

# A Study on the u-City's Concept Model with an u-IT Evolution

유비쿼터스 기술진화에 따른 u-City 개념모델에 관한 연구

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## I. Introduction

Four years ago, when the term ‘ubiquitous’ entered circulation in South Korea for the first time, through computer and network specialists, it was an unfamiliar English word that few had heard before, a word with a singular meaning: ‘being everywhere at the same time.’ By 2005, 68% of Koreans had heard this word, according to a survey conducted by the National Information Society Agency. The word ‘ubiquitous’ is now heard in advertisements of home electric appliances and even apartments. ‘Ubiquitous services,’ it inherently looks at a meaning with ubiquitous; some of them have become routine.

One of the important application areas for u-IT<sup>1)</sup>, ubiquitous information technology, is urban planning and development. u-IT has been receiving growing attention as a tool that can contribute towards enhancing a city’s image and resolving urban problems. Under the ubiquitous city, or u-City<sup>2)</sup> for short, the urban application of ubiquitous information technologies has become the leading trend in the development of futuristic, next-generation cities. Using advanced information and communications infrastructure

and ubiquitous computing technologies, u-City seamlessly integrates the electronic urban space into the physical space, so that information services are an integral part of the environment, accessed through invisible and unobtrusive computers(Cho, B. S., Jung, W. S. & Cho, H. S. 2006).

There exists, however, no broadly-accepted definition of u-City. Nor is there a standardized model for u-City’s concept. A clear understanding of exactly what new things the ‘u’ brings to traditional urban development models is thus far lacking. The understanding of u-City must be broad enough to cover future technological evolution and precise enough to describe services that may be enabled by the current state of technology. In other words, it need to look into how the ubiquitous service which is developed based on while the technology how will develop with the ubiquitous computing evolves. Having a reasonable projection as to how u-City will evolve is especially important for u-City services that are receiving attention as new digital convergence business models. In this study, we explore directions taken by the evolution in ubiquitous concepts, applications enabled by the latest

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1) The ubiquitous information technology(u-IT) is converged technology which can expand the digital concept limited to the cyber space and the other field in the real space. It is the technology which can create the new space value(Choi, B. C. et al, 2006).

2) u-City is the illustration which binds the advanced information infra and ubiquitous information services for the city’s function and improves the offset of the city life and quality of the life. It has the digital-city and cyber-city to the similarly term. An u-City was used in Korea for the first time(Cho B. S. et al, 2006 & u-City forum).

progress in ubiquitous computing technology, to provide basic information essential for designing a roadmap for these services.

Therefore, this research has an object which looks into the evolution direction of the ubiquitous service recently according to the issued ubiquitous computing technique development and prepares the u-City service load map as the basic materials

## II. Ubiquitous Computing and u-Services

### 1. Innovation in Ubiquitous IT

Ubiquitous computing<sup>3)</sup> is essentially about making computing devices that think and behave like humans. Five component technologies, including sensor, processor, communications, interface and security technologies, are important enablers for ubiquitous computing(Kim, J. Y. 2003). Sensors are tools for sensing the external environment and collecting related information. Processors and communications functions make it possible to judge the relevance of information collected by a sensor and share it with other systems or networks. Interfacing and security technologies ensure efficient and safe interaction with end-users. Of these five, sensor and

interface technologies are components that most clearly distinguish ubiquitous computing from the traditional computing model(Nam, J. H. & Choi, M. S. 2006).

Sensors, as input devices with the ability to sense changes in the surrounding environment, are the most basic unit of ubiquitous computing. With sensors as the building blocks, a processor and communication functions are added on to form an information processing unit. The latest trend is toward modulization or multifunction all-in-one devices such as smart sensors, sensors with an integrated processor or network nodes functioning as a sensor, processor and a communicator, all at the same time. No less important is developing interfaces that are human-friendly and intelligent. Sensor-assisted input tools currently under development include voice recognition, handwriting recognition and movement recognition-enabled tools. The direction for development in display, the core element of interface, is toward having monitors available in multiple locations so as to deploy a ubiquitous display network.

There are currently eight discernable directions toward which technological innovation in ubiquitous IT is leading: (1) integration of computing into objects, the environment and

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3) As to the ubiquitous computing, the mark Weiser which was U.S. Xerox researcher insisted. Ubiquitous computing integrates computation into the environment, rather than having computers which are distinct objects. Other terms for ubiquitous computing include pervasive computing, calm technology, things that think, everywhere, and more recently, pervasive Internet(Mark Weiser. 1993).

humans; (2) context awareness and use of information collected from the physical space (3) linkage between all existing IT; (4) nomadic computing; (5) increasing the autonomy of IT; (6) change in the human-IT interface paradigm; (7) digital convergence; and (8) reinforcement of physical spaces(Kang, H. R., 2004; Choi, B. C. & Park, K. S. 2006).

## 2. Changing the Service's Concepts

The dictionary meaning of the word 'service' is transporting or distributing goods produced by others for consumption or providing other labor needed for the consumption of such goods. To put it differently, 'service' refers to a series of activities and processes for altering the state of products, information or even customers of a product through participation of customers, toward a desired state it refers also to the results achieved by such activities and processes. Categories and types of service are, by nature, widely varied, and even services of the same categories can be often quite dissimilar. Changes in lifestyle and technological advancement continuously bring about new services and make others disappear, when found to be no longer relevant. Many of the services traditionally delivered face-to-face have become e-services, then m-services, and now are about to become u-services.

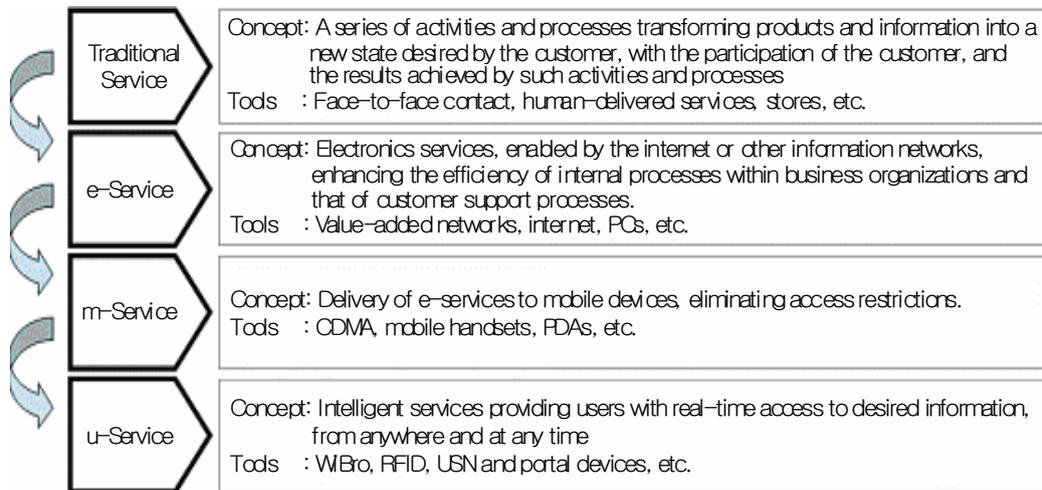
E-services(electronic services), referring to

any varieties of traditional services delivered electronically, are popularly adopted as a solution for integrating IT into the customer support process. M-services(mobile services), services delivered to customers' portable electronic devices such as mobile handsets and PDAs, extend e-services through wireless internet. M-services, applied services provided through mobile information systems, are now evolving into u-services, context-aware services that can meet the customers' need more proactively and allow a higher degree of personalization. The foremost characteristic of u-services is their ubiquitous accessibility, a characteristic fundamental to ubiquitous computing itself. Other distinguishing characteristics of u-services include universal access to tools, uniqueness of information, insofar as information delivered is tailored to individual users, and the unity of information.

The concept of u-service may therefore be understood as a model both extending and encompassing e-services and m-services, which, furthermore, broadens the categories of information devices and networks that may be used for service delivery and allows the use of more varied methods of e-commerce, thereby enlarging the scope of e-commerce as well. The different generations of services and their respective characteristics are tabulated in <figure 1>.

The word 'service', however, is currently given a meaning much broader than this

<Figure 1> Evolution of Service Concept



definition, and the boundary between what constitutes service and what does not is being increasingly blurred.

With the rapid progress in information technology, slews of new services are continuously being introduced, multiplying the varieties of economic activities classifiable as services. For example, while a broad concept like e-learning is referred to as a service, processes that are functional enablers of this service, such as searching for learning content or downloading files needed for it are also called “services”.

Hence, this state of affairs makes a classification method, based on a correct understanding of relationships between different technologies involved and a reasonable projection on technological evolution, indispensable for the understanding of a service.

### 3. Advent of Ubiquitous Services

The growth of the information industry, coupled with the advancement in mobile communications technology, has triggered the convergence between devices and services fulfilling different functions. Ubiquitous computing takes this process of convergence one step further by embedding different types of computers across the human environment and linking them together, so that people can have a ubiquitous access to computing, whenever they need and wherever they are. Convergence, initially limited to enabling a device to perform two or more functions, has now become a concept covering marriages between business models and industry sectors. Digital convergence has also spawned new service areas, causing the collapse of some

of the traditional boundaries between service sectors. The current stage of convergence, where the process is extended to the integration of broadband internet and mobile communications, suggests that we are already at the doorstep to a ubiquitous computing society.

What distinguishes ubiquitous computing from preceding models of computing is that services are not just provided in response to a customer's request, but also in a more proactive manner. The service system includes functions to identify a user's circumstances and interpret or anticipate his or her intentions. Intelligent services of this's type are precisely what ubiquitous services refer to.

For example, the environment of an office can be adjusted automatically, without a user's involvement, to a habitual setting or one that is the most appropriate to present circumstances. Information and resources needed for work can be provided wherever a user is located, and computers can perform some of the routine chores for the user. Access to information is ubiquitous, and services are provided in real time. More personalized and targeted, u-services offer a greater value than technology-enabled services of previous generations. Within a u-service environment, information is continuously generated, forming a stream of data (stream data). Although the sizes of individual data are small(fine-grained data), their volumes are large. These data are valuable only when they

are processed in real time(real-time data) [2].

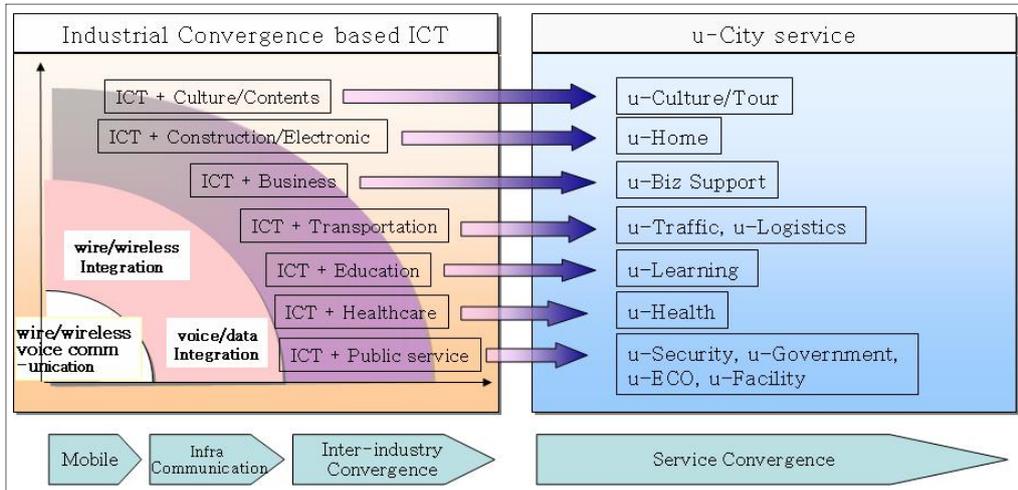
The deployment of u-services requires the collection of highly-diverse information from surrounding environments, using RFID, sensor and USN technologies. Data related to things found within the immediate environment of a user and the environment itself are collected, analyzed and processed so as to design a service that is precisely tailored to his or her needs or circumstances. Research is currently underway to develop services like location-based services, automated product management, automated medical services, disaster prevention services and home services, assisting users with various types of needs and in various circumstances. All of these services can be seamlessly linked, so that they may be accessed across an entire school, neighborhood or city(Park, J. H. 2006).

### **III. Evolution of u-Services and u-City's Concept**

#### **1. Convergence of u-Services and u-City**

South Korea unites several attributes that make it an ideal candidate to become a ubiquitous information society. The ubiquitous information society being a concept extending that of knowledge and information society, enabled by the same infrastructure as the latter, South Korea's wealth of information and communications infrastructure puts it ahead of

<Figure 2> Industrial Convergence and u-City Service



Note: 1) ICT – Information Communication Technology.  
 2) Refer to the Appendix about the definition about each u-City services.

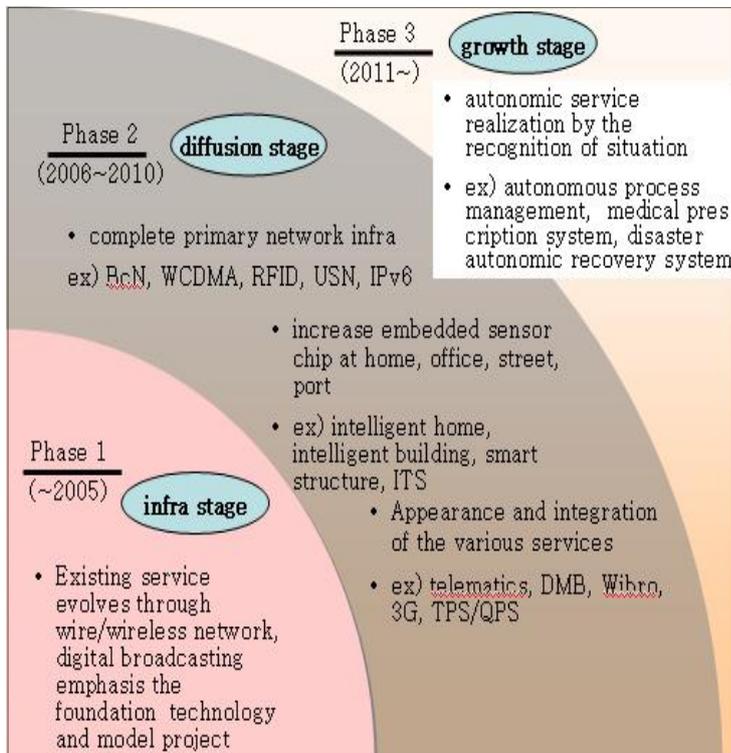
others in the race toward ubiquitous computing. The favorable disposition of its government toward IT, its companies' willingness to further invest in this field and Korean people's openness toward new technologies are also important factors, bound to positively affect the country's performance in the achievement of a ubiquitous information society. Over nine in ten South Koreans reside in cities, and six out of ten live in apartments or other types of multi-family properties. A high degree of urban concentration and prevalence of collective housing means a high degree of infrastructure efficiency; in other words, low cost of ubiquitous network infrastructure. Moreover, more competitive cities make a more competitive country.

As convergence has become, in recent years,

a social and economic trend, the phenomenon of digital convergence is no longer limited to uniting devices or functions, but tends toward a more ambitious goal of integrating IT with humans, things and spaces. One of the most exciting applications of digital convergence is u-City. By setting up cutting-edge IT infrastructure across urban space and making information services ubiquitous available in all parts of a city, u-City dramatically enhances urban functions, making life more convenient and the environment safer for residents.

The improvement of the quality of life is accompanied by major economic benefits as well u-City creates new types of business, giving new momentum for growth. The organic linkage between physical urban spaces and electronic spaces makes this futuristic city an

<Figure 3> Technology Evolution Stage For Ubiquitous Computing Service



Note: It refer to Choi et al(2006)'s article(p4).

## 2. Evolution of u-Services

Advancement of ubiquitous computing technologies does not necessarily bring about a sudden change in the way we live. An innovative concept though it is, ubiquitous computing is not achieved through radically new technologies in a clean break from past technologies. Instead, it is a state that is progressively achieved through advancements made in existing technologies. The key components of ubiquitous computing are three: network infrastructure, content and

environment ready for deployment of new and innovative types of services(National Information Society Agency. 2005).

Achieved through convergence between services, u-City service<sup>4)</sup> no longer are simple concepts, but have given rise to concrete business models as to u-Public services, u-Home, u-Health, u-Traffic, u-Learning and u-Logistics, designed for different social sectors and areas of activities.

services, parts/components and core devices(National Information Society Agency. 2005). These components are gradually brought to the required level of technological maturity, as microchip design and manufacturing technologies, network technologies and digitalization and convergence move further along their path of evolution.

Hence, the achievement of a ubiquitous computing environment is most likely to take

4) The u-City service is integration of informations and contents which is utilizing the ubiquitous technology and information & communications infrastructure and that is maximizing the effectiveness of city's functions(Kwan, J. C, 2006 & u-City forum).

place stage by stage, according to the technological readiness of each of these components. The process may comprise three phases; infrastructure build-out stage, stage of diffusion and growth stage(Bae, S. H. 2005). During the infrastructure build-out stage, the formation of the market will be led by services using existing wireless and fixed-line communications networks and broadcasting network infrastructure. Digital broadcasting, VDSL(Very high-data rate Digital Subscriber Line), and early home network systems will be the dominant business models during this stage.

During the diffusion stage, key infrastructure build-out projects will come to completion, providing the enabling condition for a variety of new business models. This stage will see the commercial roll-out of W-CDMA, DMB and portable internet services and a similar progress toward commercialization among services like telematics, digital home services and RFID-enabled services. Some of these services, independently provided initially, will undergo convergence toward the end of the second stage, and the convergence process will come to full completion during the third stage. Things in our daily environments will be extensively embedded with microchips, also during the third stage, turning living and working environments, as well as transportation, into more intelligent spaces than ever.

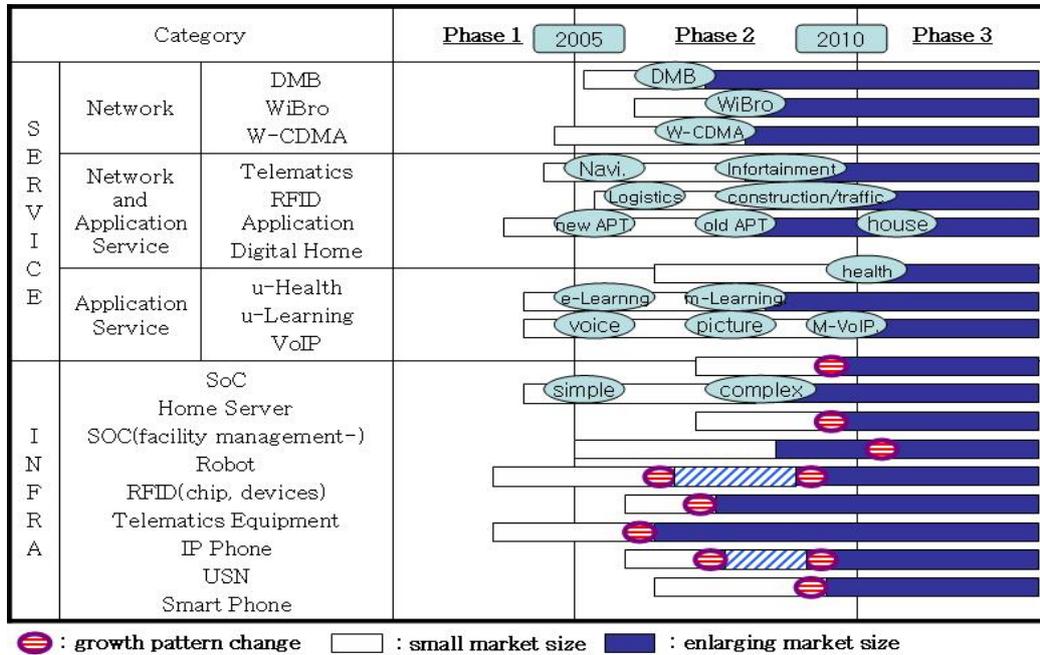
Telematics services, thus far only available in

the form of automobile navigation assistance, will become linked with traffic information systems and emergency systems, and communicate with roads, bridges and other urban facilities that are embedded with sensors. Integration with digital entertainment systems like DMB and portable internet, also achieved at this time, will make access to telematics services unprecedentedly easy. These three stages can be each equated with one of the three stages in the construction of u-cities envisioned by the Ministry of Information and Communication; infrastructure build-out(2005–2007), pilot launch (2008–2010), and diffusion(2010–)(Ministry of Information and Communication. 2006).

Growth during the initial period will, doubtless, be driven chiefly by hardware, such as network equipment, devices for enabling new services and related components and parts. This will be replaced by a service-led pattern of growth from the end of the second stage when most key infrastructure for service deployment is in place, making the environment ripe for the introduction of a variety of new intelligent services. Growth in service sales will coincide with the slowdown of the equipment market, due, in part, to the acceleration of digital convergence and convergence among service categories, reducing the demand for hardware.

Devices initially dedicated to single services will increasingly become multifunction,

<Figurer 4> Milestone of u-IT's Deployment



Note: It refer to Bae, S. H.(2005)'s article(p34) and modifies to an u-City with an author.

convergence devices, adapted for different types of services. Bundling and integration with other services are accelerating among services like W-CDMA, WiBro, HSDPA and DMB, experiencing early market success, as well as others like digital home services, u-health, u-learning and USN-enabled RFID services, contributing to a broader take up of these services.

<figure 4> provides a diagram illustrating progress forecasted per stage, in terms of infrastructure readiness and status of commercialization of applied services(Choi, B. C. & Park, K. S. 2006).

### 3. Development of u-City Concept Model

Technologies and services, important though they are, are certainly not the only variables determining success in u-City achievement. Once the required technologies and services enabled by them are determined, one must design a regulatory apparatus to support their successful commercialization and diffusion. To do that, one must have a reasonably clear vision of technological development and resulting evolution in services. One needs, in other words, a model of evolution for u-City services and

Concept.

To plan a u-City model, based on those services whose provision, immediate or in the near future, is permitted by the current state of technology and infrastructure, one must first understand their enabling technologies. The roadmap for u-City achievement under the Korean government's IT839 strategy, for instance, distinguishes two types of enabling technologies; basic u-City technologies and core technologies(Ministry of Information and Communication. 2006).

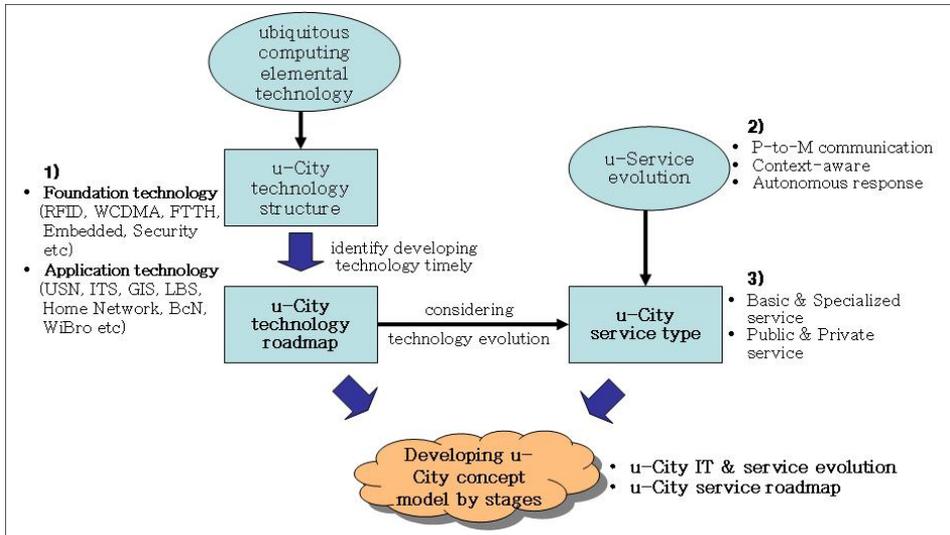
Basic technologies included in the u-City Technology Roadmap are RFID(Radio Frequency IDentification), W-LAN/W-CDMA, FTTH(Fiber To The Home), encryption, embedded SW/IT and SoC(System on Chip). Among integration technologies for applied services are USN(Ubiquitous Sensor Network), telematics/ITS(Intelligent Transport System), GIS(Geographic Information System), LBS(Location Based Service), home network, BcN(Broadband convergence Network), WiBro(Wireless Broadband Internet) and urban control and management technologies. The roadmap outlines details of development for these technologies in each of the project phases. Service planning must begin by identifying component technologies required per u-City stage and assigning an order of precedence to each of them.

It would be also useful to forecast the

timeline according to which individual services will be introduced, based on the degree and extent of intelligence at a given point in time. As the patten of information supply is likely to shift from a Person-to-Material model to a Material-to-Material model not requiring human intervention, the classification of services must reflect this change. u-City services may be classified likewise, as they will follow the same shift. Services may be distinguished into basic services that are necessary and common to all urban spaces, and special services designed for certain of them. Services may also be classified, according to their targets, into public-sector services intended to serve the public good, and private-sector services meeting the needs of businesses and consumers(Kim, E. H. 2006). Accordingly, following the steps like the ones described in <figure 5> may be highly helpful when developing a model for step-by-step deployment of u-City concept.

As a standard definition is currently lacking as to what u-City model are, services widely vary in name as well as in intended function, depending on the project and who is running it. In spite of these differences, u-City is understood by many as a period or a stage of information where a major improvement at the level of network infrastructure, driven notably by broadband infrastructure, makes possible a broad penetration of innovative IT-enabled services, resulting in an explosive growth of both

<Figure 5> Approach for the U-City Concept Model



Note: 1) According to the u-City technology loadmap of MIC(2006), the u-City technology is comprised of the basic technology and application technology.

2) According to the NRI(2003) in Japan, u-Service is evolved by the intelligent level(Person to Material communication stage → Context aware stage→ Autonomous response stage).

3) According to the SERI(2006), u-City service is comprised of basic & specialized service and public & private-sector service.

Source: It refer to Kim, D.H(2005)'s article(p.29) and modifies to an u-City with an author.

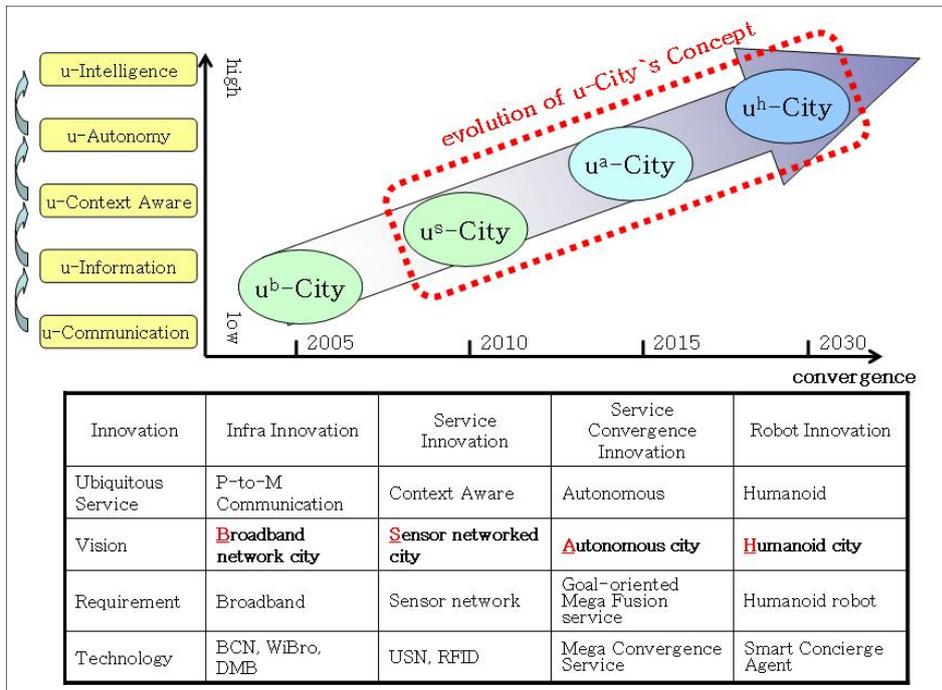
Person-to-Material and tMaterial-to-Material communications. u-City, in fact, is a state that is attained through several successive phases 'u<sup>b</sup>-City', 'u<sup>s</sup>-City', 'u<sup>a</sup>-City', 'u<sup>h</sup>-City'[13]. u-City services proper, in the sense of the term, will be seen only once we get to the s-City phase where wireless sensors will communicate with each other over broadband networks.

By taking into consideration both the level of intelligence of services and development of ubiquitous technologies, one can describe the evolution of u-City concepts and related technologies and requirements as follows:

The first stage in the evolution of u-City concept is the period during which basic infrastructure, necessary for the deployment of convergence services that are hybrids between different technologies, such as BcN, WiBro and DMB, is built. The infrastructure revolution, undertaken during this period, enables human-to-thing communications services, achieving what should be called broadband networked cities; hence ub-City for short. ub-City may be understood as an early model of u-City.

During the second stage, the

<Figure 6> Evolution of U-City's Concept Model



commercialization of RFID chip technology and USN technology will lead to more active communication between ubiquitous networks built during the first stage, making it possible to collect and transmit contextual information. Sensors implanted across our environment, collecting and transmitting contextual information, will bring about a service-level revolution, enabling hosts of previously unthinkable services. We will name these sensor-networked cities ‘u<sup>s</sup>-City.’

In the third stage, ubiquitous infrastructure and core technologies can be freely combined to automatically generate desired services. Information exchange will increasingly take

place between things, resulting in large accumulations of information, and convergence between services performing different functions will accelerate.

The model of city in this stage may be named u<sup>a</sup>-City, short for ‘autonomous city.’ The fourth and final stage is a period in which the universalization of Material-to-Material and Person-to-Material communications results in a high degree of intelligence of our daily environment, so that many of the tasks, performed previously by humans, are taken over by computers. Let us call these cities where people are surrounded by intelligent things that think and behave in a similar way to humans

‘humanoid cities,’ hence ‘u<sup>h</sup>-cities.’

#### IV. Conclusion

If the u-City market is compared to the wood, the wire/wireless network(u-Infra) will become the root of the timber And as to a stem, the ubiquitous technology(u-IT) as to a leaf, will be u-City service. Ubiquitous computing is today no longer just a visionary concept, but a concrete possibility that is becoming more and more tangible by the day.

This study was prompted by the need to take a new look at ubiquitous computing as a business model and a group of services and not just as a body of technologies. The same need exists also concerning u-City, one application of ubiquitous computing which has been receiving much attention in recent times. The technological environment is now ripe for developing new types of ubiquitous technology-enabled services.

In planning u-City services, urban developers and service providers must have a clear definition of these services and make a reasonable prediction as to how they will evolve in the near future. No less important is a well-defined roadmap for service deployment. The government, to achieve a greater degree of integration between services and reduce unnecessary or redundant development costs, has launched an initiative toward standardization of service models, so that they share the same basic vision and have a standard design.

Developing a standard service model also requires an acceptable forecast on how u-City services will evolve in the future. Our survey of previous studies on the subject suggests that u-City services are most likely to start out as individual services, as opposed to converged services. Convergence between technologies and between services will occur in the ensuing stage. u-City services will reach, in their final stage of development, the degree of intelligence allowing automated information exchange between humans and things, and between things.

In this study, we divided the process of achievement of u-City concept model, according to the status of technological evolution and service characteristics, into four different phases; u<sup>b</sup>-City, u<sup>s</sup>-City, u<sup>a</sup>-City, u<sup>h</sup>-City.

This classification, we believe, will contribute to a more systemic understanding of u-City models; the confusion from the lack of a clear definition of an overall concept of u-City is worsened by the blurred boundaries between related services. Future research must push the effort of envisioning service models to emerge in future times, targeting different customer groups and fulfilling different functions, to provide more concrete projections on the evolution of u-City.

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**[Appendix]**

<Table> The Type and Definition of u-City Service

Service	Definition
u-Culture/ Tour	The service which develops a culture and sightseeing contents and provides a user with the real-time customized information.
u-Home	The service supporting the digital home build-up conveniently and safely living and managing efficiently the residential space.
u-Biz Support	The service which supports a finance and commercial transaction activity of an enterprise and builds the telecommuting environment using information communications infrastructure.
u-Traffic	The service provides the trafficking user with the customized traffic information applying the advanced IT technology to the road and vehicle.
u-Logistics	The service which provides the integration information in order to know the flow of the physical distribution to the physical distribution relative organ and enterprise and it controls.
u-Learning	The service which provides the interactive learning using the wire/wireless network regardless of the time and place.
u-Health	The service which prepares for the system sharing the medical information and monitors the health condition of an individuals on a real-time and provides the remote medical treatment information.
u-Security	The service which watches the security and disaster accident of the public area, and which notifies rapidly manages in a government and residents.
u-Government	The service which provides 24 hours customized civil application for the convenient and efficient administration.
u-ECO	The service which is continuously a monitoring environment status and preventing the environmental contamination in city and which manages informations in order to rapidly correspond.
u-Facility	The service which manages the urban utility efficiently and controls the state through sensor network.

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**ABSTRACT**


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## 유비쿼터스 기술진화에 따른 u-City 개념모델에 관한 연구

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※ 주요단어: 유시티 모델, 유비쿼터스 서비스융합, 유비쿼터스 기술

최근 지방정부는 기본적으로 도시가 안고 있는 문제점을 해결하여 도시경쟁력을 높이는 방안으로 유비쿼터스 기술(u-IT) 도입에 관심이 높다. 이는 유비쿼터스 도시(ubiquitous city, 줄여서 u-City)라는 새로운 도시건설의 원동력이 되고 있다. u-City는 첨단정보통신 인프라와 유비쿼터스 컴퓨팅기술이 도시생활 속에 도구가 아닌 환경으로 존재하여, 물리적 도시공간과 전자적 도시공간을 융합시킨 미래형 도시다. 그러나 아직까지 u-City에 대한 명확한 정의가 존재하지 않으며 또한 제공되는 u-City 서비스에 대한 공통된 표준화 모델이 없는 실정이다.

따라서 유비쿼터스라는 개념이 일상화되고 있는 현 시점에서 u-City 서비스를 유비쿼터스 컴퓨팅 기술로서 이해하는 것에서 한걸음 더 나아가, 서비스관점에서 하나의 사업모델로서 이해해야 할 필요가 있다. 즉 유비쿼터스 기술변화를 반영하고 실현가능한 서비스관점에서 ‘u’에 대한 인식이 필요하다. 그러므로 유비쿼터스 컴퓨팅 관련기술이 발전하고 이를 바탕으로 유비쿼터스 서비스가 연계되어 u-City 모델이 진화하는 방향을 살펴볼 필요가 있다.

따라서 본 연구에서는 첫째, 서비스관점에서 u-City 모델을 정의하기 위해 전통적인 서비스 개념이 e-서비스, m-서비스, u-서비스로 진화하는 과정을 살펴보았다. 둘째, 기술·산업·서비스 간 융합현상에 의해 u-City 서비스가 새로운 사업영역으로 등장함을 설명하였다. 셋째, 유비쿼터스 기술진화의 과정을 인프라단계, 확산단계, 성장단계로 구분하였으며, u-City와 관련한 서비스의 가능성을 단계별로 도식화하고 그 방법론을 제안하였다. 마지막으로 u-City와 관련한 기술진화와 서비스의 전개방향을 바탕으로 u-City 서비스에 대한 개념적 범위를  $u^b$ -City,  $u^s$ -City,  $u^a$ -City,  $u^h$ -City로 유형화하여 정의하였다.

u-City 서비스 시장을 숲에 비유한다면 그 뿌리는 유무선 네트워크가 될 것이고 줄기는 유비쿼터스 기술이, 잎은 u-서비스가 될 것이다. 따라서 연구결과는 u-City에 대한 개념적 정의가 부족하고 서비스에 대한 경계가 불분명한 u-City 서비스를 좀 더 체계적으로 이해하는 데 기여할 것이다.

