Computing and Informatics, Vol. 30, 2011, 513–529

A CASE STUDY ON INTELLIGENT SERVICE DESIGN IN UBIQUITOUS COMPUTING

Hangbae Chang

Daejin University
San 11-1, Sundan-Dong, Pocheon-Si, Gyeonggi-Do, Korea
e-mail: hbchang@daejin.ac.kr

HyukjunKwon

Yonsei University
New Millenium Hall, Seodaemun-Gu, Seoul, Korea
e-mail: junkwon@yonsei.ac.kr

Jonggu Kang, Yanghoon Kim

Daejin University
San 11-1, Sundan-Dong, Pocheon-Si, Gyeonggi-Do, Korea
e-mail: {jgkang, kimyh7902}@daejin.ac.kr

Abstract. In this study we designed the killer services for the scene of labor learning in ubiquitous computing. To achieve this study, we have explored the unmet needs of teachers in the scene of labor learning and examined whether the unmet needs could be served by the resources and capabilities of ubiquitous computing. Then, we have crafted a detail killer services for the scene of labor learning proposed to serve educational users with the service architecture. The result of this study will be applied to develop new business model in ubiquitous computing as the basic research.

Keywords: Ubiquitous computing, ubiquitous business model, ubiquitous service, scene of labor learning

1 INTRODUCTION

U Business is defined as a business system which is applied to various fields by connecting network and intellectualizing business process equipment and system that consist of things in everyday life, which activates customers' business activities, terminal equipment, and products using ubiquitous computing and network [18]. Such U Business has several differences from internet-based E Business. The main technology of E Business is created by web-technology in personal computers network; however, U Business is created through web actualization technology and increased actualization which is based on wireless network using such as personal computer, portable terminal, chip, and various equipments. E Business activities are conscious activities of business sectors, while U Business activities are executed by active computing function of equipments and things. E Business is customer information based marketing and has limited business areas, but U Business is situation recognition marketing and it is possible to generate new business and innovate the business process [16, 17, 20].

At this moment, considering the difference between E Business and U Business, depending on applied party, services distinguished as business in which using individual's habitats and life (B2C), business where trying to increase efficiency and emerging new markets (B2B), lastly public and administrative sector (G2B, G2C) are being developed. Actually, U Payment service makes it possible to pay and use financial service anywhere, anytime by using chip installed cellular phone, wireless internet, digital TV, portable terminal and so on (i.e. reducing driving time by paying through cellular phone, considering convenience of financial service and transparency of market economy). U Supply Chain Management is a service which makes position tracking of products transportation and history management possible through logistics tool or chips included in products or package (i.e. whether supplying and ready-to-go products transfer is started, how far the products were transferred, can be checked on real-time basis, safe delivery method can be selected by delivered products information), U City service innovates necessary functions of urban area by integrating related information technology in urban space, increasing quality of life and convenience, enhancing security and welfare of citizens according to systematic urban management, emerging new industries and so on [3, 4, 5, 6].

However, since such U Business design is in the process without searching users' demands, considering only current development technology level [7, 8, 9, 10], services which are far from users' demands can be created, and those services may interfere with expansion of business [11, 12, 13]. Therefore, in this study, we will predict future ubiquitous computing environment based on systematic business development methodology, design applicable demander-centered killer service, and provide fundamental data for U Business actualization.

2 U BUSINESS SERVICE DESIGN METHODOLOGY

As previously explained, since U Business is an extended concept of E Business, in this study, we applied "E Business development methodology" suggested by Rayport and Jaworski among various business development methodologies which were executed through preceding research [15].

In accordance with this research methodology, for developing U Business services, first we can find U Business opportunity by analyzing present and future appearing value system based on characteristics of ubiquitous computing. However, current ubiquitous service environment is not actualized yet, thus we performed users' demand analysis by designing virtual ubiquitous scenario with present work process. By changing business opportunity into business service to satisfy users' unfulfilled demands and drawing management resources and capabilities to support, we designed demand-centered U Business service, not service-centered technology.

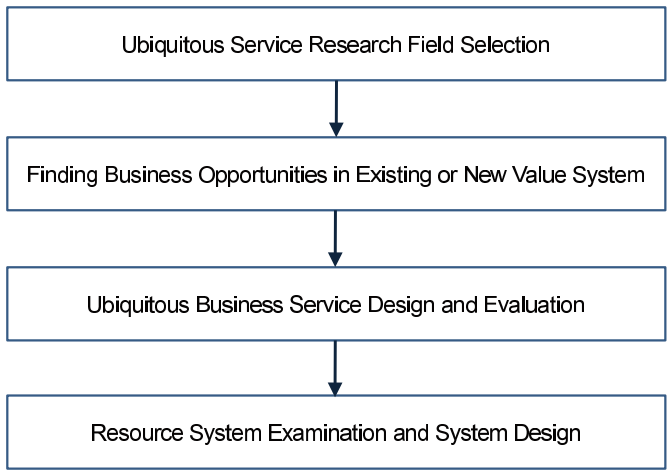

Fig. 1. U Business service design methodology

2.1 Ubiquitous Service Research Field Selection

U City, which is a compound of various ubiquitous computing technologies, is defined as a 21st Century new city that innovates functions and increases convenience and quality of life in urban life by integrating advanced information technology infrastructure and ubiquitous information service in urban space, enhancing safety and social welfare of citizens through systematic urban management, generating new business and so on. From the initial stage of U City development, depending on actualized ubiquitous information model, convenient city (online shopping and finance, online administration, remote inspection and control), safe city (crime prevention,

security monitoring, facility safety, and natural disaster prevention), healthy city (total health management, emergency medical service, remote medical treatment), clean city (air and water pollution control) are visualized [16, 19].

On-Site Experience Learning Guide field, utilizing senior citizens, has a significant meaning that we can provide excellent educational service and create job opportunities for senior citizens simultaneously. Due to advancement of medical technology and rapidly aging society, increasing number of job opportunities is an important social issue for economic independence and self-respect of senior citizens. Actually, since it is a big loss for our society if we cannot utilize senior citizens who have considerable experiences, a society should furnish capable senior citizens with workplaces. However, workplaces for those people are limited to trivial works, without continuity and special consideration such as cleaning streets and removing weeds. Thus, it is essential to create job opportunities where senior citizens can utilize their rich experiences and knowledge (Well Being Economy). On the other side, on-site experience learning is an effective method to achieve the purpose of learning by making learners experience by themselves at the place where learning materials exist, and the method is applied to various activities like observing treasures in a museum and trial case in court room. On-site experience learning and senior citizens' job opportunity creation services with ubiquitous technology are primary aspects of on-site learning experience learning guide service. In this study, we designed U Public service for public organizations (educational agencies, district offices) and schools (teachers and students) based on the above.

2.2 Finding Business Opportunities in Existing or New Value System

Value System means the chain system which connects products or services suppliers, wholesalers, logistics companies, consumers in market. At this stage, we analyze the existing value system and try to renovate it or to find opportunities to create a new one. After selecting the value system to be analyzed, we are going to analyze unsatisfied demands (currently the service is not provided) or unfurnished demands (the service is provided, but needs to be improved).

2.3 Ubiquitous Business Service Design and Evaluation

As a technical solution to resolve unsatisfied demands and unfurnished demands which were created in previously analyzed value system, we design ubiquitous services based on ubiquitous service characteristics (Situation Sensing and Decision, Autonomic Computing, Self-Growing Intelligence). Designed services are located in accordance with users' decision making process, and it is defined what kind of value is provided to users. Such services generate killer services, which should be preferentially developed through statistical analysis method, according to ubiquitous service evaluation model based on previous study regarding service evaluation.

2.4 Resource System Examination and System Design

The role of resource system is to control necessary internal resources and activities to adjust new service model for development of killer services. Such resource system consists of service provider's core benefit, assets and actions for delivering core benefit, and capabilities for execution. Especially, the assets and actions mentioned here mean specialized infrastructure and applied system in service, and when service providers' capability is added to operate such system, the designed service core benefit is finally achieved.

3 BUSINESS SERVICE DEVELOPMENT CASE STUDY

To develop new U Business service in labor learning utilizing senior citizens manpower, we designed virtual work scenario in current work process and future ubiquitous computing environment. After that, we show actions in each step to all participating parties (Teachers, Learners, Students, Senior Citizens) to search current unfulfilled user demands, and then ask them to describe what things are necessary and uncomfortable in each step [9, 11, 17, 20]. The described users' demands are as follows.

3.1 Discover Business Opportunities in Existing or New Value System

3.1.1 Pre-Activity Stage in the Scene of Labor Learning

- Not many programs in the scene of labor learning (various programs are needed).
- Difficulty in collecting information for learning program development (program information is required).
- Difficulty in organizing study materials for pre-learning (related sources should be provided promptly).
- When requesting learning guide, people can request only pre-determined fields; it is not easy to request because most learning guides need extra education.
- Difficulty in collecting information like learning guide recruiting advertisement (enough information regarding the scene of labor learning guide ought to be delivered to senior citizens).
- New labor learning program development for senior citizens are not supported (labor learning program development which uses senior citizens experience and knowledge is essential).
- It is not possible to know the situation in learning site before people move to the scene of labor learning (current situation in the scene of labor learning should be monitored in real time).

3.1.2 Activity Stage in the Scene of Labor Learning

- Sufficient explanation is not provided (guide service is needed in learning site).
- Time and quantity difficulty in using guide service (more guide services are required in proper time).
- Appropriate guider service for learners is not furnished (guide services should consider levels of each learner).
- Difficulty in checking the number of participants and accidents prevention (real-time monitoring required to control on-site situation).

3.1.3 Post-Activity Stage in the Scene of Labor Learning

- Difficulty in making post activity sources after the scene of labor learning (post activity materials should be supported).
- Difficulty in preparing learning report (learning report sources should be supported for making out).

3.2 Ubiquitous Service Design

3.2.1 Pre-Activity Stage in the Scene of Labor Learning

- Program development supporting service that senior citizens can make up the programs by themselves and recommending appropriate learning programs.
- Automatic connection service between the appropriate guide in charge of the learning service program and learners.
- Pre-activity program material service for learners who applied to labor learning.
- Remote information service regarding the learning site conditions such as facilities, weather, transportation before learners leave for the learning location.

3.2.2 Activity Stage in the Scene of Labor Learning

- Location announcement service for learning guide when learners who applied for the labor learning arrived at the learning site.
- Learning program reformation service depending on learners' level.
- Omitted information make-up service for learners in case of learning guide missed some information which is supposed to be conveyed to learners.
- Real-time learning program update service for learning guide to answer the questions of learners.
- Learners' real-time location alarming service when learners are apart from the group.

- Automatic program order modification service depending on learners' reaction to learning program.
- Frequent mistake prevention service by accumulating mistake patterns of learners when they make mistakes.
- Labor learning course modification service up to environmental changes of learning site.

3.2.3 Post-Activity Stage in the Scene of Labor Learning

- Automatic offer of labor learning results such as a structures made in labor learning, a motion picture containing activity scene to assist learners to make activity report.
- Offer of learning review materials for learners who participated in labor learning after labor learning.

3.3 Ubiquitous Service Evaluation Model Design and Evaluation

3.3.1 Ubiquitous Service Evaluation Model Design

Referring to preliminary study concerning service evaluation, we designed evaluation categories (Usability, Convenience, Opinions of Reference Group, Action Control, Service Change Cost, Risk, Trust, Purchase/Using Cost), and then performed research regarding the significance of scene of labor learning guide service evaluation category with senior citizens and teacher to verify compatibility of evaluation model. We selected the two most appropriate services for demands of senior citizens and teachers, asked what the most important thing is to be considered when users decide to use the services, and let them choose categories among 8 evaluation categories. As the result of service evaluation significance measurement, the following 6 evaluation categories were selected [1, 3, 9, 12, 14, 19].

Usability: using this service is more helpful than not using this service

Convenience: not much effort is necessary to use this service

Reference Group's Opinion: people who have great influence on me recommend that I use this service

Risk: due to many problems while using this service, it is possible to cause damages

Trust: In spite of the risk of this service, it should be used

Action Control: I think I can control this service well.

3.3.2 Ubiquitous Service Evaluation

We developed a questionnaire tool about senior citizens and elementary school teachers who are target service beneficiaries, and 6 service evaluation categories have been

applied to services which are generated by demand search. Generated labor learning guide services are only applicable to either senior citizens or elementary school teachers, so we made two separate questionnaires for both parties. Questionnaires have been answered for two weeks (from August 21 to September 2, 2006) and 30 of first round questionnaires have been collected from senior citizens and 30 from elementary school teachers. In the second round, 20 questionnaires have been collected from senior citizens, and 20 from elementary school teachers, and the total was 50 from each party.

In the questionnaire, we clarified definitions of 6 evaluation categories generated as labor learning guide service evaluation categories, distinguished detailed services in each level of the scene of the labor learning activity stage, and described contents of each stage's detailed service. Also, we added virtual scenario in each detailed service contents; the related service was applied for answerers' understanding. We made answerers check what they think in 7-scale measurement; namely "never like that", "little not like that", "not like that", "average", "like that", "little like that", "absolutely like that"; and answerers could choose their answers from among the categories.

To deal with all collected questionnaires statistically, we executed MANOVA by utilizing SPSS. The reason that we used the method was to select killer service by deciding rankings among services based on evaluation points of each service, in case that there are some statistically meaningful differences among generated services made from demands. The result of MANOVA, ubiquitous service as independent variable and evaluation candidate categories as dependent variable, in case of some evaluation categories, showed high similarity regarding answerers' answer distribution, and the differences among each service were not statistically meaningful. Thus, we removed some evaluation categories which showed high similarity of answer distribution, and executed MANOVA again. In case of senior citizens, usability, convenience, and opinions of reference group were selected as a final result. For teachers, usability, convenience, opinions of reference group, action control were finally selected as the result of MANOVA. The results are shown in Tables 1 and 2, and all 4 effects were statistically meaningful at of level significance 0.5. This means that answers' evaluation has shown a statistically meaningful difference.

First, we prove that there are statistically meaningful differences regarding questionnaire data collected from senior citizens and teachers among designed ubiquitous services, which applied MANOVA. Next, we add values regarding each service's evaluation categories, and calculate overall service evaluation results. We obtain service evaluation average of each ubiquitous service as final work to generate killer service, and decided the rankings among services. The results according to service evaluation are shown in Tables 3 and 4.

As the result of analyzing data collected by statistical method, 4 services which belong to top ranks and show wide differences among other services are generated from senior citizens and teachers points of view as killer services.

Effect		value	F	Hypotheses DOF	Significance Probability
Intercept	Pillai's Trace	0.968	3494.276 a)	3	0
	Wilks's Lambda	0.032	3494.276 a)	3	0
	Hotelling's Trace	30.741	3494.276 a)	3	0
	Roy's Largest Root	30.741	3494.276 a)	3	0
Labor Learning Guide Service	Pillai's Trace	0.086	1.684	18	0.037
	Wilks's Lambda	0.916	1.688	18	0.036
	Hotelling's Trace	0.09	1.691	18	0.035
	Roy's Largest Root	0.057	3.265 b)	6	0.004

Table 1. Verification of MANOVA about ubiquitous services from senior citizens' point of view

Effect		value	F	Hypotheses DOF	Significance Probability
Intercept	Pillai's Trace	0.967	2819.649 a)	4	0
	Wilks's Lambda	0.033	2819.649 a)	4	0
	Hotelling's Trace	28.994	2819.649 a)	4	0
	Roy's Largest Root	28.994	2819.649 a)	4	0
Labor Learning Guide Service	Pillai's Trace	0.104	1.489	28	0.048
	Wilks's Lambda	0.9	1.491	28	0.048
	Hotelling's Trace	0.108	1.493	28	0.047
	Roy's Largest Root	0.057	3.214 b)	7	0.003

Table 2. Verification of MANOVA about ubiquitous services from teachers point of view

Rank	Labor Learning Guide Service	Service Evaluation
1	Real-time learning program update service for learning guide to answer the questions of learners.	17.64
2	Program development supporting service that senior citizens can make up the programs by themselves and recommend appropriate learning programs.	17.4
3	Automatic Program Order Modification Service depending on learners' reaction toward learning program	16.9
4	Automatic Program Order Modification Service depending on learners' reaction toward learning program	16.84
5	Labor Learning course modification Service up to environmental changes of learning site	16.84
6	Learning Program Reformation service depending on learners' level.	16.38
7	Omitted information make-up service for learners in case learning guide missed some information which is supposed to deliver to learners.	16.14

Table 3. The evaluation result of the scene of labor learning guide service from senior citizens' point of view

Rank	Labor Learning Guide Service	Service Evaluation
1	Pre Activity Program Material Service for learners who applied to the labor learning.	23.8
2	Learners real-time location alarming service when learners are apart from the group.	23.12
3	Real-time learning program update service for learning guide to answer the questions of learners.	23.04
4	Frequent Mistake Prevention Service by accumulating mistake patterns of learners when they make mistakes.	22.4
5	Remote information Service regarding the learning site condition such as facilities, weather, transportation before learners leave for the learning location.	22.2
6	Automatic Connection Service between the appropriate guide in charge of the learning service program and learners.	21.86
7	Automatic offer of Labor Learning Results such as a structures made in labor learning, a motion picture containing activity scene) to assist learner to make activity report.	21.86
8	Offer learning review materials for learners who participated in labor learning after labor learning.	21.86

Table 4. The evaluation result of the scene of labor learning guide service from teachers' point of view

- Program development supporting service that senior citizens can make up the programs by themselves and recommend appropriate learning programs.
- Pre activity program material service for learners who applied to the labor learning.
- Real-time learning program update service for learning guide to answer additional questions of learners.
- Learners' real-time location alarming service when learners are apart from the group.

3.4 Killer Service Resource Verification

Among previously generated 4 killer services, we verified "the automatic program order modification service depending on learners' reaction toward learning program" with resource system and designed information system. Figure 2 shows that we designed resource system regarding killer service, based on ubiquitous computing related specialist interviews and references.

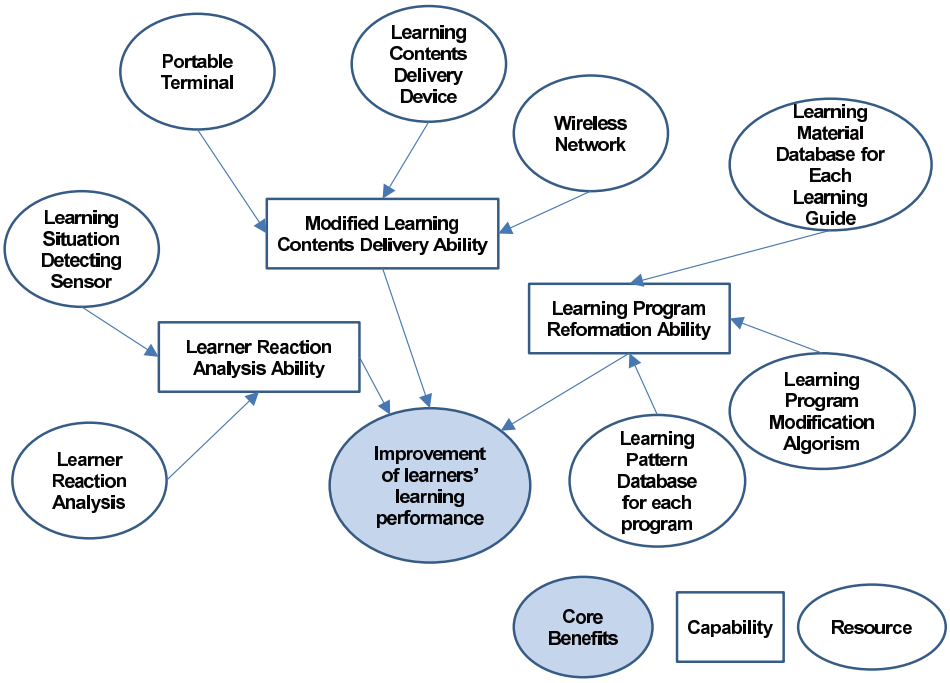

Fig. 2. Killer Service Resource System

3.4.1 Core Benefits

The core benefits we can get from the scene of labor learning program modification service are learners' learning performance itself and improvement thereof. When labor learning is in process, modifying learning contents depending on learners' reactions and providing new contents are beneficial to learners. First, they can provide learners with continuous interests. When the content of learning is not attractive for learners, new content or different learning orders help learners find new interests on the different content. Second, they can enhance the content of learning delivery efficiency of learning guides. When content of learning is not delivered properly, the situation is alarmed to learning guide and new content is delivered to the guides to increase efficiency of content delivery. In these perspectives, learning program modification service helps learners improve their learning performance.

3.4.2 Capability

To provide learning performance improvement for learners, the core capabilities that service providers must consider are learner reaction analysis ability, learning program reformation ability, modified learning contents delivery ability.

Learner reaction analysis ability: we should be able to recognize various reactions of the participants during the labor learning (i.e. boredom, lack of understanding) and to analyze what kind of learning patterns learners show while they are on the scene of labor learning.

Learning program reformation ability: we should be able to reform the program contents appropriately or change the order of learning program depending on learners' reaction by analyzing where the current learners' reaction belongs among existing learning reaction patterns, and extracting proper program as to learners' reaction patters based on learner reaction analysis.

Modified learning contents delivery ability: we should be able to deliver the reformed program contents to learning guide and the teaching method of the program, and provide new learning contents to display the facilities on the scene of labor learning and portable terminals of learners.

3.4.3 Resources

The resources for constructing killer service in addition to core benefit and capability are as follows.

Learning situation detecting sensor: automatic recognition camera, motion sensor, noise sensor which can detect facial expression of learners, movement, noise level and so on.

Learner reaction analysis algorism: We extract reaction patterns regarding learners' learning style by analyzing data which were collected by learning situation detecting sensor.

Learning pattern database for each program: We group similar reactions of learners in the labor learning site in a database, and new patterns are saved in database too. We connect with confirmed learning pattern by learner reaction analysis and learning program modification algorithms.

Learning material database for each learning guide: Resources selected by senior citizens regarding the scene of labor learning program and program guideline are reserved in a database.

Portable terminal: Learning guide (a senior citizen) and learners can download modified learning materials individually through portable terminals which display necessary materials. We can print out teaching materials for learning guides.

Learning content delivery device: The device is located in learning site, the learning content is transferred from learning content delivery device and the screen which is installed in the device displays 3-D virtual reality and other forms.

Wireless network: We can set up network among different types of devices to send out modified program contents to learners' terminals and learning guides' terminals or learning contents delivery devices using wireless network.

3.5 Information System for Killer Services

To develop Killer Service, detailed information system was schematized in Figure 3 with system map according to "context sensing layer", "intelligent layer", "autonomous layer" which generally consist of ubiquitous system [13].

4 CONCLUSION

In this study, we designed actual place experience learning service using ubiquitous computing technology and manpower of senior citizens. This service has a significant meaning because it can actualize high level educational service in U City, a compound of ubiquitous computing technology. For this, by analyzing present or future value system, based on characteristics of ubiquitous computing and creating management resource and capability for supports, after finding business opportunity and actualizing business model to fulfill users' demands, we designed demand-centered U Business service, not technology-centered.

First of all, we designed scenario based on present or future business process, and later on arranged unfulfilled demands from potential ubiquitous users. Next, we designed ubiquitous service for such unfulfilled demands, and selected outstanding services, according to ubiquitous evaluation model, which was developed through preceding study as killer application. Selected killer application which consists of resource system with value suggestion work is a preceding work, arranged by core benefit, core capability, resource and so on. Information service is produced, and connection with different research projects is investigated. As the result, since technology development is in its infant stage, it was difficult to find direct connection, but there were various connections in the aspect of infrastructure technology.

While conducting this study, we had a difficulty in executing questionnaires for actual users toward potential customers of not-commercialized ubiquitous service, but we created applicable ubiquitous service group, based on virtual scenario by first round work, and then we resolved the problems mentioned above by arranging currently unfulfilled user demands and connecting all the problems together in second round work.

As the result of this study, we anticipate that it can present the feasibility for developing ubiquitous computing related technology by suggesting necessary demands of U Service in future ubiquitous computing business environment, and use the results as basic resource for U Business expansion. In future, we should select the foremost possible ubiquitous service applicable fields (shopping, logistics, education), considering technical, business, usability aspects, develop ubiquitous killer service by analyzing business process in detail, and continue in the study regarding internal and external environment to support ubiquitous service development.

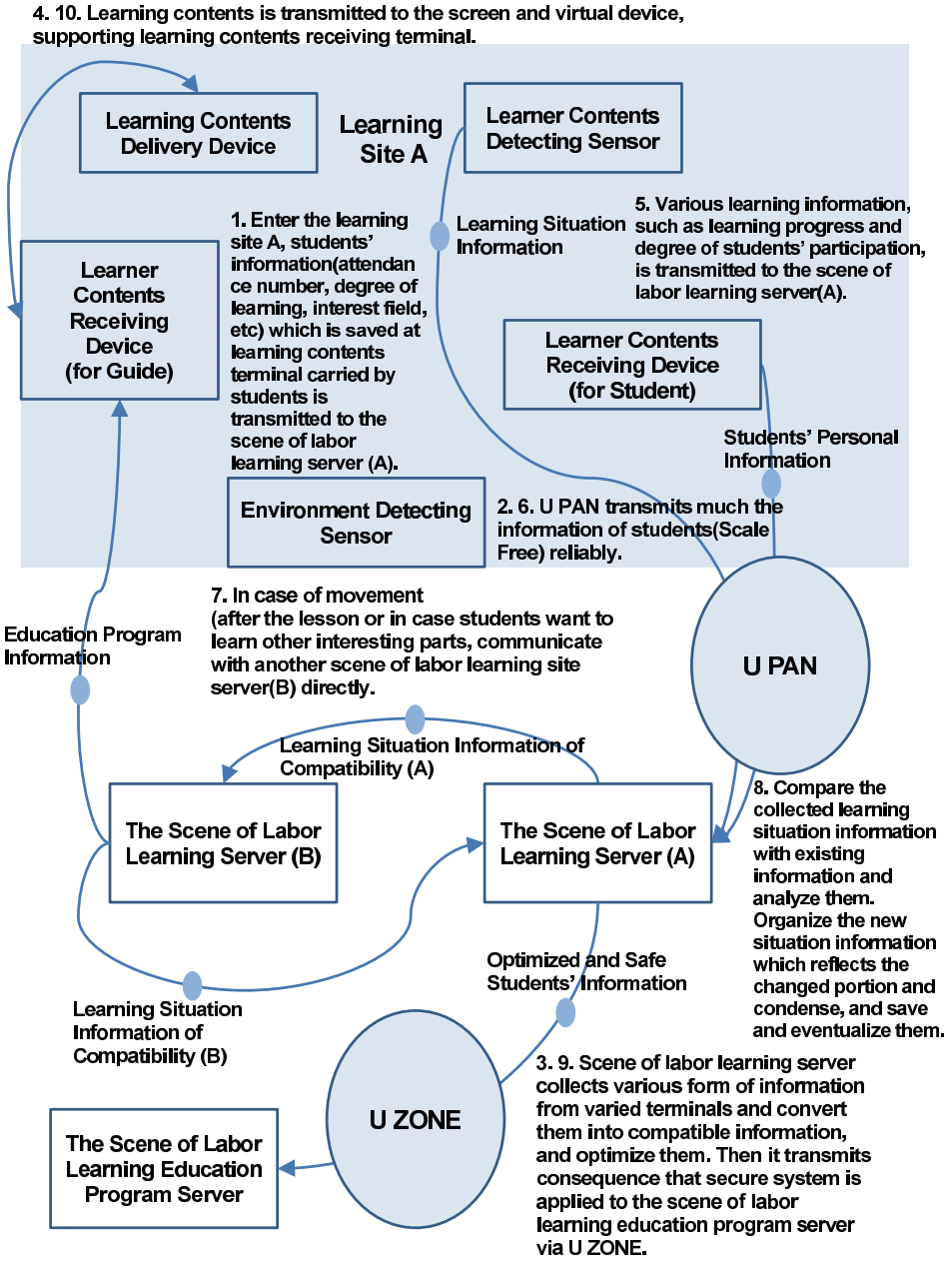

Fig. 3. Structure of Information System for Killer Service

REFERENCES

[1] Aizen, I.: The Theory of Planned Behavior. Organizational Behavior and Human decision Processes, Vol. 50, 1991.

[2] Barkhuus L.—Dey, A.: Is Context-Aware Computing Taking Control Away from the User? Proceeding of the 5th International Conference on Ubiquitous Computing, Seattle USA, 2003.

[3] Davis, F. D.: Perceived Usefulness, Perceived Case of Use and User Acceptance of Information Technology. MIS Quarterly, Vol. 13, 1989, No. 3.

[4] Garlan D.—Siewiorek, D.—Smailagic, A.—Steenkiste P. et al. Project Aura: Toward Distraction-Free Pervasive Computing. IEEE Pervasive Computing, 2002.

[5] Chen, Y. S.—Kao, T. C.—Sheu, J. P.: Realizing Outdoor Independent Learning with a Butterfly-Watching Mobile Learning System. Journal of Educational Computing Research, Vol. 33, No. 4, 2005.

[6] Dodds, W. B.—Monroe, K. B.—Grewal, D.: Effects of Price, Brand, and Store Information on Buyers' Product Evaluations. Journal of Marketing Research, Vol. 28, 1991.

[7] Dodds, W. G.—Monroe, K. B.: The Effect of Brand and Price Evaluations. In Hirschman, E. and Holdbrook, M. (Eds), Advances in Consumer Research, Association for Consumer Research, Provo, UT, 1985.

[8] Harvard Business School, Online Market Makers. Harvard Business School Publishing, 9-801-308, December 2000.

[9] Hedman, J.—Kalling, T.: The Business Model Concept: Theoretical Underpinnings and Empirical Illustrations. European Journal of Information Systems, Vol. 12, 2003, No. 1.

[10] Humble, J.—Crabtree, A.—Hemmings, T.—Kesson, A.—Koleva, B.—Rodden, T.—Hansson, P. et al.: Playing with the Bits-User-Configuration of Ubiquitous Domestic Environments. Proceedings of the 5th Annual Conference on Ubiquitous Computing, Seattle USA, 2003.

[11] Li, L.—Zheng, Y.—Ogata, H.—Yano, Y.: A Conceptual Framework of Computer-Supported Ubiquitous Learning Environment. Journal of Advanced Technology for Learning, Vol. 2, 2005, No. 4.

[12] Mishra, A. K.: Organizational Responses to Crisis: The Centrality of Trust. In Kramer, R. M. and Tyler, T. R. (Eds), Trust in Organizations: Frontiers of Theory and Research, Thousand Oaks, CA, Sage, 1996.

[13] Kwon, O.—Sadeh, N.: Applying Case-Based Reasoning and Multi-Agent Intelligent System to Context-Aware Comparative Shopping. Decision Support Systems, Vol. 36, 2004, No. 2.

[14] Porter, M. E.: Competitive Advantage: Creating and Sustaining Superior Performance, N. Y., Free Press, 1985.

[15] Rayport, J.—Jaworski, B.: E-Commerce. Mcgraw-Hill, New York, 2001.

[16] Timmers, P.: Business Models for Electronic Markets. Electronic Market, Vol. 8, 1998, No. 2.

[17] Tsung-Yu, L.—Tan-Hsu, T.—Yu-Ling, Ch.: Outdoor Natural Science Learning with an RFID-Supported Immersive Ubiquitous Learning Environment. Journal of Educational Technology and Society, Vol. 12, 2009, No. 4.

[18] Weiser, M.: Some Computer Science Issues in Ubiquitous Computing. Communications of the ACM, Vol. 36, 1993, No. 7.

[19] Williamson, O. E.: Calculativeness, Trust, and Economic Organization. Journal of Law and Economics, Vol. 36, 1993, No. 1.

[20] Zeithaml, V. A.: Consumer Perceptions of Price, Quality, and Value: A Means-End Model and Synthesis of Evidence. Journal of Marketing, Vol. 52, 1988.

Hangbae Chang is a Professor of Business Administration at Daejin University, Korea. He received his Ph. D. in Information System Management from Graduate School of Information at Yonsei University, Korea. He has published many research papers in international journals and conferences. He has been served as chairs, program committee or organizing committee for many international conferences and workshops; Chair of IPC '07, MUE '07, UASS '08, UNESST '08, TRUST '08 and so on. His works have been published in journals such as Journal of Super Computing, Computing and Informatics, Journal of Computational Information Systems, and Lecture Notes Computer Science. His research interests include issues related to Industrial Security Management and System.

Hyukjun Kwon is a student of Graduate School of Information at Yonsei University, Korea. He has received his master degree in Business Administration from Graduate School of Yonesei University, Korea. He has published many research papers in international journals and conferences. He has been serve as session chairs and program committee for few international conferences and workshop; UNESST '08, CSA '08, ISA '09, and so on. His works have been published in Journals such as Journal of Computational Information Systems, and Computing and Informatics. His areas of concern are Information Security Management, and Virtual Reality.

Jonggu Kang is a student of Business Administration at Dajin University, Korea. He has published a few research papers in international journal and conference. His areas of concern are Industrial Security Management for SMBs, and Behavioral Aspects of Industrial Technology Theft.

Yanghoon Kim is a Ph. D. Candidate of Computer Engineering at Dajin University, Korea. He has published a few research papers in international journal and conference. His areas of concern are software engineering, system analysis and design, and computer security. He has been serve as program committee for few international conferences and workshop.