

coordination, the systems on top of this can be information processing types of information systems.

The information technology infrastructure does not only favour textile and apparel industry. The infrastructure is also adopted by other industrial applications in Hong Kong, such as service industry, transportation logistics, and CAD/CAPP/CAM. Most of these applications cover all of the information access, coordination and processing functions.

The information technology infrastructure is highly cost effective for the executive managers, designers and merchandisers in the textile and apparel industry. The information technology infrastructure also helps to speed up their retrieval of worldwide industry information. By always being able to keep track of the most current product trends world-wide, the users' competitive advantage will be increased. This provides the necessary information infrastructure to put the Government Industry Projects' applications to practical use. With the advent of the new technology, we can continuously improve the performance, such as real-time access and solid security, for this infrastructure.

## TOWARD THE CONSTRUCTION OF CUSTOMER INTERFACES FOR CYBER SHOPPING MALLS - HCI RESEARCH FOR ELECTRONIC COMMERCE

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### INTRODUCTION

Nowadays, one of the most evident changes in the area of information technology is the Internet. The rate of increase in the use of the Internet is second to none compared to any other technological advances in the modern era (Chon, 1996). Twenty to thirty million people are estimated to use the Internet currently, and the number is expected to grow to two hundred million by the year 2000 (Hoffman, Kalsbeek, and Novak, 1996). As the use of the Internet becomes prevalent, it is expected to have a profound impact on our everyday life (Kraut, 1996).

One important change that can be brought by the Internet is manifested by electronic commerce. Electronic commerce is defined as the execution of information-laden transactions between two or more parties using inter-connected networks (Kalakota and Whinston, 1997). It is a generic term to include all the commercial activities using any kind of networks such as EDI or the Internet. Due to the rapid diffusion of the Internet, the market for electronic commerce is also expected to increase sharply to 600 million dollars by the year 2000 (IDC, 1997).

Electronic commerce can be classified into three distinct categories: inter-organizational electronic commerce, intra-organizational electronic commerce, and consumer-to-business electronic commerce (Kalakota and Whinston, 1996). Of the three, consumer-to-business electronic commerce, mostly implemented as cyber shopping malls, has the greatest potential to influence everyday life (Chung, 1996). Through cyber shopping malls, customers can learn about products through electronic publishing, buy products with electronic cash, and even have information goods delivered over the network.

Customers are spared the drudgery of traffic and long lines of conventional shopping. Suppliers can reduce overhead costs through less expensive distribution channels. For these reasons, the size of the cyber mall market will grow to 660 million dollars, with twenty percent of total household expenses spent via the Internet (Booz and Hamilton, 1996).

An important precondition to the success of cyber shopping malls is the construction of appropriate customer interfaces. The customer interface is defined as the user interfaces of cyber shopping mall systems, through which customers interact to search for the target items and to purchase the identified items (Kim and Moon, 1997). The customer interface differs from the conventional user interface of software systems, because user interfaces mainly focus on the issues of conveying information in an efficient way such as ease of use and ease of learning (Nielsen, 1993). Although conveying information efficiently is also important in the design of customer interfaces, the customer interface should also provide a pleasant shopping environment. It is not enough to simply provide a shopping mall that is easy to use or easy to learn. The cyber mall should satisfy or "impress" the customers so as to make their shopping experience a pleasurable one, so much that customers are tempted to return. Otherwise, customers would not visit the shopping mall again or would easily switch to an alternative mall, because the switching cost is extremely low in cyber space. Competitors are just a "click" away from the current mall in the cyber space.

In spite of the importance of customer interfaces in electronic commerce systems, most prior studies focus on the technological issues related to their implemen-

tation, such as encryption, security, and electronic cash, to name a few. These are of course important issues in electronic commerce, but the human-side issues, such as the design of customer interfaces, are also of utmost importance to the wide acceptance of electronic commerce systems. The objective of this paper is to construct a research framework that outlines the important design factors of customer interfaces. This goal is approached by 1) identifying the key design factors of customer interfaces, and 2) providing an example of research projects of relevance for each design factor currently under way by the author. This paper concludes with the discussion about the future direction of the research in customer interface.

#### FOUR DIMENSIONS OF CUSTOMER INTERFACE DESIGN

Designing a customer interface involves various activities that could be classified into four dimensions: content design, structure design, navigation design, and graphic design. This section describes the nature, scope, and possible research topics of these dimensions.

##### CONTENT DESIGN

Content is the information that is provided in the shopping mall. Content design involves the decision of the type and scope of the information to be included in the cyber shopping mall. An important aspect of content design is the decision about the features that should be shown for a commodity or service. Mind map theory indicates that customers place the target commodity or service in the center of his/her mind map, and search the Internet to bring information back to the center to help define why the product is good, useful, or economical. Only when they finish constructing the mind map, they will decide whether or not to buy. Therefore, the customer interface should provide the information needed by the customers in constructing their mind map. The question related to this phase of content design is how to decide which information is appropriate? There are various types of

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knowledge, such as facts, concepts, procedures, processes or principles. Deciding which type of knowledge is relevant to the description of products or services traded in the cyber mall is an important issue in content design.

##### STRUCTURE DESIGN

Once the products or services have been identified and the appropriate information collected, the knowledge must be organized to enable customers to understand the domain with minimum effort. Several different structures are possible, such as the hierarchical structure, network structure, grid structure, etc. Most cyber malls today adopt the hierarchical structure. An important issue in designing the structure of cyber malls is the categorization of the various products and features provided in the mall. A major obstacle to the adoption of cyber shopping malls is related to the issue of product categorization. Customers do not want to switch from their favorite local shopping malls, because they are accustomed to the product categorization employed by the malls. Precise knowledge of the exact location of stores selling particular products, such as men's apparel, prevents them from wasting time wandering around. An important research question is, therefore, how to categorize the products so that customers intuitively understand the structure of the shopping mall.

##### NAVIGATION DESIGN

After the information has been properly dispersed across different pages within the structure of the cyber mall, a mechanism that enables customers to move from one page to another with minimum effort must be provided. Navigation design determines the types of navigation aids that should be provided to the customers to enable efficient navigation of the mall. Some navigation aids are directly inferred from the inherent structure of the mall. For example, the UP button enables the customer to move one level up in the hierarchical structure, while the DOWN button moves the customer one level down. Other navigation aids are add-ons that are not based on the structure. For example, the SEARCH button enables the customer to pinpoint the page that he/she would like to see regardless of the inherent structure of the mall. An important research question addresses the usefulness of the basic and add-on navigation aids and the important design features of these aids.

##### GRAPHIC DESIGN

The structure of the cyber shopping mall and the navigation aids should be expressed explicitly in the screen of the customer interface. Graphic design determines how the information is actually represented on the screen. Graphic design involves decisions related to various items such as pixel size, background, logo, image, icons, color, polygons, and page layout. These factors significantly influence how people perceive the cyber shopping mall. An important research question is to investigate which graphic elements have important consequences on the specific feelings of customers.

##### SAMPLE STUDIES IN THE FOUR DIMENSIONS

This section explains a sample study for each of the four dimensions of customer interface design. All four studies used an experimental cyber shopping mall developed by the Cognitive Information Engineering Laboratory (CieL) at Yonsei Uni-

versity. The experimental mall was based on an actual cyber mall that had been in business for years.

THE IMPACT OF RELATIVE INFORMATION ON PRODUCT SELECTION (CONTENT DESIGN)

Information about the products or services can be provided in two ways: absolute scale or relative scale. The relative scale describes important features of an item in comparison with other related items. For example, the size of a beeper can be described to be as big as a match box the size of which is already known to the customer. The absolute scale does not use any other items, but simply provides the exact specification of the product. For example, the size of the beeper can be given as 4 cm x 4 cm x 1 cm. A different source of relative information derives from the comparison of multiple products. For example, we may view two models of the same products categories (e.g. beepers) side by side and obtain a comparative view of the two. This study explores the usage of relative information in product selection. An experiment was conducted to evaluate the usefulness of the absolute scale, relative scale, and comparative data (2 x 2 x 2). We are currently in the process of analyzing the empirical data.

HIERARCHICAL STRUCTURE USING CROSS CLASSIFICATION (STRUCTURE DESIGN)

Most cyber shopping malls use hierarchies to organize individual pages. For example, the top level page depicts the overall structure, the second level pages describe product categories (such as home electronics), the third level pages describe individual stores, and finally the bottom level pages describe individual products. Most cyber malls use a single hierarchy so that a single tree structure can represent all the pages in the mall. However, a few malls use more than one hierarchy so that products are classified in more than one way. For example, products can be classified in terms of price (high price, middle price, and low price items) and at the same in terms of common category names in alphabetic order (A, B, C, ...). This study in-

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vestigates the impact of cross classification on the understanding process of the cyber shopping mall structure. We hypothesize that the effectiveness of cross classification depends on the complexity of the hierarchical structure, measured by the number of sub classes and the depth/width of the hierarchy. An experiment is underway to test our hypothesis.

METAPHORIC NAVIGATION AIDS AND CATEGORIES OF TARGET ITEMS (NAVIGATION DESIGN)

Two types of interactive navigation aids have been frequently used in order to prevent users from "getting lost" in cyber space. One is the standard navigation aid used in most hierarchical structures such as the conventional UP and DOWN buttons. The other type is the metaphoric navigation aid based on either the spatial or non-spatial metaphors (Dieberger, 1996). A navigation aid based on the spatial metaphor maps the spatial relations of real world such as elevators, whereas one based on the non-spatial metaphor relies on the textual structure such as an alphabetic index. We hypothesize that the effectiveness of metaphoric navigation aids depends on the categories of items being searched: common or ad-hoc (Barsalou, 1982). Items in the common category have well-defined concepts such as computers, whereas those in the ad-hoc category, such as birthday gifts, have ill-defined concepts. An experiment was conducted within a cyber mall context to test our hypothesis. Results indicate that people used the navigation aids with the spatial metaphor more frequently than those with the non-spatial metaphor, inducing them to consider cyber space navigation via spatial metaphor aids to be easier. Moreover, the benefits from the spatial metaphor were greater when people were searching for items in the ad-hoc category than when searching for common category items.

EMOTIONAL USABILITY OF CUSTOMER INTERFACE (GRAPHIC DESIGN)

Emotions play a major role in the social interaction process with electronic commerce systems. In this study, we investigate the possibility of designing a customer interface for electronic commerce systems that will evoke target feelings in the customer. The focus is on the impact of graphic design factors on the feeling of trustworthiness, because of its significant effect upon the behavior of customers using electronic commerce systems. Four empirical studies were conducted in total. The first study was directed at developing

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the self-report questionnaire that faithfully reflects the emotional factors related to electronic commerce systems. The second study focused on determining the important graphic design factors from the customer's perspective. The causal relations between the emotional factors and design factors were established in the third study, and verified in the final study. Results indicate that it is possible to manipulate the graphic design factors of the customer interface in order to induce a target emotion, such as trustworthiness. These results have important implication for the design and implementation of emotionally usable electronic commerce systems.

#### DISCUSSION

The design of customer interfaces that provide a pleasant shopping environment is an important research issue in electronic commerce. This paper proposed a research framework of the customer interface for cyber shopping malls. The framework consists of four dimensions: content design, structure design, navigation design, and graphic design. Each dimension was explained together with a description of a study conducted by the author. These studies are merely a starting point in the research regarding customer interface, and further studies are needed to test and extend the framework. Two pre-conditions must be met for more research in the customer interface. First, an experimental test bed must be constructed in the form of a cyber shopping mall that provides a mechanism for manipulating the four dimensions easily and for tracking customers' behavior faithfully. Second, a channel for inter-disciplinary collaboration among researchers with different academic backgrounds must be provided. The relevant areas include marketing, consumer behavior, human factors and human computer interaction.

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## INTERNET-BASED SMALL BUSINESS COMMUNICATION: SEVEN AUSTRALIAN CASES

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#### EXECUTIVE SUMMARY

This paper presents a case study of seven small Australian businesses which are using the Internet to undertake at least part of their normal business operations. The objective of the case study is to investigate the key driving forces behind these companies' Internet adoption and continuous use and the level to which they are using the Internet to support their businesses.

Our results indicate that benefits perceived by these small businesses during Internet use and potential business opportunities are key drivers for Internet use. Management involvement and enthusiasm are also important for the Internet adoption process and ongoing usage.

Based on the research findings, we have constructed a four-stage model which depicts how small businesses use the Internet to support the business relationship development process and the activities in this process which are supported by the Internet. Finally, we advocate that more subtle but critical factors, such as entrepreneurship in Internet use, can have profound effects on the level of ongoing Internet usage success.

#### INTRODUCTION

The Internet and its applications have created an information infrastructure which now rivals the Plain Old Telephone System (POTS) in size, coverage and popularity. Despite somewhat exaggerated mass media suggestions that the Internet is effectively an enormous database of prospects to be targeted by marketing campaigns, reports in both academic and professional publications (see, for example, Barker 1994; Sieber 1996 and Telstra 1996) do offer support for the view that small business use of the Internet is in-

creasing. Early estimates, however, suggest that the percentage of Australian small businesses which are actively using the Internet is still relatively small – and primarily restricted to the more entrepreneurial organisations (Poon and Swatman 1996).

As commercial use of the Internet grows, it is becoming increasingly recognised that this is a very different business environment from its physical counterpart. For example, marketing approaches which work well for broadcast or print media (such as supplier-driven marketing strategies) may not perform as well on the Internet (Hoffman and Novak 1996). Common ways of exploiting the Internet as a business tool include marketing and information distribution; electronic mail for inter-company communication; and provision of services and products (Brown 1996). Rayport and Sviokla (1995) also suggest that businesses can use the Internet to help them gain access to marketplaces (or "marketspaces") which might otherwise be inaccessible.

Earlier research (Barker 1994) indicated that small businesses which are early adopters of the Internet believe they can gain competitive advantage by using this medium. In previous work (Poon and Swatman 1995) we have suggested that integration of Internet usage with business strategy is critical to success in such a venture – although the amount of integration (or reasons for lack of integration, where relevant) is still unknown. By interviewing a group of seven early adopters from a variety of business sectors who claim to have gained competitive advantage through Internet use, we have discovered that while such competitive advantage does appear possible, it can as yet be described only as a "perceived" benefit. The results of our interviews have