THE DESIGN FACTORS FOR SMART SHOPS WITH THE UBIQUITOUS TECHNOLOGY

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Abstract. As space has become gradually intelligent because of the innovation of ubiquitous technology, the space itself is becoming one huge interface media, and the way digital technology intervenes in space design comes to be various. An intelligent space means that physical substances interact with their users as well as the inernal components beyond the concept of materials. However, current researches and developments in the relationship between the technology and spaces have not been immensely done. This paper renders the space applications including architertural factors, environmental factors and user behaviours in commercial areas. We also study how the future commercial spaces in ubiquitous computing environment will interact with space design. Finally the methods for developing "Smart Shop Models" are discussed.

1. Introduction

In order to perform the ubiquitous computing environment, the following concepts must be concerned: the physical locations which focus on the real environment, analysis of spaces where behaviours occur, and the analysis of user behaviours within a space and distance. The establishment of a service model with these concepts is the ultimate purpose of this research. As a solution for developing a space where multi-purpose computers interact with each other in unbiquitous computing environment, we will look into the ubiquitous technology (UT) application in commercial spaces.

Nowadays, selling products does not simply mean the exchange of money with materials. People recognize the brand name of each product. Moreover, satisfying the customers' need can make more proft (Park et al., 2003). By applying the UT within shopping areas, the new shopping culture is created, the effective customer and shop management are possible to create and the efficiency of the space will be improved with virtual displays. Also, with UT computing technology, recorded consumer information could benefit both the users and the shop masters.

2. Related Works

In this chapter, some relevant researches in Intelligent Environment and Ubiquitous Tecnology are investigated and explained.

2.1. WHAT IS A SMART ENVIRONMENT?

Smart environment refers to a space where people interact naturally with other people or technology. Many new and easy-to-use concepts to improve natural and individual interaction are being developed. This environment includes a space where computer technology is smoothly integrated into background and information technology interacting with each other (Korhone).

Smart environment controls a varied range of physical devices such as lights, audio/video devices, telephone devices, pocket computers, as well as software components such as massage systems, personal file databases, schedule management device. A controlling system for this smart environment should be a standard mechanism which manages these components, enables the communication between them, and guarantees a safe interaction between environment and its user (Hanssens et al.).

2.2. THE CHARACTERISTICS OF UBIQUITOUS ENVIRONMENT

The development of Ubiquitious technology creates a new space which combines the electronic space and the physical space. Ubiquitous Environment, satisfying its users' needs for beauty, knowledge and space application, has the following characteristics (Lee and Hong, 2003). First, Network is necessary for computers to offer appropriate services to useers moving through several spaces. Second, ubiquitous environment should have 'human based interface' where users are not aware of each working device. Third, computers are required to change their service according to the users' situations. In oher words, the different users have different services offered by a device user in the context. Fourth, the difference between ubiquitous environment and virtual reality is that in virtual reality a person experiences a virtual world created by computer, while in the ubiquitous environment a person lives a normal life unaware of his or her server. Finally, in the ubiquitous environment, it is highly important to develop an interface for free communication and present the functions of intelligent agents.

2.3. APPLICATIONS IN UBIQUITOUS ENVIRONMENT

"Where is the ubiquitous tecnology currently available going to be applied to in the future commercial space?" By attaching an RFID tag to a product, we will check its shelf life. With a tag on clothing, we can display appropriate options for customers.

Other applications will also be possible such as giving information of products and connecting with CRM, inproving consumer satisfaction to promote consumption, checking stocks and distribution channel, preventing a burglar, several spreading effects, improving the relationship between clients and sales clerks, effective store management, etc. With these application possibilities, this paper intends to limit its study to small-scale shopping areas.

We can glance at some aspects of future stores through "RFID Future Store", a public relations booth of Shinsekye I & C, at Digital Industrial Complex in Guro-gu, Seoul. Opened in July 2004, the future store shows a collective settlement system and ubiquitous computing. The system consists of POS (Point of Sale information management system), wireless PDA, electronic signing and receipt.

2.4. TECHNICAL AND SOCIAL PROBLEMS

In a whole new environment which ubiquitous computing will offer, many inovative contents will be developed beyond the existing services. These contents, out of previous passive approach to offer simple function and information, will have intelligence to be aware of user's context. Based on new interaction, their single form will turn into a new one consisting of several integrated contents and services in a social network environment. In this environment, in order to enable the active communication between embedded 'material' and 'equipment', a technical standardizing work is needed. In addition, the maintenance of a foundation equipment including management methods, regulations and network maintenances must be achieved. Moreover, as the technique to be widely utilized appears throughout our society, it needs to build a common system to manage and maintain goods and service.

3. The Ubiquitus Smart Shop

Commercial space is varied in its scale, types of industry and condition for each store. Thus, multiple and congregational plan is needed on design, product quality, manager's plan and management policy, environmental characteristics, fashion, etc. in parallel with society phenomenon, customers' behaviour and product marketing. Currently, consumer's need frequently changes, and with new values and life style, a new method of sales promotion followed by abundant labour force, material and service is needed. With all these aspects, it is required to offer customers agreeable and convenient shopping activities.

3.1. THE SPACE PROGRAM OF COMMERCIAL SPACE

Generally, commercial space is divided into 6 main components: customer part,

sale part, product part, employee part, shop and office management, shop interior.
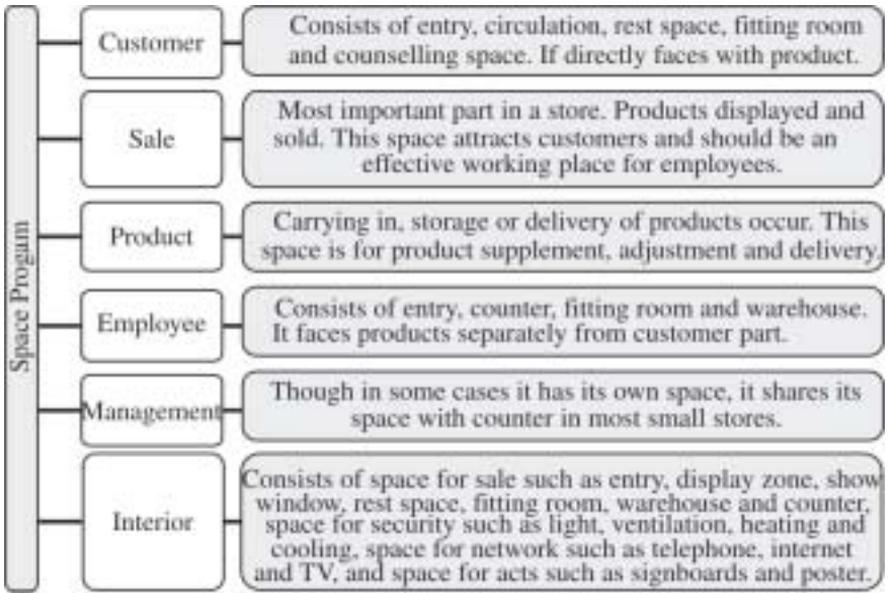

Figure 1. The Space Program of Commercial Space.

3.2. THE SPATIAL ANALYSIS FOR SHOPPING SPACE

The interior part among the components of commercial space presented above can be divided into architectural factors and object factors in terms of space. In addition, it can be divided into equipment factors and aesthetic factors in terms of environment.

TABLE 1. Spatial factors and environmental factors of commercial space.

Building	Component	Contents
Spatial factors	Architectural factors	Basic fixed factor in organizing a room for wall, floor, ceiling, column, door and window
	Object factors	Mobile factors such as displayed table, counter, show window, ads stand, signboard and rest space
Environmental factors	Equipment factors	Basic equipments for lighting, appropriate temperature and humidity, cooling and heating, and ventilation
	Aesthetic factor	Aesthetic factors such as the brightness and contrast of colour within a shop

3.3. BEHAVIOUR ANALYSIS FOR SHOPPING SPACES

Basic behaviours within a commercial space can be divided into three parts: customer's behaviour, seller (employee)'s behaviour and manager (host)'s behaviour.

TABLE 2. Behavour within a commercial space.

Behavours within a commercial space	Conents
Customer's behaviour	search, test, select, pay
Seller (employee)'s behaviour	guide, introduce the new product, help to select products, help to test selected product, help paying process, help wrap, display, adjust inventory, clean and delivery
Manager's behaviour	manage equipment, employee, products, administration, manage the store-image

4. Design Process According to Spatial Change of Smart Shop

4.1. BASIC SERVICE TYPES OF SMART SHOP

Smart Shop, a space that provides customers with quality shopping culture based on user's characteristics through ubiquitous technology and digital network, needs to build a model to offer different service for different types of store and customer's demands. To do this, basic UT service types within a commercial space have been researched.

4.2. DESIGN FACTOR FOR SMART SHOPS AS A PUBLIC SERVICE SPACE

The motivation of the intelligent space building lies in applying computer technology to the real world that users can interact with the computer using gesture, speech, movement and context. Then how should this space be designed while integrating? It should integrate itself with multiple user interfaces, knowledge from many other fields and technological methods and systems. Also, as it is applied to the real world, we should take a careful and strategic approach in selecting its components.

This paper is to set up a design process as a basic work to build a scenario based on spatial concepts for the future space.

TABLE 3. Basic service types of Smart Shop.

Type		Contents
	RFID Tag	product management/distribution channel/stock management
	Network	wireless LAN/tracking system
	System	ventilation/checking visitor/regulating the temperature/monitoring the shop
	Terminal	synthetic remote control/web pad/information of products
Service	Info appliances	robot cleaner/internet
	Supporting system	supporting products/transportation & derivery/ education of employees
	Remote control	Cooler & heater/lights/shift of display stand position/security System/control of entry and exit
	Digital solution	communication device/display/location detector/ speech recognizer/pointing system
	Entertainment	TV-VOD/ads/offering premiums/product brochure
	e-shop	internet shopping/customer oriented info system/ real-time counselling
	Info offering	searching products/location the shop/customer oriented info system/introduction of new products
	On-line counselling	helping the shopping/consultation on products & customer

5. Conclusion and Discussion

So far, we have analyzed space types and characteristics, and classified users' behaviour as one approach for the intelligent environment design. We have also set up a model to figure out relationship between UT service and space. Through this process, we have seen what design factors are in an interactive UT space, and that we need a spatial design to support user's choice and active communication between devices, not just a combination of devices and a space.
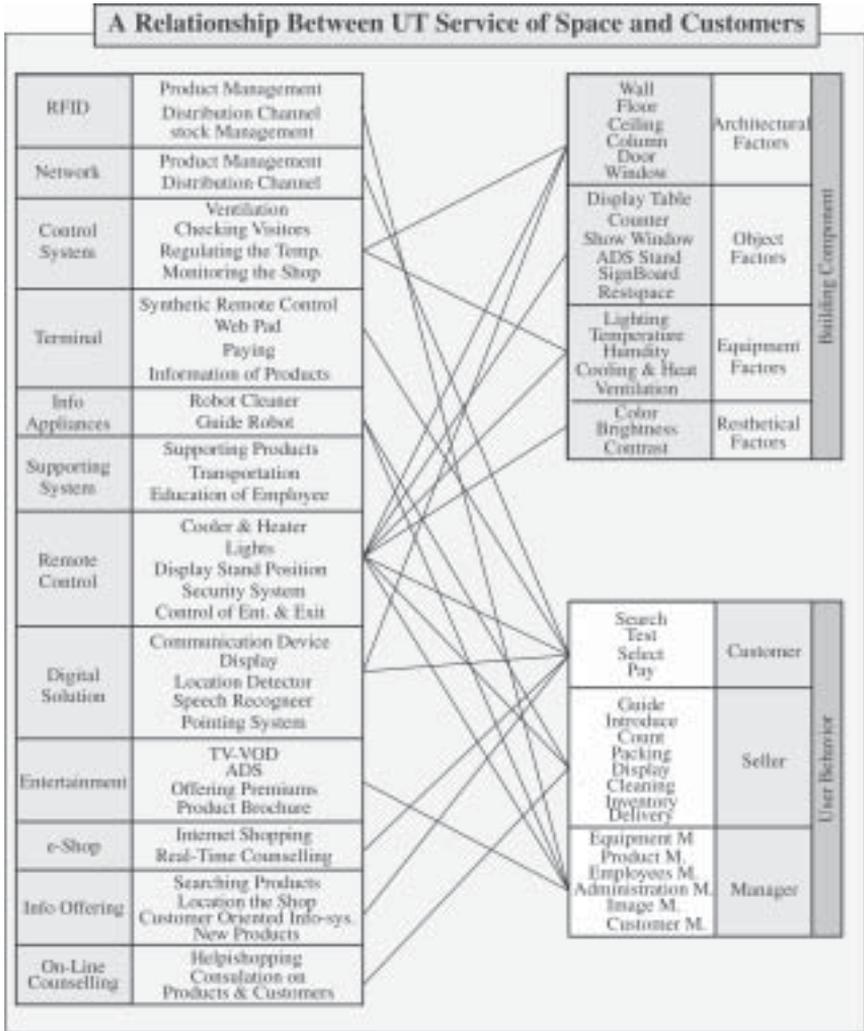
Figure 2. A relationship between UT service of the space and customers.
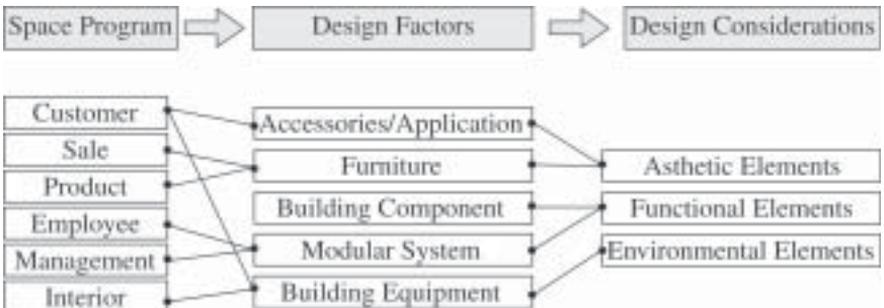

Figure 3. Design process in the shop.

For a successful spatial design in UT environment, a design plan is needed, considering systems which users can take an active approach to, which they can adjust easily, and which doesn't change to external conditions.

Acknowledgements

References

Lee, Hyuk-soo., & Hong, Kwan-sun. 2003, A Study on the Change of Human Environment and Life Space in Ubiquitous Space, Korean Institute of Interior Design journal, vol. 5, no. 5, pp. 178–180.

http://interior.dpc.ac.kr/~iska/lecture/book/dep ~ 01/dep 01.htm.

Likka Korhonen. 2003, Ubiquitous Computing VTT Human Interaction Tecnologies.

http://www.vtt.fi/tte 5/english/ubicomp.html.

Lee, J.N., et all. 2003, Ubiquitous Tecnology for Construction Industry, *Journal of Konkuk Aerospace Engineering*, vol. 28, pp. 15–21.

Nicholas Hanssens, et al. 2003, Building Agent-Based Intelligent Workspaces, Massachusetts Institute of Technology, Cambridge, MA, USA.

Par, Chung-l. 1994, A Study on the Interior Design Trend of Shop and Lounge Space in a Department Store, Monthly Interiors.

Park, Jin-Hee., et al. 2003, A Study on the Spatial Configuration from the Redefinition of a Program (Focused on New York PRADA Designed by Rem Koolhass), *Architectural Insititue of Korea journal,* vol. 10, no. 11, p. 27.