology department. This is not a surprising result since the major purpose of data warehouse and data mining is to accomplish the personalization or mass customization for the ebusiness applications. In addition, the online customers of any e-business application do periodically encounter technical difficulty and requires the assistance from the skillful staff member of the information technology department. The outsourcing contractor management also has gained its important status since it is a quick alternative method to obtain knowledgeable individuals by the information technology department for instant problem solving in this fast changing environment.

3. Conclusion

The advance information technology has created a new type of economy named electronic-economy or e-economy that has pushed the business society to a new frontier in the last decade of twenty century. This e economy has leveled the playing ground for every types of organization to conduct its business functions regardless its size, resource, location, and time.

It is important for any organization to properly obtain this incredible power by developing the e-business applications on time for the purpose of increasing its internal productivity, reducing its operating costs, or enhancing its customers and suppliers relationship in this e-economy environment. On the other hand, it is also essential for the organization to establish a well-structured information technology infrastructure in order to backing its business applications.

A survey was conducted to investigate some current practices and its implications of the information technology infrastructure existed in the organizations. Thirty responding organizations from ten different types

of industries reported that they have implemented two or more ebusiness applications using the different types of the network operating systems and network security protections. The most used e-business development method is still the traditional in-house development method that offers the best management planning and controlling strategy to align the overall business and information technology objectives together. The system integration, e-mail system management, and customer relation management have gained their importance in the routine operating functions at the information technology department.

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