# COMMUNICATIONS OF THE ICISA

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## *Feature:* MIS and the Internet

***In This Issue:***



***Feature Articles*:**



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**International Chinese Information System Association (ICISA)**
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# International Chinese Information Systems Association (ICISA)



## President's Message


**Eldon Y. Li**
**Cal Poly – San Luis Obispo**


Welcome to the *Communications of the ICISA.* This is the official publication of the ICISA. Our Association is the only vehicle through which Chinese IS professionals around the world can get to know each other and share valuable information. Therefore, we urge you to become a member. In return, we are making every effort to improve the quality of our official publication, the *Communications of the ICISA*. Hopefully, you are as proud as our editorial team of this issue of publication. My special thanks go to Dr. Binshan Lin who served as the Guest Editor for this issue, to Dr. Joseph Wen who formatted the preliminary version of this issue, to all the anonymous reviewers who helped in this endeavor, and to all our members who unconditionally supported our organization.

I thank you all very much for being part of this Association. Please keep in touch with us by sending e-mail to <eli@calpoly.edu> or visit our homepage at <http://misnt.calpoly.edu/ICISA> and fill out "People's News" online form. Please send your ideas, suggestions, and news through these two methods to me.

If you have recently visited our website, you would notice the facelift we have done to the ICISA website. This publication will be posted on our website as soon as it is printed. If you are our active member, you will be notified through e-mail the password to access it online. If you lost your password, please send me (eli@calpoly.edu) an e-mail message to me to request a another one. Furthermore, our website at Cal Poly is permanent; it will go on for as long as there is ICISA. Please pass this website information to your Chinese IS friends and colleagues and recruit them for our Association. Thanks you very much for your continuous support.

*Eldon Y. Li, President*

**Editor-in-Chief's Message**
**Eldon Y. Li**
**Cal Poly – San Luis Obispo**

As the Editor-in-Chief for the journal, I have taken the liberty to adopt an innovative way to foster teamwork in our editorial effort. I have begun at the very first time to implement guest editorship. It is a great honor for me to introduce you to our very first Guest Editor for this issue, Dr. Binshan Lin, who himself is the Editor of *Industrial Management & Data Systems*. Through his skillful editorship, we have presented here a Special Issue on "MIS and the Internet." The growing popularity of electronic commerce makes this Issue a relevant and timely addition to the MIS literature. Please also join me to welcome our Guest Editor for our next Special Issue on "MIS and TQM," Dr. Houn-Gee Chen, who is also the Editor of *Information Management* journal in Taiwan. (Please see the Call for Papers in this publication.)

In this issue, Joseph Wen, Binshan Lin, and David Yen compare six Internet search engines based on a set of criteria and present the challenges and opportunities for the next generation engines–the intelligent agents. They also describe the characteristics of four existing intelligent agents. Sooun Lee, Aaron Boucher, David Yen, and Hung L. Tang conduct an extended search on the Internet and identify the advantages of doing electronic commerce. They point out that EC is not only the competitive weapon but also the survival kit for businesses in the 2000's. Charles Trappey and Amy Trappey adopt object-oriented approach to model the data objects attributes and behaviors in a retail enterprise. They present a sequence of screen shots detailing the design of their integrated retail IS. Chang-tseh Hsieh and Binshan Lin discuss the educational value of the Internet for students. They recommend using Internet as a supplementary learning tool but not as a means to disseminating lecture materials. Finally, Shouhong Wang surveys and compares the EC curricula being published on the Internet by universities worldwide and proposes a framework of EC curriculum.

I would like to thank all the authors who submitted articles for this special issue of the Communications of the ICISA. Special thanks go to our President-Elect, Dr. Joseph Wen, for printing and mailing this issue to our members, authors, and friends. Most of all, I thank you, our readers, for your continuous support to this organization and this publication. I look forward to receiving your article submission or any feedback about this publication in the future.

*Eldon Y. Li, Editor-in-Chief*

**Guest Editor's Message**
**Binshan Lin**
**Louisiana State University**

This special issue of Communications of ICISA arose from several MIS tracks organized for 1997 and 1998 ACME Conferences. At that time, we perceived that the existing research critically lacked any guidance for educators and decision makers in understanding the nature of interaction between the Internet and MIS discipline. There were new experiences gained at several universities and organizations that could be valuable to the academic and information systems (IS) community. Hence, this special issue was undertaken to share some of these experiences. We invited all members of the ICISA and other MIS community to submit their best research on the topic to this special issue. Our aim with this special issue is not to depart from our objective of Communications of ICISA, but to embrace a broader array of papers. This aim suggests that papers could be appropriate if they are not only synthesize an area, but then map exciting new streams of MIS research into the Internet arena.

As it happened, each of these was reported on interesting aspects of the issues. There is much to say in response to this issue. Things just don't stay the same. We have to continue to try and attract quality research that adds value to both the academic and IS practitioner aspects of our readership. We have to assume our readership wants to know, What is new? We need to keep soliciting good answers that have meaning to us.

We hope this special issue is informative and look forward to continuing the mission of the journal. My best guess would be that this change in editorship should be transparent to the readers. Should that not be the case, then give credit to the ICISA and all the reviewers' good things and I'll claim the rest.

*Binshan Lin, Guest Editor*

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## ICISA People's News

- **David Chou** has accepted a full Professor position in the Dept. of Business Computer Information System at St. Cloud State University. (See <http://www.stcloudstate.edu>)
- **Bernie Han** has completed his visiting position in Taiwan and accepted an Associate Professor position in the Department of Business Information Systems at West Michigan University. (See <http://www.wmich.edu>)
- **Jim Chen** has accepted an Assistant Professor position in the Dept. of Business Computer Information System at St. Cloud State University. (See <http://www.stcloudstate.edu>)
- **David Yen** is visiting National Chung Cheng Unviersity in Taiwan. He is on leave (Fall 1998) from Miami University at Oxford, Ohio. (See <http://www.mis.ccu.edu.tw>)
- **Hung Lian Tang** has assumed the position as the Chair of the Department of Business Information Systems at West Michigan University. (See <http://www.wmich.edu>)
- **Michael Wang** has joined the Dept. of Accounting & MIS at California State University – Chico. (See <http://www-cob.csuchico.edu>)
- **Chia-Hao Chang** is visiting Lingnan College in Hong Kong. He is on leave (1998-1999) from University of Michigan - Dearborn. (See <http://www.ln.edu.hk>)
- **T. S. Lee** has assumed the position as Chair of Dept of Managerial Economics and Decision Sciences at Hong Kong Chinese University. (See <http://www.cuhk.edu.hk>)
- **Ray Tsai** has assumed the Dean's position at National Kaohsiung First Sciences and Technology University in Taiwan.
- **Ming-Te Lu** has assumed a chair professorship at Lingnan College in Hong Kong. He is Professor and Chair of Dept. of Information Systems in Lingnan College. (See <http://cptra.ln.edu.hk>)

## MIS Papers in ACME 1998 Conference

1. Li-Ling Hsu, "The Coordination between Manufacturing and Marketing from an Information Technology Perspective - A Case Study of Taiwan Information/Electronics Industry."
2. Yuet-Sing Wang, David C. Yen, and David C. Chou, "An Analysis of Data Warehouse Development."
3. Chang-Yang Lin, "Integrating Hypermedia and Enterprise-Wide Business Systems."
4. Wing S. Chow, "User Satisfaction and Success Factors of Customer Information Systems."
5. Li-Yen Shue and Joshua Fan, "The Development of an Object-Oriented System for Scheduling Computer Laboratory Classes."
6. Li-Ling Hsu, "Information System Position and Information System Planning: An Empirical Study of Taiwan's High-Tech Industry."
7. Jonathan Jen-Rong Chen, and Yuanchi Liu, "An Oblivious Transfer Protocol Based on Discrete Logarithms."
8. Tom Su and Peggy Yang, "The Comparative Study of Revised Servqual and Servperf in Taiwan Computer Information Industry."
9. W. Lok Yeun, and Ming-te Lu, "Developing and Operating Business Web Sites: In-house vs. Outsourcing."
10. Ming-te Lu, and T. S. Chan, "Internet Commerce in Hong Kong: Status and Direction."
11. Yufei Yuan, "A Study of Online Auction."
12. Mei-Wen Huang, and Ray J. Tsai, "An Investigation on the Willingness for Shopping Online in Taiwan: from Purchase Involvement and Reference Group Perspectives."
13. Dien D. Phan, and Randy S. Weinberg, "Privacy Issues in Internet and WWW: Some Solutions for Users."
14. Shen-Tzay Huang, and Hsiu-Hua Chang, "A Conceptual Framework of Trust and Security Issues Based on Interviewed Practices in Electronic Marketplaces in Taiwan."

# Internet Search Engine: Challenges and Opportunities

**H. Joseph Wen**
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**Binshan Lin**
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**David C. Yen**
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**Abstract**

*This paper defines what is Internet search engine and compares six major Internet search engines. The comparisons are based on information classifications, database characteristics, search options, user interfaces, and results accuracy. The challenges of today's search engines have opened a opportunity for developing the next generation Internet search engines – intelligent agents, which could filter materials and return more accurate results.*

***Keywords:*** Internet; Internet search engine; Intelligent agent.

Internet is a worldwide computer network which is a unique information medium allowing information to be accessed at anytime from anywhere in the world. Although the Internet contains a vast array of useful information, one of the major problems of using Internet is the time taken to find the desired information. This problem has led to the development of search engines.

Internet search engines are linked to databases that essentially are giant indexes of much of the information available on the Internet. Search engines are powered by database indexing software, and human librarians who classify, sort, and make the Web a searchable matrix. Despite there are over 100 search engines and browsing tools, users are often frustrated by the difficulty in finding authoritative and relevant information. The key issue today is not whether some piece of information is available online, but where it is [1, 2, 3, 4, 5].

This paper is organized as follows. We first define what is an Internet search engine and then review six major Internet search engines. This is followed by the comparison of the six search engines based on information classifications, database characteristics, search options, user interfaces, and results accuracy. Finally the challenges of today's search engines and the opportunities for developing the future Internet search engines are discussed.

## Internet Search Engine

Search engines have three major elements [6]. First is the spider, also called the crawler. The spider visits a web page, reads it, and then follows links to other pages within the site. The spider returns to the site regularly, such as every month or two, to look for changes. Everything the spider finds goes into the second part of a search engine, the index, sometimes called the catalog. It is like a giant book containing a directory of every web page that the spider finds. If a web page changes, then the new information is updated. Sometimes it can take a while for new pages or changes that the spider finds to be added to the index. Thus, a web page may have been "spidered" but not yet "indexed." Until it is added to the index, it is not available to the search engine. Search engine software is the third part of a search engine. This is the program that sifts through the millions of pages recorded in the index to find matches to search and rank them in order of what it believes is most relevant.

Search engines are designed to explore Web sites base on simple queries. Users type in words or phrases on specific topics. Software "spiders" then crawl through the Web and use algorithm-based search logic to retrieve requested data within a couple of seconds. Responding to a search request, it finds and gets the addresses of relevant documents selected from millions of data sources. Search engines produce annotated lists of hyperlinks to relevant Internet home pages. Each hyperlink activates a unique Internet address, which functions like a postal address. When clicked on, the hyperlink uses the address to find and ask another computer to get new text, pictures and even more hyperlinks.

Internet search engines with their huge indexes of Web pages have been refining their search algorithms and adding new features. Each search engine has its own personality and works differently [7, 8, 9]. Six major search engines - Alta Vista, Excite, HotBot, Infoseek, Lycos, and Yahoo are briefly reviewed as follows.

***Alta Vista***

Digital Equipment Corporation operates the search engine. Alta Vista supports word-in-a-order search. It also applies artificial intelligence to determine the language of individual Web pages. Users can customize Alta Vista search options and set the advanced or simple search as well as allowing specific displays. Unlike those index the key descriptive words of home pages, Alta Vista indexes the complete text within pages. This allows an exhaustive search. However, unless users are very specific, they probably will be flooded with data. Because its indexing is so comprehensive, it needs more time to index new pages. As a result, some very new ones don't get into the database immediately.

***Excite***

Excite applies Intelligent Concept Extraction search technology to summarize information on Internet. It allows users to query by example. It is also America Online's search engine of choice. Excite is able to estimate how relevant each found page is to your initial request. If users click on a button that say "More like this," the search engine will track down more sites that are similar to any of the sites just found.

***HotBot***

HotBot uses multi-machines parallel computing for Internet searching and indexes up to 10 million pages daily. Recently, HotBot added some subject categories at the bottom of its search page. It also has expanded its search capabilities. One of the most useful features is the page type limit. This offers four radio button choices: any, front page, index page, and page depth. Choosing the front page option, for example, limits the search to pages that are the central pages on a specific computer.

***Infoseek***

Infoseek has currently updated it search software and is being promoted as the preferred search engine by many in the computer industry. In its May 1996 issue, Internet World tested many search engines and praised Infoseek as delivering the most relevant results. One attractive feature of the Infoseek search engine is its post-processing option. After running a search, a follow-up search can be run against the results.

***Lycos***

Lycos is one of the oldest search engines. It allows both subject and word searches. When a user enters key words for searches, Lycos not only displays the addresses located but also provides a summary of what is available in each site. Lycos features proximity operators available from none of the other primary search engines. It also supports a handy feature called "remote control." This feature allows users to work within the search engine while viewing Web sites.

***Yahoo***

Yahoo is the best known Internet search engine. It presents a catalog of sites on the Web. Its listings are much like the yellow pages or an encyclopedia-showing many sites under subject categories or key words. Yahoo provides some very useful information on its home page, such as, finding a business, finding phone numbers and e-mail of individuals, finding city maps, today's news, stock quotes and sport scores. it can link to the other five search engines, using the same criteria to run query in another search engine.

## A Comparison Study

***Information Classification***

Librarians organize the publication by classifying. Creating a catalog makes searching, filtering, and retrieving very efficient. The same idea has been applied to electronic resources. All the data are divided by several subject headings, and then is separated into various sub titles. A search engine with data classification certainly saves the searching time and makes the query result more accurate. When culling data from the imaginable huge databases on the Web, the search engine just needs to consider those meeting the criteria and ignores the rest parts. That definitely saves retrieving time. On the other hand, if users couldn't assign a specific field to search, they might got some data nothing to do with their search but it happens to have the keyword in those documents.

Nearly all well-known search engines have a category. Some of them even classify data by nationality, region (in US), or language. A comparison of the information classification is shown in Table 1.

***Database Characteristics***

Database is critical to a search engine, because it decides what kind of results a user will get. Some search engines regularly crawl the Web and create the listing automatically. Others include the sites after reviewing and selecting. Definitely the former ones get bigger databases.

For Internet databases of Web pages, measuring size can be much more complex [10, 11]. The search engine companies try to find ways to trumpet how large they are and how much larger they are than their competitors.

One current measure of database size is determined by counting the number of individual Web pages included in the database. It is a more meaningful measure than counting URLs, because a large amount of the pages are duplicates. A single Web page can often be referenced with two, three, four or more URLs. For example, the following URLs could all refer to the same page:

http://www.corporate.com/

http://www.corporate.com /welcome.html
http:// corporate.com /
http://3388.corporate.com /welcome.html

Since the changeable nature of the Web, a published article on a web site can be easily changed. Even a Web page can be deleted after it was added to a search engine's database. The entire content can be changed on a daily basis. The file can be moved to a different directory. So another question on database size concerns the availability of records in the database.

A more important consideration than database size is how fresh the information is. If a search engine has a huge but old database, it is possible that many new pages are missing, and the sites that users are looking for do not exist any more. A comparison of the size and freshness of search engine databases is shown in Table 2.

***Searching Options***

Each search engine has its own way to track the sites that meet the searching criteria. The premise is how the search engines search. For instance, Yahoo searches only the title for the keywords, some of other search engines scan the entire text of Web pages. All search engine also permit Boolean searches and other sophisticated search options.

Users have a choice to assign a group for search, such as Web, News, or Usenet. Moreover, it is available in some search engines to select a specific data type, such as picture, sound, or video. Picking up information date (usually a period of time) is also possible. Since a large amount of retrieving data always need to be refined then to be acceptable, a refine-result search option that can be run against the previous results is very useful. A comparison of search options of the selected engines is summarized in Table 3.

***User Interfaces***

A search engine performs its function through user interfaces, which include input and output screens. Interfaces must be friendly and ease to use. Sometimes a good user interface is the most

**Table 1. A Comparison of Information Classification**

| Search Engines | Yahoo | Alta Vista | Excite | HotBot | InfoSeek | Lycos |
|---|---|---|---|---|---|---|
| **Category** | Yes | No | Yes | Yes | Yes | Yes |
| **By Nationality** | Yes | No | Yes | Yes | Yes | Yes |
| **By Region(US)** | Yes | No | No | No | No | No |
| **By Language** | No | Yes | No | No | No | No |

*Resource: http://www.searchenginewatch.com/, February, 1998.*

**Table 2. A Comparison of Database Characteristics**

| Search Engines | Alta Vista | Excite | HotBot | InfoSeek | Lycos |
|---|---|---|---|---|---|
| **Size (pages in million)** | Big (100) | Big (55) | Big (110) | Medium (30) | Medium (30) |
| **Pages crawled Per day** | 10 million | 3 million | Up to 10 million | - | 6 to 10 million |
| **Way to index** | Register | Register | Auto-matically | Register | Register |
| **Freshness** | 1 day to 3 months | 1 to 3 weeks | 1 day to 2 weeks | Minutes to 2 months | 1 to 2 weeks |

*Resource: http://www.searchenginewatch.com/, February, 1998.*

**Table 3. A Comparison of Database Search Options**

| Search Engines | Yahoo | Alta Vista | Excite | HotBot | InfoSeek | Lycos |
|---|---|---|---|---|---|---|
| **Search for** | Title | Title | Entire Text | Entire Text | Entire Text | Optional |
| **Assign Group** | Yes | Yes | Yes | Yes | Yes | Yes |
| **Media Type** | No | No | No | Yes | No | Yes |
| **Assign Date** | Yes | No | No | Yes | No | No |
| **Boolean Logic** | Yes | Yes | Yes | Yes | Yes | Yes |
| **Refine Result** | No | No | Yes | No | Yes | Yes |
| **Link others** | Yes | No | No | No | No | No |

*Resource: http://www.searchenginewatch.com/, February, 1998.*

important factor to attract users. Designers usually do their best to give users more control over the search process and make the result more readable, and predictable.

A good input screen should be clear presented with option windows, checkboxes and buttons instead of user's key in to avoid mistake and time wasting. Most of the major search engines perform well in this. For instance, HotBot uses a series of panels to clear lay out the options available to the users. With these panels, it achieves a balance between simplicity of presentation and robustness of functionality [12].

A good output screen should provide customized format, allowing users to summarize and organize search results and cluster retrieved documents according to their contents. To save time and make it more readable, number of data returned should be optional. Relevancy rating is also necessary, because users can select the most relevant data first. A comparison of the database user interfaces for the selected engines is listed in Table 4.

For a good user interface, online help could not be missed. It provides good documentation for first visiting and instructs users how to do a effective search. The help should be divided into several separate short pages. Users have a choice to read only the pages they concern and ignore others.

***Results Accuracy***

A huge indexed database is not useful, if it does not returns relevant hits. Users are always hoping their search results are packed with relevant documents. However, accuracy can be hard to quantify and to some extent, it is subjective. Nevertheless, researchers in the field of information retrieval have come up with two criteria that can be used to measure the accuracy of search results [13].

1. **Recall** - This measures how many relevant documents the system retrieves. In broad terms, it describes how comprehensive or extensive the database is. For example, if there are 100 relevant documents on the database, and the search engine brings back a result list that contains 80 of those documents, then the recall is 80%.
2. **Precision** - Precision is complementary to recall. It describes how many documents in a given result list are relevant. A service could have high recall by bringing back 80 relevant documents out of 100 relevant documents in the database. But if it had to ask for a result list of 1000 documents to get those 80 relevant documents, then the precision would be 80/1000, or just 8%. On the other hand, if the search engine brought back those 80 relevant documents in a result list of only 90 documents, then the precision would be 89%.

High recall means that the search engine brings back a lot of relevant documents. High precision means that the search engine does not bring back a lot of non-relevant documents. A good search engine needs to have both high recall and high precision. If recall is high and precision is low, then users will have to sort through lots of junks to find the useful ones. If precision is high and recall is low, then the result list will have mostly relevant documents, but it will miss many other relevant documents on the database.

## Challenges and Opportunities

Although many search engines claim successfulness, current search engines suffer the following severe deficiencies: (1) Keyword searches lead to many hits and most of them are false; (2) The huge number of search engines, all with different user interfaces, leads to a problem of cognitive overload; (3) Database indexing methods often bear no semantic relationship with information content; (4) Inadequate strategies for maintenance often result in the retrieval of information items that no longer exist; (5) Search engines are not sophisticated enough to fully understand natural language; and (6) Valid judgment on the usefulness of a resource can be almost impossible given the level of conceptual access provided by search engines [14].

Recently there have grown urgently the needs for intelligent aids for satisfying information goals, for searching over the vast Internet or corporate intranets for specific information targets. This leads to the development of intelligent agents [15, 16].

An intelligent agent is software that, in its most basic form, is part of a search engine, but in its most advanced form, it acts as a personal assistant. It uses artificial intelligence technology to find and sort information. It is a search engine, which thinks and acts for itself. An agent is trained by the user about a subject, which is then sent out to the Web to find and evaluate materials from the millions of documents available. An intelligent agent can be recalled at any time to see how it is doing and be retrained on the basis of what it has found so far to make the search more precise. Examples of intelligent agents and their skills are shown in Table 5.

Intelligent agents carry out a set of instructions on behalf of a user or another program and can run independently and with some degree of autonomy on a network. There are some differences between intelligent agents and Java applets. With Java, the applets are downloaded from Internet and the work is done on the user's workstation. With intelligent agents, the agents actually go out onto the network and look for the appropriate applications to accomplish their task, and carry out their mission remotely, freeing the user's workstation to do other tasks. When the agents have accomplished their goal, they alert the user that they are finished and present their results.

Intelligent agents have the capability to learn what information the user wants to see. Agents can be programmed to change behavior based on experiences and interactions with other agents. The characteristics of intelligent agents can be summarized as follows:

**Table 4. A Comparison of Database User Interfaces**

| Search Engines | Yahoo | Alta Vista | Excite | HotBot | InfoSeek | Lycos |
|---|---|---|---|---|---|---|
| **Number of Data Returned** | Optional | All | Optional | Optional | All | Optional |
| **Result Data Description** | No | Yes | Optional | Optional | Yes | Yes |
| **Relevancy Rating** | No | No | Yes | Yes | Yes | No |

*Resource: http://www.searchenginewatch.com/, February, 1998.*

**Table 5. Examples of Intelligent Agents and Their Skills**

| Intelligent Agent | Skills |
|---|---|
| Daily News Agent | • Automate time-consuming Web surfing for time-critical information<br>• Deliver important business information to those who need it<br>• Monitor specified external websites for relevant information |
| User Profile Agent | • Generate user interest profiles by observing the way that user responds to messages and learn what kind of messages are important<br>• Learn what time of day the user likes to respond to messages<br>• Profiles change as user interests change<br>• Interact with other user profile agents to determine which messages are important |
| Event Alert Agent | • Alert user via e-mail, dynamic Web page of update news, or other push technology<br>• Monitor live news and information feeds<br>• Distribute up-to-date late breaking, critical news to the people who need to know |
| Workgroups Agent | • Allow transparent creation of subject interest groups of users to reduce redundancy of efforts<br>• Enable easy agent exchange<br>• Work with log-in user authentication<br>• Reduce costs by identifying other organization resources focused on solving the same issue<br>• Allow for more efficient knowledge transfer within organization |

- Intelligent – learn from feedback, examples, mistakes, and from interact with other agents
- Easy to Use – can be trained by users in natural language
- Personalized – can be trained to adopt to users' preferences
- Integrated – learn continually, integrating new cases with prior knowledge and develop a mental model about a task
- Autonomous – are capable of sensing and responding to their immediate environment and of making judgments

## Summary

This paper has reviewed the six major Internet search engines and compared them based on information classifications, database characteristics, search options, user interfaces, and results accuracy. Although the search engines that we have reviewed are far from perfect for searching the Internet, we suggest that an ideal search engine should meet the following criteria: 1) ease of use, 2) a large, organized and up-to-date index, 3) short database search and response time, 4) reliable and accurate results, and 5) customizable interfaces and intelligent agents.

The continuously expanding number and scope of Internet information sources make it clear that a centralized search engine database solution will never be satisfactory. Intelligent agents have been touted as a significant new direction for the next generation Internet search engines, which could filter materials and return more accurate results.

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# Electronic Commerce: Current Success and Future Implications

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**Abstract**

*Electronic Commerce (EC) is defined as any business transactions conducted through an electronic medium on the Internet. EC allows a company to integrate internal and external business processes electronically through information technologies via connecting an intranet, and extranet to the Internet. EC can allow for businesses to create closer relationships with outside constituencies, reduce business costs, and increase demand/orders. In fact, EC applications and success stories are found in almost any sector of the industry. Most of them are showing promising strategic gains. While it is too early to predict the ultimate impact of electronic commerce, it can certainly be viewed as a source for real business opportunity as well as growth. Based on stories found, EC is no longer simply a tool to use to be competitive but becomes a survival weapon to beat the ever-increasing competition of the modern businesses.*

***Keywords:*** Electronic commerce; Intranet; Extranet; Business stragegy

Electronic Commerce (EC) is defined as any business transactions conducted through an electronic medium on the Internet. EC allows a company to integrate internal and external business processes electronically through information technologies via connecting an intranet, and extranet to the Internet. By using these technologies, electronic commerce can allow for businesses to create closer relationships with outside constituencies, reduce business costs, and increase demand/orders. While it is too early to predict the ultimate impact of electronic commerce, it can certainly be viewed as a source for real business opportunity as well as growth. With the definition of EC getting broader almost every day, so too does the increasing opportunities that EC holds for the future of business. The future of electronic commerce and its many ways to help business transactions is as bright and prolific as the many new opportunities that are created by electronic commerce.

Few people would argue that the Internet is a perfectly safe marketplace for conducting business transactions. In fact, the lack of security has long stood as a main hurdle to its broad acceptance as a vehicle for commerce. So what could possibly inspire a Chief Executive Officer (CEO) to make an investment decision for developing an Internet site for the EC? The best answer over this question can be the numerous success stories, which will be discussed later, that companies have already experienced when implementing EC over the Internet. The US Commerce Department summed up the future of Internet use when it stated, "where advances in telecommunications and computing largely occurred side-by-side in the past, today, they converge in the Internet. Soon, virtually all information technology investment will be part of inter-linked communications systems, whether internal to a business, between individuals and businesses, or individual to individual. EC is not going to fade and businesses and consumers alike must make efforts to adapt to the environment that it will create." [8]

Electronic Commerce has four main application areas. There are inter-organizational (business-to-business), intra-organizational (within an organization), business-to-consumer, and Internet intermediaries. Inter-organizational EC facilitates the following business applications: supplier management, inventory management, distribution management, channel management, and payment management. Intra-organizational EC focuses on integrating various functions within the organization. These business applications are work group communications, electronic publishing and sales force productivity. Consumers needs are met with the business-to-consumer EC, having information goods delivered over the Internet, and paying with

electronic cash. This EC facilitates the following economic transactions: social interaction, personal finance management, and purchasing products and information. The final component is the Internet intermediaries. These electronic brokers stand between the parties of a contact, for example, buyers and sellers, and perform functions necessary to the fulfillment of the buyers and sellers. Examples of the intermediaries are equipment providers, network access providers, and financial intermediaries [1]. New developments are being made in all of these areas.

Currently, business-to-business transactions are the most common form of Electronic Commerce applications followed by business-to-consumer type applications. This is due to the fact that 95 percent of the business market has electronic access compared to only 20 percent of the consumer market [4]. This means that 200 million (conservative figure for 1998 due to its exponential growth in the recent years) consumers were unable to engage in EC transactions last year. The following table illustrates the tremendous potential for growth in the consumer market.

**Table 1: 1997 U.S. Commerce Market Statistics**

| Business-to-Business | Business-to-Consumer |
|---|---|
| $2,600 billion market | $4,300 billion market |
| 3.5 million companies | 250 million consumers |
| 95% electronic access | 20% electronic access |

*[4] June 10, 1997, "Electronic Commerce: Taking Supply Chain Management to the Operate and Own Paradigm"*

The consumer market is virtually an untapped source of Electronic Commerce that will continue to emerge in the near future. As more consumers become familiar with the Internet, they will be engaging in commerce over the Internet. This will continue as security and other technology issues continue to be enhanced, the competitive nature of the industry continues to push down prices, and consumers learn about the benefits of EC.

The Internet is undeniably going to become the next common media for communication and business transactions. According to the US Commerce Department, "The Internet's pace of adoption eclipses all other technologies that preceded it. Radio was in existence 38 years before 50 million people turned in; TV took 13 years to reach that benchmark. Once the Internet was opened to the general public, it crossed that line in four years. In 1994, 3 million people were connected to the Internet. By the end of 1997, more than 100 million people were using the Internet. Traffic on the Internet has been doubling every 100 days." [8]

There are several advantages for doing EC on Internet: lower purchasing costs, reduce inventories and cycle times, provide more efficient and effective customer service, lower sales and marketing costs, and realize new sales opportunities. Among these benefits, the following two major benefits (revenue increase and cost reduction) are further explained in detail as these are the most important factors for corporate investment decisions.

### Increasing Revenue with Electronic Commerce

On April 8, 1998, ActivMedia Inc. published its fifth annual "Real Numbers Behind Net Profits" report of Web generated revenues. Data collected in that study showed a large growth in both the Web population and per-site revenue. Revenue generated from the Web in 1998 will be close to $75 billion, which more than triples the previous year's total of almost $22 billion [1]. On April 15, 1998, Commerce Secretary William Daley stated, "Booming growth in information technology industries driven by the Internet is boosting U.S. economic growth and holding down inflation...The digital economy is alive and well and growing." [8] The Commerce Department has predicted Web revenues to reach only $300 billion by year 2002, which is a conservative dollar amount compared to ActivMedia's expectations of $1.2 trillion and a $1.25 trillion projection from a 1997 study by Hambrecht [2].

The Year 2000 Project will effect future revenues from Internet Electronic Commerce. With the Year 2000 deadline quickly approaching, companies who did not correct this problem early have been forced to spend the majority of their IT budget racing to get their information system into compliance. There is no benefit gained from Year 2000 work but there is a definite potential for severe damage to a company's systems if they are not updated correctly and timely. Until the Year 2000 issue is conquered, companies will continue sinking the majority of budgeted IT funds into this project. After year 2000, companies will have the freedom to refocus IT funds to toward the effective utilization of Electronic Commerce. This helps to partially explain the prediction that Web-driven revenues will experience large increases after the year 2000.

A study [2] shows how Internet users and

**Table 2: Web Generated Revenues from 1995-1997 and Calculated Projections for 1998-2002**

| | Annual Revenue | | | Predicted Revenue | | | | |
|---|---|---|---|---|---|---|---|---|
| **YEAR** | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
| **REVENUE** | $0.1 | $2.7 | $21.8 | $73.9 | $180 | $377 | $717 | $1,234 |
| *(in billions of dollars)* | | | | | | | | |

*[1]April 8, 1998, ActivMedia Inc: Real Numbers behind Net Profits*

businesses benefit more the longer they have been online. The Communication and Information Technology industries reported that revenues were up an average of 50 percent or more since going online. This is not surprising since these are the two industries that have been online the longest. Newer to the Internet were the manufacturing, transportation, and retail industries, which have shown a more modest average growth of between 15 and 30 percent.

**Decreasing Cost with Electronic Commerce**

The Internet has shrunken Earth from a sphere with a radius of 6,357 kilometers to not much more than a point, with the radius of a human arm. In less time than it takes to walk to the mailbox, people can send and receive 50 e-mails from around the world. The tremors caused by burrowing from three-dimensional physical space into one-dimensional cyberspace are only beginning to be felt.

The most beneficial aspect of EC might just be the speed with which it operates. Since employees are often compensated based upon time and people who offer professional services usually bill based upon time, the Internet has the potential to lower cost simply by reducing the time required to complete a certain task. Companies can now get more miles out of their employees because the task force that formerly took a lot of time and energy can be completed electronically in a few seconds. Look at the following three examples of how EC over the Internet has reduced the amount of time and money required to complete certain transactions.

The economics are obvious. Moving physical matter such as people, books, tapes, and so on, costs dozens or hundreds of times as much as moving the information that makes up that matter through videoconference conversations, online documents, audio files, and so on. Businesses have reported tremendous impacts from online adoption with many aspects of their operations realizing savings of as much as 99 percent.

Some of the decreases in cost have come from the lower use of paper due to online document storage and retrieval systems, the more efficient use of employees, and the lower advertising and sales budgets needed to operate successfully.

In order to save overhead cost associated with the office rental space, many companies are implementing a strategy referred to as "hoteling". Associates in the Columbus, Ohio office of Coopers and Lybrand (C&L) travel quite often and others telecommunicate a few days of the week. Eric Galstad, Director of Human Resources for C&L, described hoteling as "a process where associates go online and schedule a desk space when they know they will be in the office for a certain day." Before hoteling was implemented, they were incurring huge costs for downtown office space that was not being used 45% of the time. Hoteling has proven to be another example of how EC can produce huge cost savings.

Online banking, financing, and investing is another area where cost savings could be realized. It costs about a penny to conduct a banking transaction using the Internet and more than one dollar if handled by a teller at a branch bank. In 1997, 4.5 million households were banking online. By the year 2000, as many as 16 million households are expected to do so. Connecting billers and payers electronically could save as much as $19 to $46 billion each year in check processing costs. Nearly 5 million people actively trade stocks online and paid $8-$30 per trade, versus an average of $80 paid to traditional brokers. In 1997, $614 million in broker commissions were generated online, which represented 29 percent of all commissions paid to discount brokers last year [8].

**Success Stories of E-Commerce**

***Business-to-Customers Applications***

As discussed earlier, this business-to-customers area has the great potential for the rapid growth. This type of EC applications and success stories are found in almost any sector of the industry. Most of them are showing promising strategic gains. Based on stories found, EC is no longer simply a tool to use to be competitive but becomes a survival weapon to beat the ever-increasing competition of the modern businesses. Strategic advantages include creating new markets and demand, improving customer interaction/ satisfaction, creating new products/ services, and improving productivity/efficiency of internal business operations. The examples that are grouped based on each of strategic advantages follow.

**(1) Create new markets and demand:**

E-commerce enables to create new markets and

**Table 3: Savings Factors: Moving Electronics vs. Molecules**

| Item | Time Required Off-line: vs. Time Required Online | $Required Off-line: vs. $Required Online |
|---|---|---|
| Overnight audio CD shipment | 54:1 | 8:1 |
| 2-hr visit for 1 person: (Airfare, hotel, cab, food, misc.) vs. Net-based videoconference | 12:1 | 40:1 |
| Overnight letter | 65,000:1 | 900:1 |

*[3] 1998, FutureScapes Executive Report, "Planning for the Internet Decade"*

demand that otherwise are not available for buyers and sellers to find each other in these markets without ever entering a store.

At the beginning of 1997, Dell was selling $1 million worth of computers via the Internet each day. By the end of the year, Dell regularly sold over $3 million pr day via the Internet. Dell estimates that it saves several million dollars a year by having basic customer service and technical support functions available on the Internet. Fifty percent of small businesses that bought from Dell's Web sit in 1997 had never before purchased from Dell. Dell expects to do half its business on the Internet by the year 2000. [16]

Amazon Book Co. offers a selection of 2 million book titles to Internet customers (traditional bookstores have about 150,000 titles). In 1996, the company recorded sales of less than $16 million, In 1997 its sales reached $148 million. [11]

W.W. Grainger (a leading wholesaler of manufacturing supplies in North America) shows revenues from its Web site have been growing 100 percent quarter over quarter. Over 30 percent of its online sales are to new customers or incremental sales to existing customers. More than half of all online orders is made when Grainger stores are closed. [22]

American Airlines NetSAAver program has generated tens of millions of incremental revenues since its launch in March 1996. Airlines are able to drive down costs and generate new revenues through the Internet. Commissions paid to online travel agents are about half the commission paid to traditional agents. Through auctions and special A cyberfares offered to Internet customers, airlines can sell seats that otherwise would go unsold. [12]

**(2) Produce new products/services to the customers:**

EC enables to produce new product/services to the customers. This should ultimately generate new revenue streams as well as increase customer satisfaction.

These applications have already begun in a number of industries. An example of an industry that has begun to profit from the inception of EC is the banking industry. Many North American banks have formed a partnership called Integration Financial Network. The partnership's Web based technology allows consumers to manage financial information through the bank by use of fax or phone. The system also lets the customer conveniently conduct any number of transactions securely over the Net. According to member banks of the Integration Financial Network, transactions that cost the bank $1.07, now can be done over the Net for only 1 penny. [23] As you can see, this is a trend that has already begun and it is safe to assume that many other companies will follow in the footsteps of these in the airline and banking industries.

Another example is in the airline industry. Companies have already begun to link their ticketing system and established reservations to the Web. This allows the customer to purchase tickets over the Net as well as find out any other information about the company or other possible flights that he/she might want to know. The economics of doing this kind of transaction over the Web is also beneficial. The cost of processing a traditional airline ticket is $8; he same cost for an e-ticket is only $1. [23] Hence this process benefits not only the consumer, but the airlines as well.

Final example is in the finance industry. Within the last year, Charles Schwab has created web sites that allow customers to buy and sell securities over the Web. The Web site allows customers to ask questions as well. Since its inception, the company's Web service has generated over one million online accounts totaling over $68 billion in assets. Charles Schwab has also seen their on-line trade volume grow at a compound annual rate of more than 40% in just 8 months. Another company that has flourished is Advance Bank AG. They offer 24-hour banking service via fax, telephone, and PC. During their first year of existence (1997) they acquired 26,000 customers. [23]

**(3) Improve the productivity/efficiency of operations:**

EC enables to improve the productivity/efficiency of operations by realigning and reengineering the existing operations.

Cisco Systems has saved $363 million (approximately 17.5 percent of total operating costs) by putting key business applications on the Internet. Its technical support productivity has increased by 200-300 percent per year, lowering technical support staff costs by $125 million. Customers download new software releases directly from Cisco's site, saving the company $180 million in distribution, packaging, and duplicating costs. Having product and pricing information on the Web and Web-based CD-ROMs saves Cisco $50 million in printing and distributing catalogs and marketing materials. [15]

***Inter/Intra-organizational applications***

Electronic Commerce will help to transform the way companies interact with vendors, suppliers, and other possible business partners. The Meta Group recently conducted a survey of over 41 business groups intranets, and came to the following conclusion: the average intranet had a ROI of 38%. Those that provided up-to-the-minute information had a 68% ROI.[25] Hence, the more interactive you are to your constitutes the better the payoff. An example of this could be how you track the logistics of a shipment. Instead of constituencies having to call your company, talk to an operator, and wait while he/she has to access the destination file from a database, one can access the tracing of a shipment over the Net, thus saving the third party both time and money. This type of application is often called as EDI (Electronic Data Interchange) applications.

Recently, MCI has introduced Simple Form EC. Simple Form EC is an efficient and simple way for

businesses to extend their EDI and electronic commerce applications to smaller companies." [26] Simple form EC is generally targeted towards businesses that tend to fully utilize EDI technology. This new service enables these businesses to expand their EC programs to their constituencies that are not EDI capable. Some of the benefits include eliminating financial mistakes due to rekeying data, allows host to increase its range of trading partners, and reduces costs by receiving smaller companies business documents electronically. Some of the applications of Simple Form EC include electronic purchase orders, electronic product brochures and information, and improved customer service. [26]

General Electric uses the Internet for procurement. Its lighting division has lowered its purchasing labor costs by 30 percent and its material costs by up to 20 percent. By the year 2000, GE aims to have all 12 of its business units purchasing materials via the Internet, for a total of $5 billion. Doing so could save the company $500-$700 million over the next three years. [20]

Boeing spare parts business allows its airline customers around the world to check parts availability and pricing, order parts, and track the status of their orders on the Internet. Less than a year after this service was launched, about 50 percent of Boeing's customers used it for 9 percent of all parts orders and a much larger percentage of customer service inquiries. Because of the Internet, Boeing was able to process roughly 20 percent more shipments per month in 1997 than in 1996 with the same number of data entry people. [13]

Two-thirds of Federal Express shipping transactions are transmitted and received using online services. 54 million transactions are handled a day, allowing it to keep track of every package FedEx delivers, and every step of the way through the online service. Using this system, National Semiconductor, a FedEx logistic customer, has seen a reduction of its average customer delivery cycle from four weeks to one week, and its distribution costs from 2.9 percent of sales to 1.2 percent. [19]

### Electronic Commerce Intermediaries

A new opportunity will be that EC will enable new products and services geared specifically for electronic media, such as Yahoo, Alta Vista, Lycos, Infoseek, Pick-of-the-Day, AOL NetFind, Excite, and other Internet directories. Thompson-Sun Interactive has introduced technologies that enable the development and delivery of interactive applications for digital broadcast television.

A good example of a company capitalizing on this idea is FairMarket Incorporated's new "Market Buyer". Market Buyer is positively affecting the electronic commerce market by offering a centralized location for buyers and sellers to purchase and sell excess products over the Internet, without the use of the middleman. Fairmarket allows for business-to-business transactions for sellers looking to unload various computer products and components1. Sellers can move their products over the net quickly and at better margins than through traditional intermediaries. This also benefits the sellers in that it allows him/her to unload any excess inventory quickly over the net. Market Buyer is also a beneficial situation for the buyer who has a broad access to business-to-business products. Buyers can receive most updated auction prices, as well as obtain auction product previews via e-mail. [18]

### Concerns/Future Implications

There are two major concerns in EC: security and reliability. Reliability concerns will never truly disappear, as the computers become more complex with each generation, there is always the chance of something going wrong. As operating systems, encryption technologies, and other monitoring software become more advanced, the chances of a failure happening will decrease.

Security is an issue that is of utmost importance to everybody online, or at least should be. While many of the fears of someone hacking into a computer and taking every last important bit is much overblown and greatly fantasized by Hollywood, the truth is that a breakdown of such magnitude is very unlikely to happen. The point where people have most to be worried with is the server side and the information these contain, since they are much easier to reach. Much fear is placed in sending credit card information over the Internet because users believe some hacker will intercept the transmission. The truth is, the risk is as low if not lower, than doing the same over the phone.

Over the Internet, such protection schemes as Secure Socket Layer (SSL) are used to encrypt the sent data, which only the intended receiver can decode. The newest and soon to be released protocol for encryption is Secure Electronic Transmission (SET), is to be a universally adopted method. These encryption methods are incredibly hard to crack. As an example, a group of computer engineers in England decided to see how long it took them to break a transmission. It took them, with a computer network of 30 computers, three months to decode the transmission. The best way to remedy this is for people to spend more time online and become better educated on security issues and the technology they are using.

Other security issues to be solved in the future include the identification of the trading partners. At this moment, digital certificates seem to be the way to resolve these security issues. As of right now and for the foreseeable future, the problem will not be with the technological side, but with educating the users on the technologies and convincing them that they do indeed work.

Due to the ease to put up a web site and with the expected drop in price to create a fully functional commercial site, today hundreds and thousands of web sites are being created every month. With this

growth, the ability to collect information will become critical. Today, this incredible growth is causing some problems as users are having trouble finding what they want. As Jeff Ubois [7] stated, "punch in 'travel' on Altavista's search engine and you'll get more than seven million possible answers." That's noise, not information. Already some advanced search technologies are appearing. We have the traditional tree-based directories such as Altavista and Yahoo, which we know so well today.

Recommendation/collaborative filtering programs, in which a profile of the user is created to facilitate what is being searched and personalized have been appeared. Some recommendation/ collaborative engines are Alexa Internet (www.alexa.com), and Firefly Network Inc. (www.firefly.net). The kind that deviates most from what we know today is the 3D visualization. These create images that can be anything from a 3D topographical map to a bike wheel with 100 spokes. The idea is that with a visual, representation of the results will be easier to use. Examples of this kind of technology include Visual Insights (www.lucent.com/visualinsights), ThemeMedia Inc. (www.thememedia.com) and Inxight Software Inc. (www.inxight.com). Of these, the 3D visualization seem to be the kind most aimed at replacing the search engines that we know today, while the recommendation/collaborative seemed more toward refining a search made on one of the traditional tree-based search engines. Next development is to incorporate these engines into what is being called "agents", these cybernetic beings will do all kinds of searching, filtering, and in short, do all kinds of micro managing the information presented to the user. A preview of these can be seen in some of the "bot's" already in existence. A good example of one of these bots is Jango 2.0. [30]

What we are going to see is a progression of the Internet being incorporated more and more into our everyday lives. From the Deloitte and Touche survey [29], we can see that most people expect the Internet to become the primary source of information up to the point of slowly phasing out newspapers, magazines, and trade journals. It is not unthinkable for this to happen -- we see there is an increased demand to get information now. With the ability for the Internet to deliver such information on demand, it becomes pointless to have to wait for the printed version. We also expect electronic stores to become the de facto standard in retailing, but not completely overtaking physical stores.

The massive growth by the Internet has created opportunities for businesses and consumers alike by creating different channels of commerce. Yet this same growth has created problems as seen by the difficulty sometimes encountered in finding the information users want from the Internet. Other problems include the difficulty in the copyright issues; this is especially difficult for intellectual material such as music and software mostly because of their ease in transmission over the Internet. As the Internet helps us by creating fast and more varied communication channels, it also has created its fair share of problem. Some of these problems will not be resolved any time soon, but considering the youth of the Internet we must consider these growing pains and learn from them, as this is the only way we will better learn to use this powerful new technology.

## Conclusion

IT and electronic commerce can be expected to drive economic growth for many years to come. Governments must allow electronic commerce to grow up in an environment driven by markets, not burdened with extensive regulation, taxation, or censorship.

Information technology has already begun to create demand for highly skilled workers. As electronic commerce becomes more widespread, it will drive further changes in the labor market. Countries that have an insufficient supply of skilled workers will see high-skilled, high-paying jobs migrate to countries that can supply the needed talent. The private sector and governments must work together to create new human resources policies that better prepare students and workers to meet the challenges of the emerging digital economy.

In closing, President Bill Clinton sums up the future of the Internet. [17] "I call upon all Internet users, both in government and in the private sector, to join me in seeking global consensus...so that we may enter the new millennium ready to reap the benefits of the emerging electronic age of commerce." President Clinton mentioned three important aspects about the Internet in his quote.

1) "That the Internet has created a global market and global responsibilities."
2) "That the Internet is creating a new millennium that will undoubtedly alter our lifestyles."
3) "That the Internet will produce benefits for our society to reap."

The Internet is at an exciting point in its life cycle. It continues to grow daily and one can only imagine what its future will bring. Electronic Commerce will simply follow the path of Internet, very closely.

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# Internet-Based Retail Information Integration and Electronic Commerce: Using Object Oriented Principles

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**Abstract**

*Retail structures, particularly in developing economies, have rapidly modernized over the past decade, largely due to the advances in information technology (IT). The revolution in IT applications has encouraged new startups, escalated their growth and has resulted in the success of large, modern, integrated retail enterprises. Modern retail stores and wholesale outlets are logistic enterprises that constantly receive, shelve, and sell merchandise according to closely monitored consumer demand. Thus, enterprises that can manage large amounts of information and make wise retail management decisions in a distributed multi-store environment are most likely to succeed in the increasingly competitive marketplace. In this research, an internet-based retail information system is design and developed. First, an object-oriented data modeling approach called EXPRESS is used to define data formats describing retail stores, products, categories, and sales. The approach allows for data abstraction, encapsulation and flexible modification. Point of Sales (POS) systems at the store level provide the streams of data from retail stores. The retail data is integrated into the headquarter's database and is accessed in real time by the chain-store members. These data are used by the store managers for dynamic sales analysis, merchandise planning and store (shelf) management. Decision models, namely automated shelf layout, continuous sales analysis, and real-time logistic management, are incorporated into the retail information system (RIS) using a web-based interface. The WWW is the communicators' medium used to link the retail headquarters with the distributed retail chain. Retail enterprises that implement retail information systems of this nature can easily expand to suitable and profitable economies of scale without loss of information and control.*

***Keywords:*** Category management; Data model; Marketing information system; Enterprise integration; Electronic commerce.

The trend of modern retailing is to move away from dis-aggregated independent stores with a limited range and slowly changing product line and toward an aggregation of stores (e.g., chain stores or franchisers) that provide wider assortments of products and economies of scale. With the continuing industrialization of countries and the increasing limitations on consumers' time, traditional and independent retail stores are ill equipped to satisfy the modern consumers' ever-changing demand. As a result, retailers are shifting from a singular focus on product distribution to a more complex emphasis on logistics and store management designed to satisfy the needs and lifestyles of the consumers.

A report published by Nielsen (1990) models the traditional marketing channels as a deadlock in the flow of information. Communication becomes restricted when layers of manufacturer representatives and layers of retail buyers negotiate, without the support of accurate and timely information, in the process of selecting merchandise for consumers. When incomplete market information is used to select the target customers, to plan the merchandise assortments, and to evaluate the results of the marketing strategy, incomplete product offerings and incorrect assortments are offered to consumers. Thus, efficient and effective utilization of electronic data is essential in modern commercial practice. Electronic commerce (EC) is the evolutionary tool needed by modern retailers to remain competitive and increase sales.

The use of point of sales (POS) system is the first step and a uni-directional approach to provide a means to collect and transmit retail data electronically. However, by their very nature of providing a continuous stream of data, POS systems have a tendency to overwhelm retailers and manufacturers with too much information. The key to the effective use of POS data is to build a close-looped information system to properly manage and utilize the data for decision making. If data is

integrated among retail stores, headquarters (or distribution centers), and manufacturers, and if an integrated communications environment is built, then store managers can use the information for accurate store planning and management.

The focus of this research is to build a retail information system that not only preaches but also practices EC in retailing. The system builds bi-directional communication between stores and headquarters and demonstrates the competitive advantage of integrated information and decision support systems. The prototype system is constructed using an object-oriented (OO) concept. The OO data model (EXPRESS) represents much of the information related to the business including the products, the stores, the shelf layout and sales data. The system enables the retailers to trace product sales, evaluate promotional strategies, and plan product shelf layout across the chain stores. The system helps managers to plan shelf space (based on sales trends), to attract customers, and to increase profits. Managers are enabled to plan merchandise and to decide the inventory level of products in the store. Thus, the costs of running a store can be reduced and the profit can be increased.

## Background

### *A Global View of EC*

Nash and McGrath (1997) identify Electronic Commerce (EC) as having much broader applications than Electronic Data Interchange (EDI) for extending unlimited business opportunities by advancing information-sharing technologies. EC enables "business" and "technical" integration across the product life-cycle support activities.

Pittman (1997) has clearly stated that "EC is an important part of automotive industry's future" and must be implemented within 3 to 5 years (not 10 to 20 years) if companies are to remain global competitive. This claim is suitable to many industrial sectors with international operations, such as electronics, computers and machinery. The key benefit of EC is to enable supply chain integration (Morell, 1997), which prevents improper or delayed deliveries among suppliers, the original equipment manufacturers (OEM's) and customers. Further, virtual enterprises (VE) can be formed to increase competitiveness in the world market.

In order to overcome the geographical (distance) barriers, information system (IS) diversification, and dynamic variation of supply chains (i.e., the characteristics of international business operations), internet-based EC and EDI are viewed as the main trend toward realization of virtual enterprises (VE) (Nash and McGrath, 1997). Recent R&D efforts in EC and EDI have largely focused on the "internet" solutions and applications.

Barber (1997) states that Value Aided Networking (VAN)-based EDI has met resistance from small- and medium-enterprises (SME) due to its high complexity and cost. He stresses that the Internet (more specifically the World Wide Web – WWW) may be the savior of EDI by expanding trading partner pools with minimal technical supports to the partners required. Tuten (1997) makes a similar argument for Internet-EDI's bright future and applications to SME's. Further, Mak and Johnston (1998) provide a good introduction to Internet EDI implementation tools.

As an important step forward, Tucker (1997) states that WWW browser is more and more the standard user interface and the Internet (Intranet for internal communication and extranet for external communication) is commonly used in corporate environments. The merging of web management tools, corporate databases, and externally distributed databases are re-shaping the corporate information environment.

Segev, Porra, and Roldan (1997) report on the following use of the Internet to implement and conduct financial EDI in the banking industry. Karduck (1996) takes a step further in defining modern (domestic and international) banking services by using the latest advanced information technology (IT). The key IT's include Internet technology, multimedia technology and information brokerage mechanisms. One key aspect of EC is payments on the web (Piette-Coudol and Lauzen, 1997). Piette-Condol and Lauzen point out that the internet-based transactions (electronic purchasing for business to business or business to individuals) can be delayed if the last stage in the accounting cycle, payments, are not carried out using the Net. Three factors, namely ease of use, security and legal protection, must be considered to ensure internet-based payments advance toward maturity.

The benefits of implementing Electronic Marketplaces are formally analyzed by Bakos (1997). Bakos forms mathematical model to describe cost reductions from the viewpoints of buyers, sellers and independent intermediaries. The results support the incentives of EC, particularly in the application of a global electronic marketplace.

### *Database Issues in EC*

Tucker (1997) points out that corporate computing is evolving toward an environment where the intranet reflects the internal communications environment and the Internet provides the gateway to external information, databases, and clients. The new corporate environment is merging web management tools, corporate databases, and external distributed databases at each user's terminal. The end result is that the emerging technical problems are distributed database problems. The new environment demands quick solutions for linking and feeding data to the web, searching, managing security, increasing speed, and developing custom applications and user interfaces.

Industry needs newer and better tools to manage web sites and distributed databases. However, classical problems such as integrating databases

within organizations still remain. Lim, et al. (1995) note that databases within organizations are frequently heterogeneous and must maintain their own autonomy. Problems arise when there is a push for enterprise integration and there is a lack of tools that can be used for global transaction management and query processing over the existing database management systems. Litwin and Abdellatif (1986) extend the work of the multibase project. Multibase provided generalized hierarchies to integrate homogeneous schemas but did not provide integrated schema over local databases. The aim of the authors is to provide a general-purpose data flow query language to issue queries over multiple databases simultaneously. Another solution approach for the heterogeneous database integration is provided by Sigh, et al. (1997).

***EC Practice***

Taking Taiwan's first step toward EC practice as an example, POS systems have been successfully implemented in over 76% Taiwan's chain stores. However, only about 20% of stores use an infrared bar code number system (Cheesman and Wilkinson, 1995). These percentages indicate that the use of modern technology allowing for the continuous access of electronic sales information is still in an early stage of development. If a system is built to continuously integrate information from each store of a chain and support decisions, then ordering costs can be lowered, lead times decreased, and out-of-stock incidences limited. Just these improvements will substantially lower costs and increase profits of retail enterprises.

Lin and Liao (1997) describe a closed POS system built for Taiwan's China Oil gas station chain stores. The initial system covered several test stores and offered consumer receipt services and automatic gas refueling cards. To completely implement the POS system though, expensive hardware and software was needed to link all gas stations across Taiwan. The authors report that after the system was constructed, it was both expensive and difficult to add functions or to change data input formats. Thus, retail enterprises are finding little economic incentive to invest and implement this type of electronic commerce (EC) solution. For clothing retailers and large category stores in particular, the consumer demand for variety necessitates the continuous introduction of products. If a traditional or closed POS system is implemented, its only benefit will be to provide basic accounting information. Managers will not be enabled to make the flexible and dynamic merchandising decisions necessary to survive in competitive consumer markets.

The retail information system constructed for this research is easier to build and less expensive than a closed POS system. We use PC-based Web technologies to facilitate the information sharing and communication between headquarters and retail stores. Even after its construction, the data models can be extended and applied to other decision support applications. The chosen information technologies are common and the requirements for hardware and software are PC based. Further, the Web interface is inexpensive to develop and needs less maintenance. Thus, the system is developed using a more affordable approach that can be adopted by small or medium-size retailers as well as by large-scale retailers.

The objective of this research is to construct a chain store (distributed) Retail Information System (RIS). Information schemas are constructed using STEP (ISO10303-1, 1994), a means to develop standard retail data models describing products, stores, promotion, and sales. Then, using the information schemas, the real-time data, input from POS, are placed in an object oriented (O-O) database using ObjectStore (1993) DBMS. Retailers can thus study changes in the market place and develop market strategies using the most updated data in the database. The system writes and retrieves data from the database and communicates with remote users by way of the World Wide Web (WWW).

***Overview of STEP and EXPRESS***

STEP is a product data representation and exchange standard that can model a variety of data types. STEP is developed to transfer product data between companies and departments (usually using different hardware and software systems) for information sharing and exchanges. In the following sections, the architecture of STEP, an overview of EXPRESS (the STEP data modeling language), and its graphical representation, EXPRESS-G, are introduced.

The Standard for Exchange Product Models Data (STEP) uses the EXPRESS language to describe a structure of product information (data model). STEP defines the different data that the product model relies on. The purpose of EXPRESS is to describe the assortment of data that is created in the complete product life cycle, and to process these data by computer. Therefore, EXPRESS is a general model language that aids computer-based management. The EXPRESS compiler compiles data models generated by EXPRESS and serves as the application language that read, writes, and operates on the data. The object-oriented characteristics of EXPRESS extend the data model so that it is robust and reusable.

Since EXPRESS is a concept schema language, it defines the units and constraints of objects. EXPRESS has several functional units including an editor, a browser, standard STEP consistence and ENTITY constraints, schema detection and testing, and format transfers between IGES, DXF and STEP. An EXPRESS-formatted file is a software independent text file that consists of neutral data models as translation or transformation media. EXPRESS has no I/O functions and does not offer database formats, file formats, nor transfer syntax. Thus, another higher level language such as C++ or Visual Basics is used to assist the modeling process. The EXPRESS entities present information and

related constraints or combinations of constraints and information. EXPRESS-G is the graphical representation interface of EXPRESS, transfers the data models into graphics and allows the user to browse or edit data models visually.

***Basic Concept of Common Gateway Interface (CGI)***

CGI is a standard for interfacing external applications with information servers, such as HTTP or Web servers. A plain HTML document that a web client retrieves is static; meaning that it exists in a constant state as a text file. A CGI program, on the other hand, is executed in real-time and can output dynamic information. CGI provides the middle-ware between World Wide Web (WWW) servers and external databases (or information sources). The CGI defines a method for the Web server to accommodate additional programs and services that may be used to access external applications or data sources from within the context of any active Web document. CGI allows a web server to provide information from external databases to web clients that would not otherwise be available to those clients in a readable form. This allows, for example, a WWW client to issue a query to an Oracle database and receive an appropriate response in the form of a custom-built Web document.

**Approach**

The system architecture of the web-based marketing information system (MIS) is shown in Figure 1. Personal computers (PC) are implemented in the chain stores to transmit store data and sales information to headquarters and to access data from the central database. In a web environment, retailers transmit information by forms on web pages to the web server. The web server sends the information as parameters of a CGI program and executes the program for database access. After processing the CGI programs, the results are translated for the web server and the user receives results in the HTML format. A retail store only needs a PC with a web browser to access the centrally managed database and decision support system.

The system organization allows headquarters to collect all the stores' data and analyze consumer trends across the chain stores. Remote store sites can also obtain a standard analysis of sales from headquarters, avoiding problems that might occur from the application of individual management practices without central control.

***Data Modeling***

Data modeling begins by defining the data requirements of the application. For re-ordering

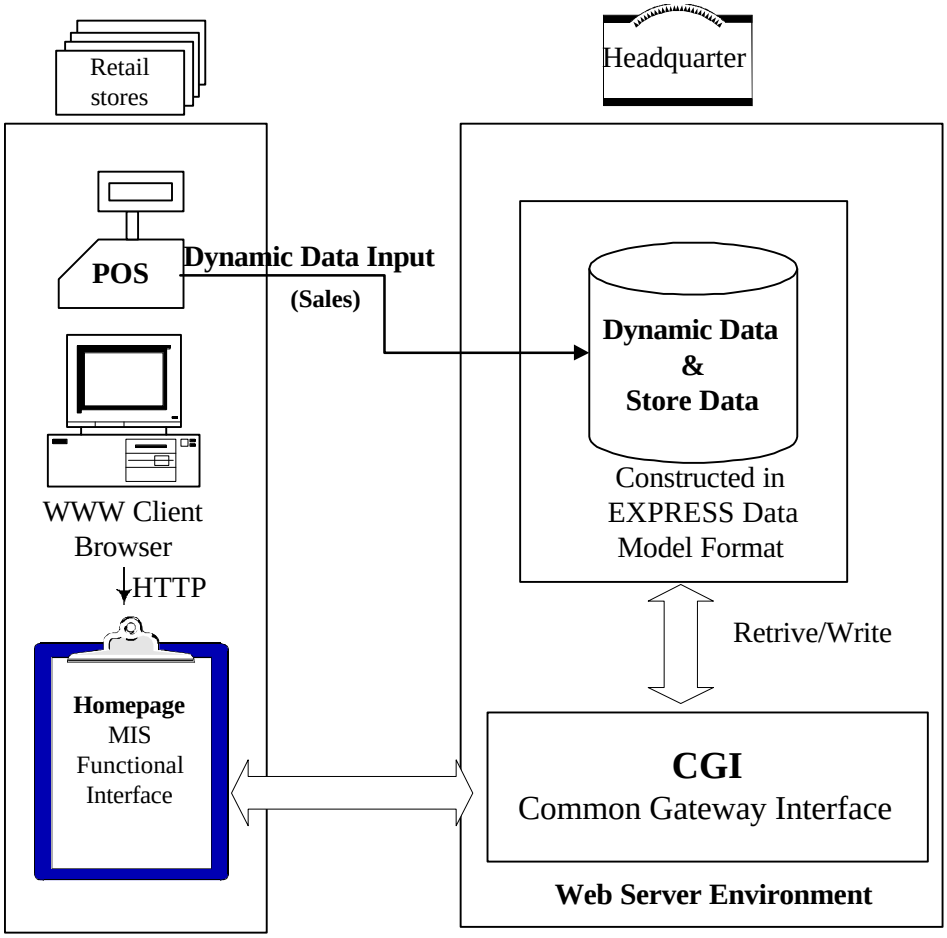


**Figure 1. A chain store retail information system**

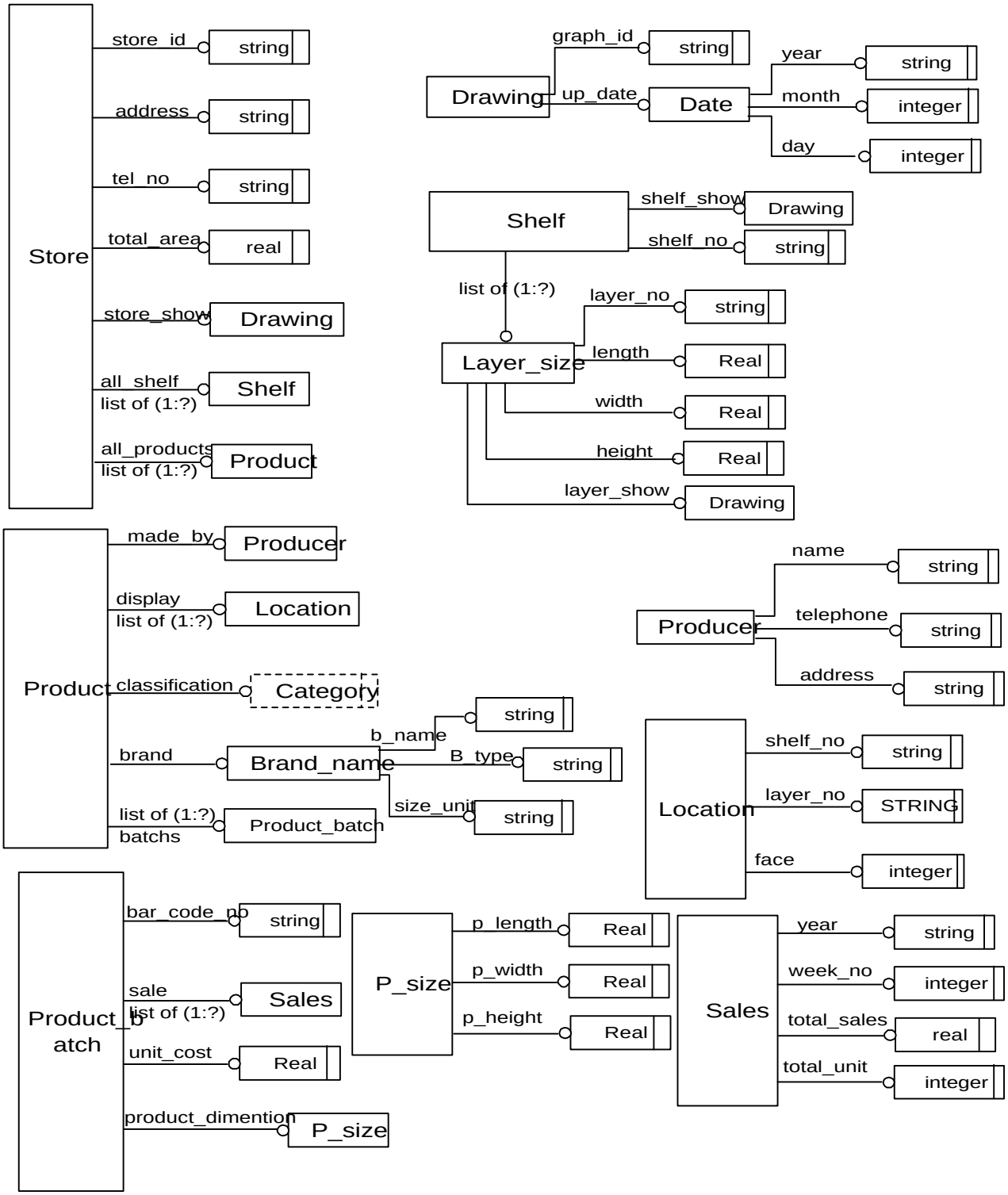


**Figure 2. Merchandise planning model created with EXPRESS-G**

decisions, the model requires data about the inventory in each store. Second, it is necessary to define data for each product, the stock levels, brand names, product costs, and so on to determine when to ship and where to place each product in the store. Third, it is necessary to manage and re-arrange the location of categories of products in each store, to identify sales trends, to introduce new products, and to track sales across the shelves and layers in the chain of stores.

EXPRESS-G and EXPRESS language is used to specify the shelf layout schema and organized information into two main data models -- the store data model and the product data model. EXPRESS-G provides representations for all entities as shown in Figure 3. The store data model includes store_id to

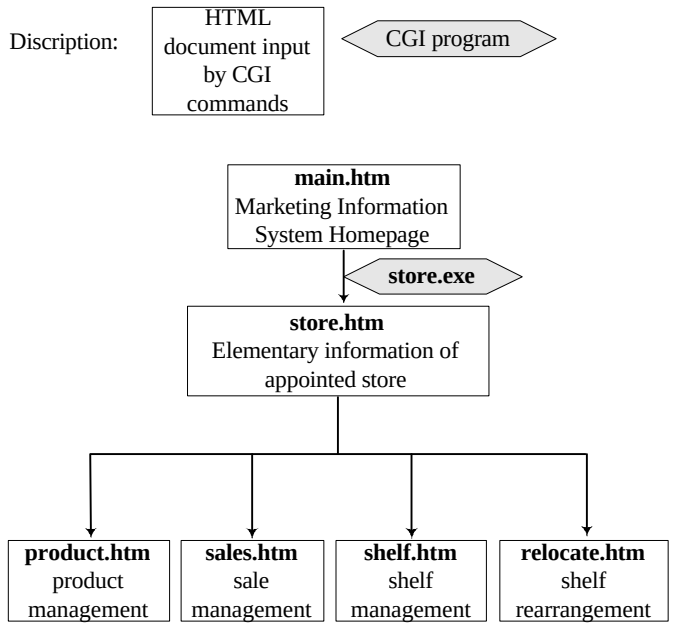


**Figure 3. Structure of the system functions**

identify the store, address and tel_no to record the location and telephone number of the store, total_area to indicate the total area of the store, and drawing to contain the store layout graphic. Finally, shelf includes data about shelves in the store and product describes products in the store. In the store data model, the attributes drawing, shelf and product are entities. A drawing entity includes the graph_id and the up_date. A shelf entity has the shelf_no, a drawing list and shelf_size as its attributes. Layer_size is defined with layer_no, length, width, height, and layer_show as the descriptive attributes.

The second data model called product is also an entity. The product entity defines its attributes such as producer, category, brand_name, and the product_batches of goods sold. Additionally, the entity indicates where the product should be placed using location. An important attribute of the product data model is the product_batch. In a retail store, there are often thousands of products. Each product may also have different purchase prices depending on its batch shipment. This case is modeled with an attribute that lists the batches, product_batch, and accounts for different batches with different unit costs. For example, if the batch was purchased during a promotion period, the unit cost will be lower. However, the product may be sold during a non-promotion serial and earn larger profits. Thus, the unit cost is an attribute of product_batch and not an attribute of product. The attributes of product_batch include bar_code_no, sales, unit_cost, and product_dimension. Frequently, the bar-code numbers on products in a store are attributed to different batches. The POS system records product data such as bar_code_no and unit cost whereby the bar_code_no serves as a reference point for products that have different unit costs. By aggregating products using the bar code number, it is possible to calculate the profit of the different batches (sales price minus unit cost). For shelf layout management, different batches may also have different size packages. As an example, during a promotion period, the manufacturer may add 20% volume to a product package. If the size is different, then the location arrangement relies on the new product size.

The location entity includes the shelf_no to indicate which product will be placed on what shelf. The layer_no indicates the layer of the shelf that the product will be placed on and the face_width describes the shelf frontage that will be given to the product. The sales entity is defined to collect the sales of the product and the sales record in weekly periods. Shorter time periods, such as daily or hourly sales are also possible via the data model. To identify weekly sales, the entity uses year and week_no attributes. During the assigned week, total_sales and total_volume of the products sold are described. In order to analyze the shelf layout, the area of the shelf layer and the size of the product must be determined. By defining layer_size as a shelf entity and defining the product size as p_size entity with attributes such as p_length, p_width and p_height, the shelf layout is analyzed.

## Implementation

First, an object-oriented database containing information about the retail store, products, shelves, and sales is built on an NT server. The database is built using the data models described in the previous section. The steps taken to build an Object-Oriented (OO) database are introduced in this section.

The OO database includes retail information such as store data, product data, shelf data and sales data that are built into directories. The decision system can write and retrieve data from the database to perform shelf and sales analysis. In the following paragraphs, an overview of the application system, the requirements of the environment and the requirements of the software for the system implementation are described.

### *Overview of the System*

The decision support for the retail marketing information system focuses on shelf layout and sales analysis. The decision rules and correlation programs are written in the C++ language that interfaces with the ObjectStore database and the World Wide Web browser environment.

ObjectStore is a high performance object-oriented database (OODBMS) useful for storing large, complex data structures, and provides functions such as data integrity, version control, and query processing in a complete multi-client/multi-server architecture. The objective of the system is to deliver

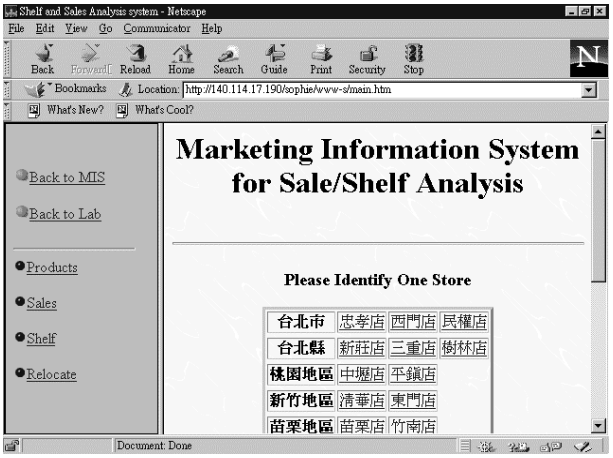


**Figure 4. Main homepage of the system.**


**Figure 5. Data format of a selected store.**

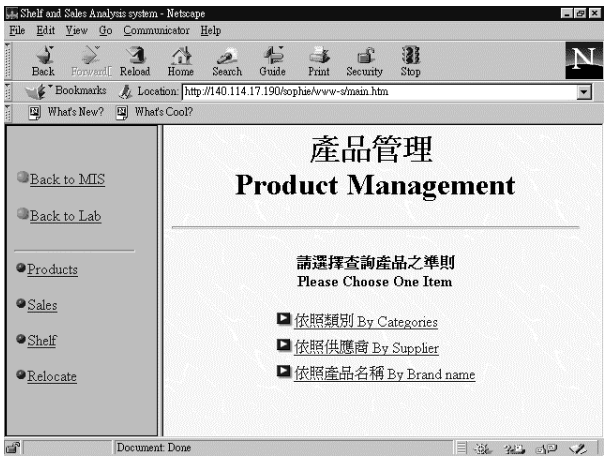


**Figure 6. The product search interface.**

basic decision support needed by retailers to manage shelf layout, perform sales analysis, and develop marketing strategies. The decision system consists of five functions for shelf and sales analysis.

***System Functions***

After the central database collects data from retailers' POS systems, the shelf and sales analysis system is ready to run. The system consists of five functions. These functions include store data retrieval and display, product search, sales analysis, shelf layout and shelf rearrangement (Figure 3).

**(a) Store data**

Store data retrieval and display is a basic function to depict individual retail store information. In the main system interface, a two-frame interface is used to show functions and results (Figure 4). When the pointer is used to click on a store in the table, then the basic data of the store including store area, address, telephone number and the floor sketch are shown in frame (Figure 5).

**(b) Product search**

After a specific store is chosen, products can be searched using keys such as product category, brand and supplier. The sequences of product search by category are illustrated in Figures 6-8.

**(c) Sales analysis**

There are two options for sales analysis. The first allows the user to calculate the growth rate of sales, units sold and profits of identified product in a given period of time. The equation for calculating the growth rate of sales, units sold, and profits is listed as follows:

$$GR = \frac{n\sum_{i=1}^{n} x_i y_i - \left(\sum_{i=1}^{n} x_i\right)\left(\sum_{i=1}^{n} y_i\right)}{n\sum_{i=1}^{n} x_i^{\,2} - \left(\sum_{i=1}^{n} x_i\right)^2} \quad (1)$$

GR: The growth rate of sales, units sold or profits

$x_i$ : Week number

$Y_i$ : The sales or units sold or profits of ith week number

n: Number of weeks to analyze

The sales growth rate is the estimated value of least squares in a simple regression model (Figure 9). The second analysis option allows users to sort and list sales, units sold, and profits (Figure 10).

**(d) Shelf layout**

The shelf layout function is used to depict the products as arranged on shelves in the store. The main page of the shelf layout function is shown in Figure 11. Users click on the shelf that they want to analyze and the graphical display of the shelf, its layers, and its products are shown (Figures 12 and 13).

**(e) Shelf Rearrangement**

A rule-based method is used for rearranging the display of products in a store. The method rearranges the display in two stages - across categories and within categories. The process flow of rearranging the shelf layout is shown in Figure 14.

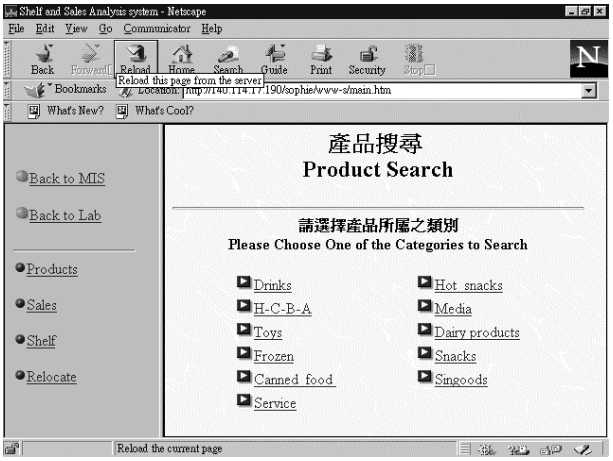


**Figure 7. Product search by category.**


**Figure 8. Results of a product search by category.**


**Figure 9. The query result for growth rate of sales.**

First, the algorithm calculates sales in the store and the proportion of sales for each category in a given period. Second, the growth rate of sales in the time period for each category is calculated. Finally, the proportion of shelf-space for each category is rearranged according to the proportion of sales and the growth rates of categories in the store. A similar approach is used to allocate space to brands within categories.

Let X be the total shelf space in the store. Assume there are 11 categories in the store. Let $x_1$, $x_2$, $x_3$ ... $x_{11}$ be the original shelf space of each category. Thus, the ratio of category i's shelf space is represented by $a_i$, where $a_i = \frac{x_i}{X}$. Thus,

$$\sum_{n=1}^{11} x_i = X \qquad (2)$$

$$\sum_{n=1}^{11} a_i = 1 \qquad (3)$$

$x_i$ is derived using the equation below:

$$x_i = \sum_{j=1}^{n_i} p_{ij} \times F_{ij} \qquad (4)$$

where $n_i$ is the number of product types in category $i$.

$p_{ij}$ is the length of the $j$ th product type in the $i$ th category.

$F_{ij}$ is the face number of product $j$ in the $i$ th category. The face number is the number of rows that a product type occupies on a given shelf.

Equation (5) is used to calculate, Ai, the growth rate contribution of each merchandise category.

$$A_i = \frac{G_i \times M_i}{\sum_{i=1}^{n} G_i M_i} \qquad (5)$$

$G_i$ The growth rate of category i in a given period of time.

$M_i$ The total sales of category i.

N The number of categories.

According to these definitions, the average growth rate of the store is $\overline{G}$.

$$\overline{G} = \frac{\sum_{i=1}^{n} G_i M_i}{\sum_{i=1}^{n} M_i}, \quad i=1, 2,..., n. \qquad (6)$$

Equation 7 defines $B_i$, the growth rate of sales for category i.


**Figure 10. Sales analysis main page.**

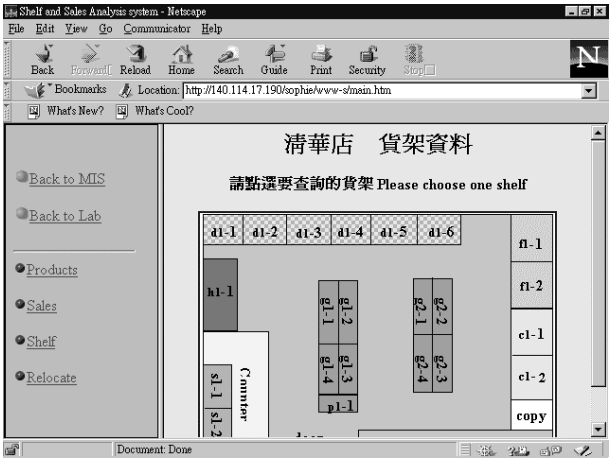


**Figure 11. The shelf layout of a retail store.**

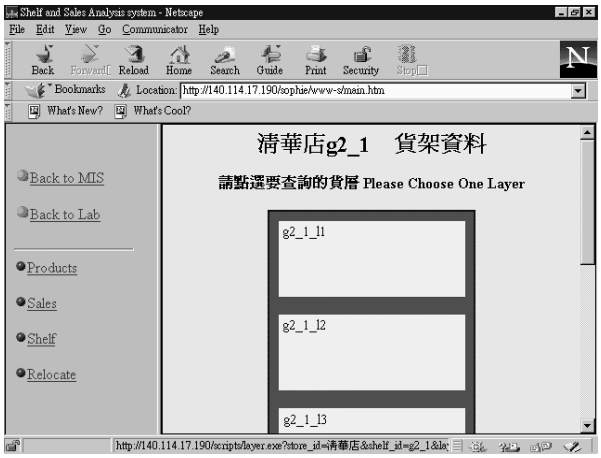


**Figure 12. The graphical display of shelf layers.**

$$B_i = A_i \times \overline{G} = \frac{G_i \times M_i}{\sum_{i=1}^{n} M_i} \quad (7)$$

In order to adjust shelf space by category, the sales growth rate is used. Let $L_j$ be the suggested new shelf space for category j. Then, $L_j$ is represented as:

$$L_j = \frac{a_j (1+B_j)}{\sum_{i=1}^{n} a_i (1+B_i)} \quad (8)$$

Thus, the new arrangement for shelf space by category is expressed by $X \times L_j$.

The method of calculating the new shelf space for a specific product type within a category is the same as the method of calculating shelf space by category. The shelf space by product type determined by:

$$l_i = N \times \frac{d_i (1+b_i)}{\sum_{i=1}^{n} d_i (1+b_i)} \quad (9)$$

$l_i$ The new length of shelf space for product i.

N The new shelf space of a category obtained previously.

$d_i$ The original length of shelf space for product i.

$b_i$ The growth rate of sales for product i.

The number of rows of products (Rp) needed to fill the derived shelf space is calculated as:

$$\text{Rp} = \frac{l_i - Kd_i}{p_i} \quad (10)$$

$Kd_i$ The original shelf space for product i and

pi The face length of product i.

The above algorithms demonstrate the seamless incorporation of quantitative decision models in an EC implementation. Thus, retail managers access the enterprise data and take advantage of decision support tools (i.e., shelf arrangement) that utilizes real-time data. The concept can be extended across the chain of stores to support enterprise-wide decision making and resource planning.

## Discussion and Conclusion

This paper offers a new approach for developing a chain-store retail information system. The system is constructed in a internet-based environment and is developed with two main focuses. First, this research defines a standard object-oriented data representation model for enterprise-wide databases. The model


**Figure 13. The graphical display of products on a shelf layer.**

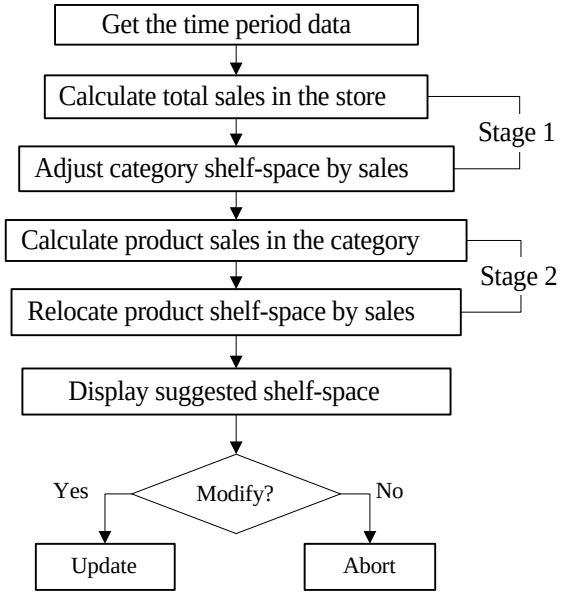


**Figure 14. Process for shelf rearrangement.**

keeps the retail data consistent and flexible for applications. The second focus is the transmission, communication and incorporation of data in a central decision support system. The research enables two-way (closed-loop) communication to overcome the shortcomings of a POS system. The system uses web-based technology for the interface between headquarters and retail stores. The information about the chain of stores flows into the central database of the headquarters computer. The headquarters system accumulates data such as management sales history and store layout data to provide higher quality analysis and management support on-line through the web. The system and its concept is easily adapted to retail enterprises because the environment, technologies, and equipment for system development are prevalent. Thus, retail enterprises can devote their efforts on developing sophisticated decision models that satisfy their business needs. The retail information system architecture matches the structure of the retail business. Therefore, retailers can continue to build the system with modularized analytical rules without major reconstruction of the system.

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# Educational Value of the Internet: Students' Perceptions

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**Abstract**

*A survey is conducted to study the value of the Internet for educational support as perceived by students in College of Business Administration. Students attributed the Internet to increased interests for the courses and better learning experience. They did not value the Internet as an effective means of disseminating lecture materials, as many instructors believed so. There was no significant difference between gender in assessing the usefulness of the Internet.*

***Keywords:*** Internet, Educational Value, teaching pedagogy

One of the most important missions currently confronting educators is to prepare students to meet challenges in the emerging globally networked information intensive economy. In the traditional setting where presentation tools such as blackboard and overhead projector are commonly used, development of relatively complex concepts and their subsequent application to the real world problems is very ineffective through these means. It becomes indispensable that a new teaching pedagogy coupled with a drastically restructured course framework be developed to assist students in becoming effective and knowledgeable workers in the virtual learning environment, and ones who can work productively as members of dispersed task teams across organizational, national, and cultural boundaries [1, 9].

Since business and media discovered the Internet in 1993 [3], interest among educators in incorporating the Internet in course framework has increased at a phenomenal rate. Many have learned that the vast resources of the Internet can be a foundation for curricular innovations and restructuring. The various services on the Internet can also be used as tools to support a variety of instructional activities in the implementation of virtual learning environment, and to enhance interaction in the learning process.

With more than 20 million users in over 60 countries, the Internet is a cultural and technological phenomenon. Growing at the rate of 15% per month, the Internet has the potential to transform how we prepare students to participate in a globally networked economy. This immense sea of constantly updated information has the potential to effectively involve students in all aspects of learning (7).

While educators have recognized the usefulness of the Internet, few studies have been done to discover the educational value of the Internet from the students' point of view. From the media, we have become aware of the increased use of Internet by the students at all ages. However, there seems to have been little of study on students' feedback from their experience with the Internet and how that impact on education [4].

In this paper, a tool is proposed for studying students' perception of the usefulness of the Internet with regard to a variety of classroom activities. Using this tool, students' feedback as to the educational value of the Internet was then collected using a simple questionnaire as described in the section. Statistic analyses of the sampling results are reported to provide educators with useful information from students regarding ways of better utilizing Internet to prepare students for meeting challenges in the future.

## Educators' Views of the Internet Education Value

With the introduction of more user-friendly Internet browsers such as Netscape, using the World Wide Web (WWW) as an effective tool for supporting a variety of instruction activities has become more promising. There are three major approaches to incorporating the Internet into course structure [2, 8, 10]. These approaches are briefly described as follows.

1. The courses supplement approach. This approach aims at providing up-to-the- minute information as supplements to lecture materials.
2. The virtual classroom approach. This approach focuses on providing information to enhance the classroom interactions (11), such as:

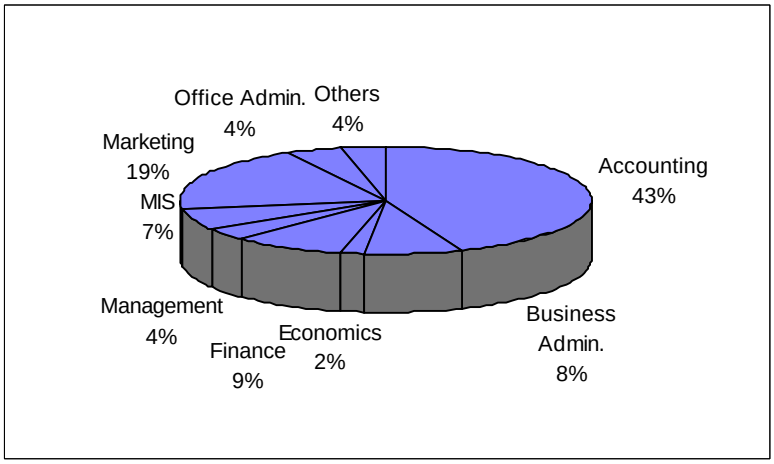


**Figure 1: Survey Participants by Majors**

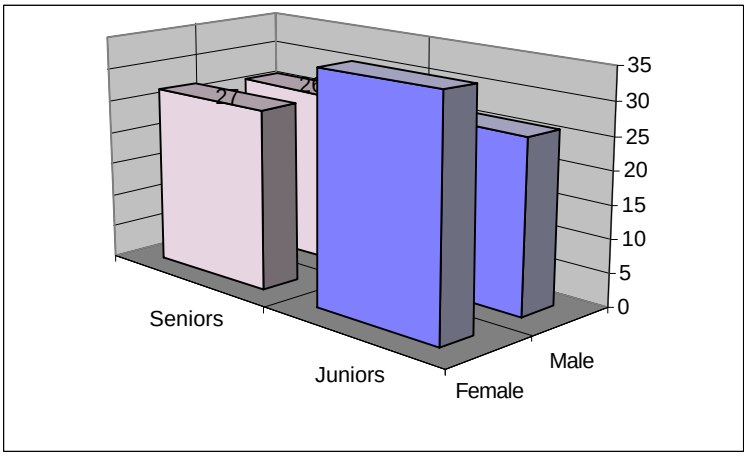


**Figure 2: Profile of Survey Participants**

* Online lectures and instructional materials
* Interactive multimedia textbooks
* One-to-one communications
* Access to remote systems
* Asynchronous group communications
* Synchronous group discussions
* Experimental learning
* Course and content management
* Online testing
* Online assessment

3. The multi-cultural learning approach. This approach provides students with the opportunity of learning in different cultural environment and improves student's awareness of international aspects of virtually all courses.

These approaches seem very promising in terms of improving students' learning efficiency, especially when traditional classroom settings and teaching tools limit their exposure to a broader range of knowledge and up-to-the-minute information. But, do students share the same enthusiasm as instructors in using the Internet? Are they willing to learn how to surf the Internet and make an Internet-based teaching environment a feasible one? Are they willing to spend extra hours to meet the new challenges in an-Internet focused class would require? Do they think that all classes could benefit from using the Internet? Answers to these important questions and several others will have to come from students.

## Investigating Students' Perceptions

### *Research Design*

To observe if students would have similar perception of the usefulness of the Internet as the educators', educators' views of the Internet education value have been generalized in nine questions to be included in the questionnaire. Another question is added to the end of the list to see if students believe more courses should involve the Internet. Sample copy of this questionnaire is presented in Appendix.

Students in all sections of the Introduction to Management Information Systems class were selected to participate for the purpose of collecting feedback. This class was selected because this is the only course, which would have the foundation skills for extensively surfing the Internet. All business majors and several other non-business programs in a typical university require a course such as this. The

**Table 1: Internet Experience of Survey Participants**

| Characteristics of Survey Participants | Mean Experience | Standard Error |
|---|---|---|
| Total Sample | 2.54 | 1.2 |
| | | |
| By Class | | |
| Juniors | 2.52 | 1.23 |
| Seniors | 2.57 | 1.17 |
| | | |
| By Gender | | |
| Female | 2.44 | 1.29 |
| Male | 2.67 | 1.08 |

**Table 2: General Feedback Regarding Internet Uses**

| Question | Mean | SE |
|---|---|---|
| 1. An effective means of disseminating lecture materials | 3.46 | 0.87 |
| 2. Providing materials not available in textbook | 3.72 | 0.89 |
| 3. Bringing closer the classroom and the real world | 3.99 | 0.81 |
| 4. Improving efficiency of interpersonal communication | 3.88 | 0.88 |
| 5. Increasing motivation for the course | 3.75 | 0.93 |
| 6. Making the student feel more involved | 3.82 | 0.88 |
| 7. Providing a better learning experience | 4.06 | 0.79 |
| 8. Making the course more interesting | 4.11 | 0.92 |
| 9. Contributing to better performance of the students | 3.66 | 0.95 |
| 10. More courses should use the Internet | 3.74 | 1.06 |

diversity of the student population and the requirement as a core course for most students in the sample help improve the validity of the feedback.

Of the 150 questionnaires returned, 114 copies were complete and were considered as valid cases. These are used as the sample to derive relevant statistics for empirical study purpose. Profiles of these students and their responses are analyzed in the following sections.

### Characteristics of Survey Participants

Most participants are students in the College of Business Administration. A breakdown of the 114 cases by the major is presented in Figure 1. This distribution of participating students coincides with the overall distribution of total students in the College.

To further analyze students' perception of the educational value of the Internet, gender, class, and their experience with surfing the Internet also categorize participating students. Figure 2 presents the profile of survey participants by class and gender.

Only juniors and seniors were selected for the survey, since freshmen and sophomores have little classroom experience in courses covering Internet topics. The ratios of juniors to seniors and female to male are also consistent with the ratios of all students in the College of Business Administration where this sample was collected. Ratios suggest that the sample is a reasonable representation of the student population in the College.

Average Internet experience of these participants and the standard errors of the means are summarized in Table 1.

Measured with a 5-point Likert scale, the participants, on average, demonstrated a moderate level of experience with the Internet with no significant difference between juniors and seniors. On average, male students had slightly more working experience on the Internet than female. But, again, that difference was not significant.

Information from the profile of the survey participants suggests this is likely a fair representation of the Internet experience of the student population. Input provided by these participants would probably be a fairly accurate measurement of the educational value of the Internet as perceived by a student population.

***Empirical Analyses***

Each participant was asked to answer the ten questions using a 5-point Likert scale, with 1 being "strongly disagree" and 5 being "strongly agree". The higher scores would indicate that the Internet was a very important tool for educational purposes. Table 2 below presents the average scores and standard errors (SE) of the answers to these ten questions as collected from this sample population.

**Table 3: Survey Results by Student Class**

| By Class | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Junior** | 3.43 | 3.64 | 4.07 | 3.95 | 3.87 | 3.84 | 4.02 | 4.20 | 3.69 | 3.69 |
| | (0.90) | (0.97) | (0.77) | (0.88) | (0.90) | (0.90) | (0.83) | (0.91) | (0.92) | (1.12) |
| **Senior** | 3.51 | 3.81 | 3.91 | 3.79 | 3.60 | 3.81 | 4.11 | 4.02 | 3.62 | 3.79 |
| | (0.85) | (0.79) | (0.86) | (0.88) | (0.95) | (0.88) | (0.75) | (0.93) | (0.99) | (1.04) |

**Table 4: Survey Results by Student Gender**

| By Gender | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Female** | *3.37* | *3.65* | *3.92* | *3.94* | *3.77* | *3.84* | *4.03* | *4.11* | *3.60* | *3.69* |
| | *(1.03)* | *(0.99)* | *(0.84)* | *(0.88)* | *(0.95)* | *(0.93)* | *(0.85)* | *(0.99)* | *(1.06)* | *(1.20)* |
| **Male** | *3.58* | *3.81* | *4.08* | *3.81* | *3.71* | *3.81* | *4.10* | *4.12* | *3.73* | *3.79* |
| | *(0.64)* | *(0.74)* | *(0.79)* | *(0.89)* | *(0.91)* | *(0.84)* | *(0.72)* | *(0.83)* | *(0.79)* | *(0.94)* |

**Table 5: Survey Results by Student Major**

| By Major | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Accounting** | 3.46 | 3.66 | 3.96 | 3.92 | 3.76 | 3.78 | 3.98 | 4.08 | 3.60 | 3.74 |
| | (0.89) | (0.89) | (0.63) | (0.85) | (0.82) | (0.91) | (0.89) | (1.01) | (0.88) | (1.03) |
| **Economics** | 3.50 | 3.50 | 4.50 | 4.00 | 3.50 | 4.00 | 4.00 | 4.00 | 3.00 | 2.50 |
| | (0.71) | (0.71) | (0.71) | (0.00) | (0.71) | (0.00) | (0.00) | (0.00) | (1.41) | (0.71) |
| **Management** | 2.75 | 3.50 | 3.50 | 3.50 | 3.00 | 3.50 | 3.75 | 3.50 | 3.75 | 3.75 |
| | (0.50) | (0.58) | (1.00) | (1.00) | (0.82) | (0.58) | (0.96) | (1.00) | (0.96) | (1.51) |
| **MIS** | 3.50 | 3.88 | 3.88 | 3.63 | 3.75 | 3.88 | 4.13 | 4.50 | 4.00 | 4.13 |
| | (0.76) | (0.99) | (0.64) | (0.74) | (1.04) | (1.03) | (0.83) | (0.53) | (0.76) | (0.83) |
| **Marketing** | 3.50 | 3.77 | 4.32 | 4.05 | 3.82 | 3.91 | 4.27 | 4.27 | 3.73 | 3.68 |
| | (0.91) | (1.02) | (0.78) | (1.00) | (1.01) | (0.81) | (0.55) | (0.83) | (1.03) | (1.25) |
| **Finance** | 3.60 | 3.90 | 4.10 | 4.10 | 4.10 | 4.20 | 4.20 | 4.40 | 4.00 | 3.80 |
| | (0.97) | (0.57) | (0.74) | (0.88) | (0.88) | (1.03) | (0.79) | (0.70) | (0.82) | (1.14) |
| **Business Administration** | 3.44 | 3.78 | 3.78 | 3.44 | 3.67 | 3.78 | 4.33 | 4.00 | 3.67 | 3.67 |
| | (1.01) | (0.83) | (1.20) | (1.01) | (1.12) | (0.83) | (0.71) | (1.00) | (1.12) | (1.22) |
| **Office Administration** | 3.80 | 3.20 | 3.40 | 3.80 | 3.20 | 3.40 | 3.60 | 3.40 | 3.20 | 3.60 |
| | (0.84) | (1.10) | (1.14) | (0.84) | (1.30) | (1.14) | (0.89) | (1.14) | (1.30) | (0.89) |
| **Other Majors** | 3.25 | 4.25 | 4.00 | 3.75 | 4.00 | 3.75 | 3.75 | 4.00 | 3.25 | 4.00 |
| | (0.96) | (0.96) | (0.82) | (0.96) | (1.15) | (0.50) | (0.50) | (0.82) | (1.26) | (1.15) |

Statistics suggest that the majority of students did feel the use of the Internet provided them with a better learning experience and made the course more interesting. They also felt that the Internet helped bring them closer to the real world. The least favorable response from the students was to question No. 1, as an effective means of disseminating lecture materials (3.46), although they did feel that the Internet helped significantly to improve interpersonal communication.

Since the survey was conducted in a technology-related course, general responses from students who have diversified career objectives may not be sufficient to justify the usefulness of the Internet. Therefore, a further breakdown of sample data based on major, class, gender, and experience with the Internet has been done to derive more specific information regarding students' perception of the possible educational value of the Internet. These results are reported in Tables 3 - 6.

**Survey Results by Student's Experience with the Internet**

In these tables, Q1 through Q10 are the 10 questions presented in the questionnaire. Figures in parentheses are the standard deviation of the means. Based on the calculated means for the surveyed questions, juniors rated the Internet highly useful in (1) making the course more interesting, (2) bringing closer the classroom and the real world, and (3) providing a better experience. Seniors considered the Internet most useful in areas of (1) providing better learning experience and (2) making the course more interesting. The mean values suggest that gender might not have any significant effect in assessing the usefulness of the Internet. Both groups considered the Internet most useful in ways of (1) making the course more interesting, (2) providing a better learning experience, and (3) bringing closer the classroom and the real world.

**Table 6: Survey Results by Student's Experience with the Internet**

| By Internet Experience | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Little experienced** | 3.15 | 3.45 | 3.64 | 3.52 | 3.48 | 3.36 | 3.70 | 3.82 | 3.45 | 3.52 |
| | (0.97) | (0.87) | (0.65) | (0.91) | (0.83) | (0.93) | (0.85) | (0.98) | (1.00) | (1.06) |
| **Little - Modest** | 3.07 | 3.27 | 3.87 | 3.67 | 3.53 | 3.80 | 4.13 | 4.00 | 3.60 | 3.27 |
| | (0.80) | (0.96) | (1.13) | (0.49) | (1.06) | (0.77) | (0.74) | (0.93) | (1.18) | (1.16) |
| **Modest experienced** | 3.48 | 3.86 | 4.10 | 4.05 | 3.86 | 3.98 | 4.21 | 4.19 | 3.57 | 3.86 |
| | (0.77) | (0.87) | (0.79) | (0.94) | (1.00) | (0.87) | (0.75) | (0.97) | (0.94) | (1.12) |
| **Modest - Very** | 4.00 | 3.89 | 4.21 | 4.05 | 4.05 | 4.16 | 4.16 | 4.32 | 4.05 | 4.11 |
| | (0.47) | (0.57) | (0.63) | (0.78) | (0.62) | (0.60) | (0.69) | (0.58) | (0.52) | (0.88) |
| **Very experienced** | 4.60 | 5.00 | 5.00 | 4.80 | 4.00 | 4.40 | 4.60 | 5.00 | 4.40 | 4.20 |
| | (0.55) | (0.00) | (0.00) | (0.45) | (1.22) | (0.89) | (0.55) | (0.00) | (0.56) | (0.84) |

**Table 7: Kruskal-Wallis Test Results**

| Survey Question | By Major | By Class | By Gender | By Internet Experience |
|---|---|---|---|---|
| **Q1** | 4.7692 | 0.3825 | 0.7350 | 24.5245* |
| **Q2** | 5.4604 | 1.0431 | 1.0709 | 20.1277* |
| **Q3** | 8.8215 | 0.6923 | 1.0010 | 18.5298* |
| **Q4** | 6.6028 | 1.1223 | 0.7233 | 15.2253* |
| **Q5** | 5.7254 | 2.0192 | 0.1905 | 6.6314 |
| **Q6** | 4.4882 | 0.0033 | 0.1100 | 13.7696** |
| **Q7** | 6.4086 | 0.4130 | 0.0592 | 10.6879** |
| **Q8** | 7.5937 | 1.2912 | 0.1493 | 10.7176** |
| **Q9** | 5.2594 | 0.1129 | 0.2059 | 8.8835*** |
| **Q10** | 4.1719 | 0.2075 | 0.0064 | 7.6440 |

Level of significance: * = 0.005, ** = 0.05, *** = 0.1

The mean values of these questions grouped by student major, as reported in Table 5, show a somewhat diversified perceptions of the Internet uses. For example, Accounting, MIS, and Finance majors rated "making the course more interesting" higher than any other item. Economics and marketing majors thought "bringing closer the classroom and the real world" most useful. Business Administration majors liked the Internet best in its capacity to "provide a better learning experience." Other non-business majors considered that "providing materials not available in textbook" most useful.

Figures in Table 6 suggest that highly experienced Internet users tend to have a more favorable assessment of the Internet usefulness than those with lesser Internet experience. Overall, except those students with very high level of Internet experience, students tend to consider the Internet an ineffective way of disseminating lecture materials.

To see if any significant distinction among students' perceptions of the Internet educational value due to difference in major, gender, class, or experience with the Internet exists, the Kruskal-Wallis (KW) test was conducted. This tool involves a one-factor analysis of variance by ranks and does not require any assumptions about the population distribution. It is deemed the most appropriate testing tool for this type of sampling results [5]. KW test statistics for all ten questions tested by major, class, gender and experience with the Internet are reported in Table 7.

The KW test results indicate that students' perceptions of the educational value of the Internet are consistent regardless of major, class, or gender. However, levels of experience with the Internet do result in a significant difference in students' responses to all questions except questions number 5 and 10. Experience seems to have nothing to do with their feeling that the Internet tends to increase motivation for the course and that more courses should involve the Internet. For other questions, the results suggest that the more experience a student had with the Internet, the more positive that student was toward the importance and usefulness of the Internet.

Overall, as revealed from the results of the empirical analyses, students are enthusiastic about using the Internet to help them in the classroom. They recognize its importance and usefulness as an educational tool, and are willing to face the challenges of cyberspace.

## Concluding Remarks

There are many ways instructors can help the students better utilize the Internet as an educational tool. Among the major ones are:

(1) Help students select an appropriate Net browser to improve the efficiency of interacting with the Internet. There are many web browsers

available. They don't have the same performance (6).

(2) Discuss and refine the research topics that will use information from the Internet.
(3) Help students improve search skills.
(4) Help students organize the information retrieved from the Net and convert it for use.
(5) Create specific linking Web pages to bring together relevant Web sites for quick access by students.

Students today are well aware of the importance of being exposed to a multi-national and multi-cultural environment, and of being familiar with cutting-edge knowledge and skills. They also realize that the substantive information resources coming from the Internet can be very useful. Results from this study indicate that by using the Internet in more courses, students would be offered an unprecedented learning environment in which to link concepts and skills learned in classrooms to the real world.

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**APPENDIX**

**Internet Uses Survey Form**

Major**:** _____ Class**:** _____
Gender**: F M**

Experience with the Internet:
1.....2.....3.....4.....5
Little Moderate Highly

**INSTRUCTIONS: Please circle using the above scale the appropriate number to indicate your agreement or disagreement with each statement.**

1. Internet is an effective means of disseminating lecture materials.

   1.....2.....3.....4.....5

2. Internet provides up-to-date course materials that are not available in textbook.

   1.....2.....3.....4.....5

3. Internet helps bring closer the classroom and the real world.

   1.....2.....3.....4.....5

4. Internet improves the efficiency of one-to-one and group communications.

   1.....2.....3.....4.....5

5. The use of the Internet increases motivation for the course.

   1.....2.....3.....4.....5

6. The use of the Internet makes the student feel more involved.

   1.....2.....3.....4.....5

7. The use of the Internet helps provide a better learning experience.

   1.....2.....3.....4.....5

8. The use of the Internet makes the course more interesting.

   1.....2.....3.....4.....5

9. The use of the Internet contributes to better performance of the students.

   1.....2.....3.....4.....5

10. More courses should use the Internet to provide lecture materials and assignments.

    1.....2.....3.....4.....5

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**1999 Faculty Position Opening**

**National Chung Cheng University**

National Chung Cheng University in Chia-Yi, Taiwan began its operations in the Fall of 1989. Today it has established a decent reputation in Taiwan. Its newly constructed campus facilities and layout have been rated several times the #1 campus by the Ministry of Education in Taiwan. There are many National Science Council (Taiwan) funded projects undergoing in the university. Its research facilities and budget are abundant. The Department of Information Management has been established in the fall of 1994. Currently, it offers a Master of Science program. It will start its B.S. program in 1998. The department has 5 full-time faculty members and is recruiting for several opening positions at all ranks in the Fall of 1999. Please help us circulate the following position announcement.

RANK:
Assistant, Associate or Full Professor, depending on qualification

STIPENDS:
Similar to the other national university in Taiwan

QUALIFICATION:
1. Ph.D. or DBA degree from an AACSB accredited institution major in Management Information Systems, or related areas.
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# Business Education in Electronic Commerce: A Survey on the Internet

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**Abstract**

*Electronic commerce (EC) is becoming critical for successful organizations in the globally competitive business environment. To meet the challenge of EC, the business education community has been innovating by establishing new educational programs or concentration curriculums in EC. This research study is to provide an overview of the state-of-the-art of the business education in EC based on a comprehensive survey on the Internet. Twenty (20) MBA programs and fourteen (14) undergraduate programs were found to possess significant components in EC. The common characteristics of these programs are summarized into a curriculum structure which can be used for design of business education in EC.*

***Keywords:*** Business education; Electronic commerce; Internet; Teaching pedagogy.

In the modern global economy, businesses are continuously looking for new technologies to increase profits, cut costs and improve strategic advantage. Electronic commerce (EC) is becoming critical for successful organizations in the competitive business environment. Many businesses are focusing their investment capital and energy towards EC in order to exploit new information technology (IT) (Kalakota & Whinston, 1996).

Broadly, EC is a contemporary methodology that addresses issues of improving the performance of business through the use of advanced IT. EC tends not to be perceived as just another example of the alliance of business and the new IT. Specifically, EC provides the impetus for IT enabled business process reengineering in modern organizations. In our view, EC and Management of Information Technology are synonymous. Its requirements for the longitudinal integration of traditional managerial functions makes EC unique to other applications of IT to business in the following aspects.

**(1) EC provides new strategic opportunities.**

In general, two types of strategic opportunities can be counted on as a result of the implementation of EC. One is business process reengineering through the use of IT including point-of-sale systems (POS), electronic data interchange (EDI), electronic funds transfer (EFT), and the Internet (Davenport & Short, 1990). IT enabled business process reengineering would dramatically improve business performance. Another promising vehicle for EC is electronic markets (Senn, 1996). Electronic marketing changes the existing distribution channels of dealers, brokers, and retailers, as well as consumers' behavior. Organizations engaged in EC would get closer to customers, suppliers and distributors, and have faster responses to the markets.

**(2) EC requires organizational redesign.**

Research (Deese, 1996) indicated that successful implementation of EC requires a corporate-wide strategy, with "cross-boundary" examination and streamlining of processes. The result often forces greater cooperation between intracompany departments as well as external partners. Increased openness of corporate enterprise networks in the EC age will fundamentally change the configurations of organization networks.

**(3) EC requires new management techniques for the new technological environment.**

Electronic commerce would significantly change the operational processes in the organization due to its new information technological environment. New management techniques for the new technology environment of EC are emerging. For instance, workflow management (WARIA, 1997; WFMC, 1997) is being considered a technique for organizations to manage the new technological environment of EC.

**(4) EC creates new security and legal issues.**

Electronic commerce has created a special environment for business. Companies engaged in EC face a variety of security threats, from malicious hackers attempting to crash a system, to data warehouse losses. The biggest caution sign on the road to electronic commerce is security (Perry, 1998). Also, EC creates a variety of special legal issues (Piette-Coudol, 1996).

As more and more organizations have embarked on projects of EC, there has been a growing realization of the importance of business education in EC. Many educational institutions have discovered that today's management requires considerable knowledge and skills in EC to make EC suitable for their work places.

This paper will examine the recent developments in EC and the present state of educational opportunities which facilitate a formal education in IT through graduate and undergraduate levels. Programs currently offered by educational institutions will be reviewed and compared in order to determine their respective unique aspects. Considerable effort will be spent reviewing specific areas which are emphasized within the topic. The motivation of this study is initiated by the fact that many business education institutions, including the faculty where the authors are working, are establishing majors in EC. An overview of EC programs might provide a useful guideline for the identification of teaching and research topics in the field of EC.

## Search Origins and Methodologies

A comprehensive search on the Internet has been conducted in order to have an overview of business education in EC and related new fields in IT. The information obtained for this paper has been obtained exclusively from a search on the Internet and retrieval of Web pages. The consideration for using the Internet is that leading universities have been assumed to have representation on the Web. The keywords used for the comprehensive search include:

- Schools of business;
- Faculties of business;
- Electronic commerce;
- MBA;
- BBA;
- EC;
- Information technologies;
- EC courses;
- Major in EC; and
- Major in Management Information Systems (MIS).

The primary search engines utilized for the queries was Infoseek (Infoseek, 1998), excite (Excite, 1998), yahoo (Yahoo, 1998), and lycos (Lycos, 1998). Documents such as ECWorld Directory of Courses and Cases (CCECW, 1997), which lists various courses offered at universities throughout the United States, and ISWorld Net's EC Course Syllabi Page (ECCSP, 1997), which lists course syllabi for courses that are in the subject area of EC, were both utilized as starting points for the search.

The individual universities and business institutions cited in these documents were further investigated to determine their suitability. Additional efforts consisted of examinations of home pages of individual Canadian universities identified through Netsearch (CLU, 1997).

## Findings

Twenty (20) institutions were found that are offering courses or specializations in the field of EC or Information Technology at the MBA level. Fourteen (14) institutions were found to have significant subjects on EC at the undergraduate level. These educational institutions and their respective programs are summarized in Appendices A (for the MBA level) and B (for the undergraduate level). Selected textbooks and readings used for teaching in these programs are included in the Appendices.

(1) The primary emphasis of universities offering concentrations or majors in EC is at the graduate level, while the undergraduate programs are more likely to focus on an individual course approach. Among the 20 MBA programs, 12 are offering concentrations or majors in EC, but only 3 in the 14 undergraduate programs are offering majors in EC.

(2) A review of the institutions offering majors or concentrations at the MBA level has revealed a common theme. Due to dramatic shifts in standard business practices caused by the emergence of a global electronic marketplace there is enormous need from a variety of fronts to understand the implications for strategic initiatives, marketing and advertising, financial markets, information systems strategy, human resource management and supply chain management (Vanderbilt, 1998). The emphasis of EC programs is given to managing the global, strategic and organizational impact of IT. Some programs do address the technical aspects of computers and information systems (e.g., (Dublin, 1998)); however, such technical aspects should contribute to the understanding of the implications of IT for the new electronic economy and management.

(3) Business educators realize that the technology is advancing and developing at such an extreme rate that courses must continually evolve to give participants a thorough understanding of the issues pertinent to the management of the new technology. Consequently, many of the course syllabi state that additional readings will be provided by the instructor as they become available.

(4) In general terms, EC majors or concentrations diverge from the existing business education programs by adding either specific required or elective courses. Examples of typical required course topics include: Marketing in Computer Mediated Relations (Vanderbilt, 1998), Systems Analysis for Managers, Global Telecommunication (American, 1998), EC Systems, and Infrastructure for EC (Monash, 1998). The required courses vary among the institutions with some emphasizing an information systems approach (Dublin, 1998) and others offering a purer EC framework (Monash, 1998). The elective programs offer a variety of topics from which to choose. Examples of these offerings include selections in the topics of the Information Highway (Boston, 1998), Strategy and EC (INSEAD, 1998) and

numerous aspects of IT (Vanderbilt, 1998). The overall emphasis of the courses offered centers on the concept of the impact of IT on organizations and their practices. Many focus on the subject of change or organizational structure through business process reengineering and point to the logical conclusion that the implementation of EC and restructuring are directly complementary with each other. The courses examine the trends in computer uses for IT, and the subsequent effects on competition, organizations, and corporate strategies.

(5) According to our review of curriculums of individual EC programs, the EC discipline requires substantial longitudinal integration of traditional managerial functions, including policy, organizational theory, management information systems, marketing, and others. The EC discipline is problem solving oriented rather than singular methodology oriented. Specifically, EC programs are designed to train business practitioners to change the traditional ways of doing business by exploiting IT. We will develop this point later in the section on curriculum structure for EC.

## Discussion

Several correlated points are worth further discussion. First, while many leading business educational institutions are establishing majors or concentrations in EC, the majority of colleges and universities represented on the Internet (estimated a thousand) had basically no reference to EC or Information Technology in their curriculum despite claims of offering business programs designed to educate managers in current and emerging business issues. One might wonder whether or not there is a lack of demand for training of EC specialists. In our view, the slow movement of EC education is another example of the lag of business education behind business practices. The development of expertise, theories, curriculum designs, and teaching materials (e.g., textbooks and cases) for EC training is time consuming.

Second, as revealed in the findings, thus far the majors or concentrations of EC are established mostly at the MBA level. However, little effort thus far has been devoted to the undergraduate level other than to offer a course in the topic as an elective to the BBA program. While one could interpret this fact in several ways, we consider that it is primarily a result of the limitation of faculty resources and the imperative demand for EC personnel at middle or high levels in organizations.

Third, the majors or concentrations in EC in business degree programs commonly require significant proportions of computer related technical courses in their curriculums. Also, many courses currently offered for EC are categorized within the respective MIS divisions. Advanced IT for most managers is still the ABC of EC training. The business education programs continuously face the dilemma of the balance between technical and non-technical components. On one hand, the fast pace of the development of new IT in conjunction with EC trainees' eager needs for knowledge of advanced IT drives the business educators to upgrade their technical background; but it is never fast enough. On the other hand, business schools would like to emphasize the managerial training so that their students can possess the capability to assess and manage technological impacts on managerial and strategic aspects of the organizations. These non-technical skills of managers are far more critical to organizational success.

## A Curriculum Structure for EC Programs

In designing a major or concentration of EC, the curriculum designers must be able to keep in mind the various aspects of the host business educational program. They need a structure, or framework, to help them to focus on the business educational program in its entirety while structuring the individual parts of the program. A structure indicates which components are most important to consider during the curriculum design of courses. It shows the relationships between these components and the conventional business functions. Figure 1 shows the structure that is built on the surveyed leading business educational programs which meets the specific requirements of course design for EC.

As shown in Figure 1, EC has become a business education domain which is built on the extensions of several traditional managerial fields, including:

- Organizational Theory: Networked organizations, virtual organizations, organizational design in the IT age;
- Management: Management of technology, business process reengineering;
- Marketing: Marketing in computer mediated environment;
- Policy: Strategy for EC, public policy of IT;
- Business Law: EC legal issues;
- Accounting Information Systems: Electronic auditing, electronic banking, electronic fund transferring;
- Management Information Systems: Strategic role of IT, systems analysis and design;
- Supplemental technical foundation of IT: Data communication, information highway, business application software development, database management, system security.

Unlike other longitudinally integrated programs such as Tourism and Retail Management, EC is essentially industry-independent but associated with the backbone of IT.

While greater investigation on the issues of business programs for EC awaits further study, this summary result provides an initial delineation of the current state of business education in EC.

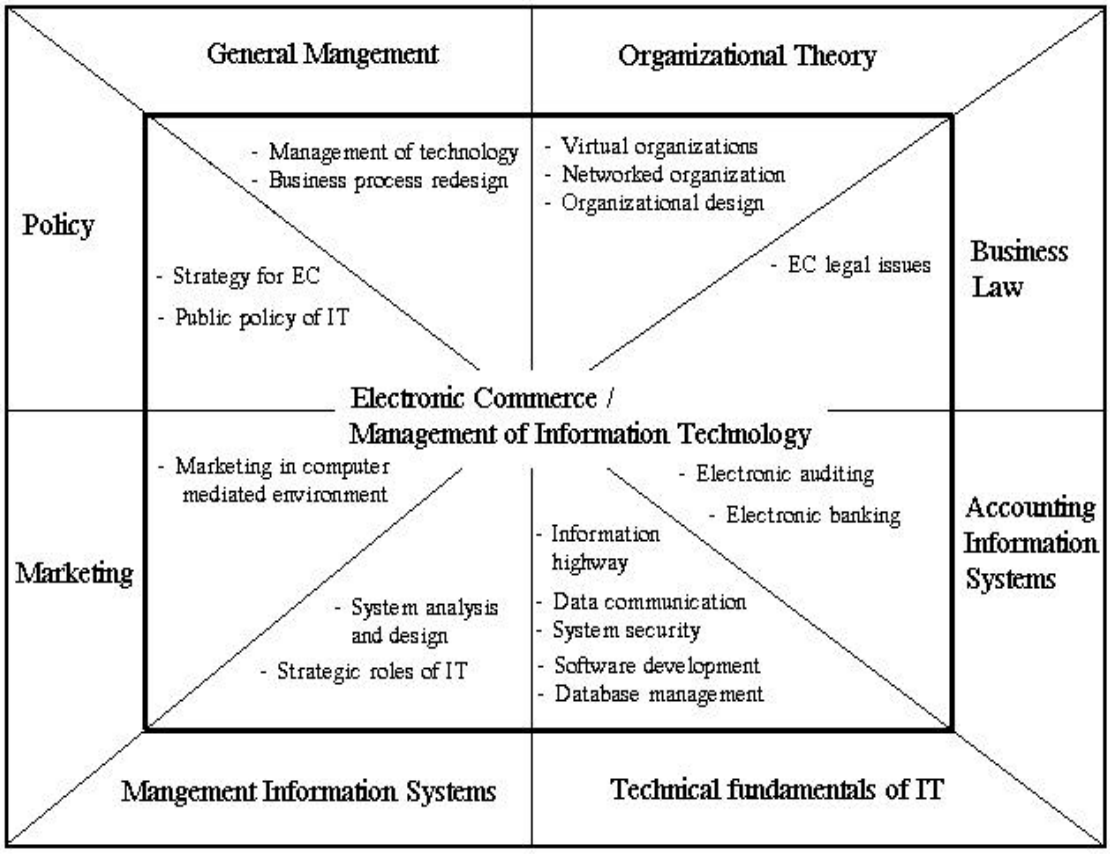


**Figure 1: A Curriculum Structure for Electronic Commerce**

Based on the structure, a prototype curriculum with 18 credit-hours for majors of EC is proposed as follows.

***A. Intro-level courses:***

A.1. Principles of Electronic Commerce. This is an introductory course that examines all facets of EC in general. It also provides the technological basis of EC from a business perspective. Topics include computer networks, internet/intranet, telephony, IT infrastructure, and IT supplier industries.

A.2. Legal and Public Policy in Electronic Commerce. Legal, security and privacy issues range from ownership of information to trade settlements and subjects of international law. This course also examines government policies and industry policies as well as their impact on electronic commerce.

***B. Mid-level courses:***

B.1. Technique Tools for Electronic Commerce. This presents various computer tools in the field of electronic commerce. Topics covered include computer data processing, development of Web pages, client-server computing, electronic data interchange (EDI), and software agents.

B.2. Electronic Markets. This course discusses major characteristics of electronic markets. Topics include supplier-consumer chain in the computer mediated environment, goals for online marketing, and interactive customer service.

B.3. Organization and Electronic Commerce. This course examines the effects of electronic commerce on organizations and individuals within the organization. Issues discussed include organizational analysis and design for electronic commerce, inter-organizational networks, virtual organizations, and human resource management in electronic commerce.

***C. High-level courses:***

C.1. Competitive Strategy of Electronic Commerce. A project course in which students prepare a proposal for launching an electronic commerce project for real business. The course project addresses issues of a new electronic commerce product or service, business process reengineering, financing, marketing, and organizational changes.

**Limitations and Concluding Remarks**

Although the search is close to exhaustive, any extensive conclusion of the search results would become unjustifiably speculative in view of the limitations of this study. Educational institutions which do not have representation on the Internet have received no acknowledgment. Only educational institutions which have included details of their programs have been reviewed. Facilities which may be in the planning or near completion stage to

offering courses in the subject have not been recognized unless such facts were disclosed in their Web page. Further, due to the vast numbers of schools represented on the Web, universities which have not stipulated either a major or concentration in EC or Information Technology through their business programs have not been examined to the extent of reviewing each individual course, even though the possibility exists that a relevant course may have been omitted.

Given the current momentum of applications of EC, many organizations will find themselves scrambling to find qualified personnel in EC. This demand will propel universities to update and modify their current programs in order to accommodate this new market trend. This study has illustrated clearly that business education in EC is still very much in an embryonic stage. However, the fact that many leading educational institutions have offered majors or concentrations in the EC field might encourage many business schools to create distinct competitive advantages and opportunities by establishing themselves as leaders in the EC field.

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**Appendix A. Universities Offering Majors/Concentrations in EC at the MBA Level**

| University [Country] | Features |
|---|---|
| American University (American, 1998) [USA] | Program in Management of Global Information Technology.<br><br>Three required courses:<br>Foundation of Telecommunication for Managers<br>Systems & Database Design<br>Systems Analysis for Mangers<br><br>One of the Globally-Intensive course:<br>Impacts of National IT Environment on Business<br>Designing Systems for the Global User<br><br>Electives:<br>Global Collaborative Technology<br>Global Telecommunications<br>International Electronic Commerce<br>Current Topics in Management of Global Information Technology |

| | |
|---|---|
| | Strategic Management of Global Information Systems<br>Managing the Global Information Systems Organization<br><br>Textbooks/Required Reading:<br>(Hoffer, George & Valacich, 1996), (Kroenke & David, 1998), (Shneiderman, 1998), (Yesil & Magdalena, 1996) |
| BI Norwegian School of Management<br>(BI, 1998)<br>[Norway] | Management of IT<br>Deals with: managing IT for competitive advantage, managing the IT resource; special issues in IT management |
| Boston University<br>(Boston, 1998)<br>[USA] | Elective course of information technology:<br>The Information Highway<br>(Address the challenges posed to individuals, organizations, and society by the development of the information superhighway. Focus will be on the WWW as a key technological platform and understanding its essential features, tools and languages.)<br><br>Textbooks/Required Reading:<br>(National Academy of Sciences, 1998) |
| DePaul University<br>(DePaul, 1998)<br>[USA] | Core Courses:<br>Management of Information Technology<br><br>Other courses:<br>Management of Innovation and Technological Change<br><br>Concentration MIS Courses:<br>Emerging Technologies<br>Electronic Commerce<br>Information Technology Strategy and Architecture<br>Social Issues of Information Technology<br>Telecommunications Management |
| Dublin University<br>(Dublin, 1998)<br>[UK] | Master of Business Studies in Management Information Systems.<br>Core courses:<br>Management Information Systems Framework<br>Information Requirements and Databases<br>Electronic Commerce<br>Management Support Systems<br>Economics of Information Systems Management |
| Harvard University<br>(Harvard, 1998)<br>[USA] | Courses and field study in Information Technology<br><br>Required:<br>Technology and Operations Management (TOM)<br><br>Electives:<br>Business and the Internet: Strategy, Policy, and the Law<br>Competing in the Information Age<br>Managing in an Information Age<br>International Marketing Management<br>Information Technology (field study)<br>Technology and Operations Management (field study)<br>Information Technology |
| INSEAD<br>(INSEAD, 1998)<br>[France] | Information Technology courses for specialization include:<br><br>Business Process Reengineering<br>Competing on Quality<br>Creating New Products and Services<br>Decision Traps & Tools<br>Information Technology for Managers<br>Leveraging Groupware and Multimedia in Business<br>Managerial Decision Making<br>Management of Services<br>Managing Networked Organizations<br>Operations Strategy |
| Massachusetts Institute of Technology<br>(MIT, 1998) | Information Technology and Business Transformation<br>(This track is offered to provide the education that current and future managers require to thrive in this environment. The goal of the ITBT Track is to educate students to succeed in a world where information technology (IT) is changing the basic economics of products and |

| | |
|---|---|
| [USA] | services around the world.) |
| McGill University<br>(McGill, 1998)<br>[Canada] | Required:<br>Information Systems<br><br>Elective:<br>Information Systems Administration |
| Monash University<br>(Monash, 1998)<br>[Australia] | The School of Business and Electronic Commerce, a department of the Faculty of Business and Economics offers<br>Graduate Diploma in Electronic Commerce<br>Graduate Certificate in Electronic Commerce<br>Executive Certificate in Electronic Commerce |
| Nanyang University<br>(Nanyang, 1998)<br>[Singapore] | Specialization in Management of Information Technology<br><br>Compulsory Functional Subjects:<br>IT Management Forum<br><br>Functional Subjects (select a minimum of 4):<br>Communication Technology and Network Management<br>Global Information Technology<br>Information Technology Controls, Security and Audit<br>Advanced Topics in Information Systems<br>Emerging Data Management Technologies and Applications<br>Contemporary Engineering of Enterprise Software<br>Strategic IT: Creating Business Value from Technology<br><br>Electives:<br>International Electronic Commerce |
| Queen's University<br>(Queens, 1998)<br>[Canada] | Operations and Information Technology Strategy<br>Readings:<br>(Pisano & Hayes, 1998), (Parker, 1998), (Chase and Aquilano, 1998), (Frenzel, 1998) |
| Rochester University<br>(Rochester, 1998)<br>[USA] | Core Course related to Electronic commerce:<br>Information Systems for Management<br><br>Concentration Courses:<br>Accounting and Information Systems (AIS) concentration:<br>The Economics of Computer Management<br>Advanced Information Technology<br>Business Data Communications<br>Computer Auditing, Security and Control<br>Financial Information Systems (FIN 446)<br>Performance Evaluation and Capacity Planning of Computer Systems<br>Advanced Topics in Database Design<br><br>Computers and Information Systems (CIS) concentration:<br>The Economics of Computer Management<br>Advanced Information Technology<br>Managing Electronic Commerce<br>Business Data Communications<br>Computer Auditing, Security and Control<br>Financial Information Systems<br>Decision-Support Systems<br>Advanced Topics in Database Design<br>Database Marketing<br>Service Management<br>Consulting Project |
| Southern Methodist University<br>(Southern Methodist 1998)<br>[USA] | Managing Information Technology<br>Emerging Information Technologies<br>Analysis of Information Systems<br>Electronic Commerce |
| University of Arizona<br>(Arizona, 1998)<br>[USA] | Behavioural:<br>Social Issues of Computing<br>Introduction to Information Systems Analysis and Design<br>International Dimensions of the Information Technologies<br>Management and Evaluation of Information Systems<br>MIS/Journalism - Information, Technology and Business on the Internet<br>Systems Design for Management |

| | |
|---|---|
| | Collaboration Computing<br>Domestic and International Issues<br>Group Support Systems<br>Management of Executive Information<br><br>Technical:<br>Data Communications<br>Information Systems Architecture<br>Systems Modelling and Simulation<br>Data Structures and Algorithms<br>Data Base Management<br>Advanced Business Programming<br>Software Systems<br>Advanced Object Oriented Programming in Visual C++ and Java<br>Introduction to Artificial Intelligence and Expert Systems<br>Advanced Topics in Artificial Intelligence<br>Advanced Topics in Information Systems Analysis and Design<br>Advanced Topics in Database Systems |
| University of California at Berkeley<br>(California, 1998)<br>[USA] | Business Value of Electronic Commerce<br>Technology Topics and Trends<br>Strategic Information Technologies & Their Business Implications<br>Textbooks/Required Reading:<br>(Messershmitt, 1998) |
| University of Denver<br>(Denver, 1998)<br>[USA] | Information Technology & Electronic Commerce<br>Master of Arts in Technology and International Public Policy<br>Electronic Commerce<br>Technology Management<br>Telecommunications |
| University of Louisville<br>(Louisville, 1998)<br>[USA] | Electronic Commerce<br>Module in Information Technology<br>Textbooks/Required Reading:<br>(Kalakota & Whinston, 1996) |
| Vanderbilt University<br>(Vanderbilt, 1998)<br>[USA] | The electronic commerce emphasis may be added to any concentration by taking four of the electronic commerce offerings.<br><br>Required course:<br>Marketing in Computer Mediated Relations<br><br>At least one macro issues course:<br>Marketing in Computer Mediated Environments<br>Management of Technology<br>MIS: Telecommunication for Competitive Advantage<br>Electronic Commerce and the Virtual Organization<br>Internet & the Information Superhighway<br>Strategy for the Electronic Commerce<br><br>At least one micro issues course:<br>Decision Support Systems<br>Introduction to Data Base Management Systems<br>Telecommunication Management<br>Wireless Communication |
| Wales University<br>(Wales, 1997)<br>[UK] | Electronic Commerce<br>(Covering topic areas such as: an introduction to electronic trading; problems with paper-based trading; electronic data interchange (EDI); business process re-engineering; the Internet and other technologies.) |

**Appendix B. Universities Offering Majors/Concentrations in EC at the BBA Level**

| University [Country] | Features |
|---|---|
| BI Norwegian School of Management<br>(BI, 1998)<br>[Norway] | Using Information Technology in a Global Economy<br>(Communications Technology, Strategic Computer System, Global Electronic Marketplace, Organizing for Global Commerce, Telecommunications Marketplace, Law and Global Information Technology, Copyright in a Digital Economy and Establishing an Internet Business.) |
| Bowling University<br>(Bowling, 1998)<br>[USA] | Electronic Commerce<br>(How organizations can harness information technologies to create new business opportunities and new ways to run existing businesses. ) |
| DePaul University<br>(DePaul, 1998)<br>[USA]] | Electronic Commerce<br>(Explores the tools, skills, and business and social implications of the emergence of electronic commerce in the cyber space. In addition to acquiring basic skills for navigating the Internet and creating personal and business electronic presence on the Web, the students reexamine fundamental processes of business as they are performed in the cyber space in contrast to the marketplace.) |
| Harvard University<br>(Harvard, 1998)<br>[USA] | Doing Business on the Internet<br>(Examines the impact of the Internet on traditional methods of doing business. It explores the existing and future uses of the Internet for the marketing of goods and services across a range of product categories.) |
| Massachusetts Institute of Technology<br>(MIT, 1998)<br>[USA] | Students may specialize in Information Technologies.<br>The Information Technologies curriculum focuses on how information technology can be used, designed, and managed to support effective decision making. |
| Monash University<br>(Monash, 1998)<br>[Australia] | The School of Business and Electronic Commerce, a department of the Faculty of Business and Economics, offers a Bachelor of Business and Electronic Commerce Degree.<br><br>Core and foundation subjects in electronic commerce:<br>Introduction to Electronic Commerce<br>Supra-Organizational Systems<br>Commercial Aspects of Electronic Commerce<br>Electronic Commerce Systems - Analysis and Design<br>Infrastructure for Electronic Commerce<br>Electronic Commerce Project Management<br>Information Law<br>Programming for Business Applications |
| New York University<br>(New York, 1998)<br>[USA] | Electronic Commerce Seminar |
| Royal Roads University<br>(Royal Roads, 1998)<br>[Canada] | Bachelor of Commerce in Entrepreneurial Management<br>Contemporary Issues Module<br>(Occasionally learners take a group of Contemporary Issues courses. These courses change to reflect business trends. Examples include:<br>management of technology; entering developing markets; maintenance of business growth; cultural considerations in business negotiations; new venture creation and management; quality management; electronic commerce) |
| University of California at Berkeley<br>(California, 1998)<br>[USA] | Computers and Modern Organizations<br>MIS: Business Systems Planning and Design<br>Special Topics in Manufacturing and Information Technology |
| University of Denver<br>(Denver, 1998)<br>[USA] | Information Technology and Electronic Commerce |
| University of Illinois at Springfield<br>(Illinois, 1998)<br>[USA] | Electronic Commerce: Business Uses of the Internet<br>(Course options include attendance in classroom or delivery through the Internet.)<br>Textbooks/Required Reading:<br>(Cronin, 1994), (Resnick & Taylor, 1995) |
| University of Michigan<br>(Michigan, 1998)<br>[USA] | Electronic Commerce on the Internet<br>(Course provides an understanding of the evolving Internet technologies and explore the business implications of these developments. The focus is on the fit between technology and strategy.)<br>Implementing Electronic Commerce and Intranets<br>Textbooks/Required Reading: |

| | |
|---|---|
| | (Kalakota & Whinston, 1997) |
| University of Pittsburgh<br>(Pittsburgh, 1998)<br>[USA] | Commerce on the Information Highway<br>(How businesses might make use of electronic, computer based communications services to increase or even create their market presence. Technology focus will be on the World Wide Web.)<br>Textbooks/Required Reading:<br>(Kalakota & Whinston,1997), (Castro, 1997) |
| University of Witwatersrand<br>(WIT, 1998)<br>[South Africa] | Core modules:<br>Philosophy of Information Systems<br>Presentation Skills<br>Organizational Implications of IT<br>Information Systems Management<br>Research Methodology<br>Database Theories<br>IT Strategy<br>Information Engineering<br>Evaluation of IT<br>Risk Management<br><br>Elective:<br>Quality Control<br>The Information Age<br>Object Orientation<br>Project Management<br>Electronic Commerce<br>Interpreting Information Systems<br>Computer, Audit, Security & Control<br>Expert Systems<br>Internet/Intranet<br>Change Management |

**About the Author:**

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19th International Conference on Information Systems (ICIS): December 13-16, 1998, Helsinki, Finland. (http://www.icisnet.org) Submission date: May 1, 1998.

28th Western Decision Sciences Institute (WDSI) Annual Meeting: April 6-10, 1998, Puerto Vallarta, Mexico. (http://misnt.calpoly.edu/wdsi) Submission date: October 1, 1998.

9th Annual Meeting of Association for Chinese Management Educators, August 13-15, 1999, San Francisco, USA. (http://misnt.calpoly.edu/icisa) Submission date: January 15, 1999.

3rd Asia Pacific Decision Sciences Institute (APDSI) Annual Conference, June 9-12, 1999, Shanghai, China. (http://misnt.calpoly.edu/icisa) Submission date: January 31, 1999.

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On behalf of ICISA, I want to remind you that all members of the ICISA and MIS community are invited to submit their research on the topic to this special issue. Our aim with this special issue is not to depart from our objective of *Communications of ICISA*, but to embrace a broader array of papers. This aim suggests that review papers could be appropriate if they are not only synthesize an area, but then map exciting new streams of MIS research into the TQM arena.

Articles should be around 4000 words in length, typed with wide margins and double spacing. Submission should be sent to the following address, together with a brief biographical note, and an abstract of approximately 150 words. All paper must be prepared in Word97 format. The deadline for paper submissions is March 1, 1999. Electronic submission is strongly encouraged and should be sent to <mishgc@mis.ccu.edu.tw>. For hard-copy submission, please send 4 copies to the Guest Editor's address.

All manuscripts will be reviewed to determine their suitability for publication. We will assign reviewers and all papers will go through a rigorous, double-blind review process. Preliminary inquiries about topics and formats are welcome.

Please do not hesitate to email me if you would like to discuss any of these issues further. I look forward to receiving your papers over the next few months.

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