REQUIREMENTS OF NEW EMERGING SERVICES IN THE UBIQUITOUS NETWORKING SOCIETY BASED ON IQ ANALYSIS

(Research-in-Progress)
Research Topic: Models

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Abstract: The rapid and wide diffusion of mobile phones has made the word 'ubiquitous' a very trendy buzzword not only in the computer science field but also in the social sciences. In preparation for the deployment of the technologies and services within what is being referred to as the advent of the 'ubiquitous network society', the Japanese government released a set of short-term policy strategies called the 'u-Japan Strategy', which aims to a) diffuse ubiquitous computing environment realized by wireless technologies and sensor networks and b) realize user-centric service model. This paper discusses how to keep or improve information quality within such ubiquitous network services. Firstly, the definitions and classification of ubiquitous services are discussed based on previously presented research results. Then we review a representative typical ubiquitous service example from which we derive a hypothesis on user acceptance. Finally we test this by applying the correspondence analysis to the results of a user questionnaire.

Keywords: Ubiquitous Network Society, Presence Services, Context Awareness, Expected/Real Service Quality, Correspondence Analysis, Ubiquitous Concierge

INTRODUCTION

In Japan and other developed markets, new data services accessible via mobile phones are being rapidly deployed and tested, including high-speed mobile Internet services on 3G networks, mobile electronic wallets using embedded chips, location-based services, e-ticketing services and even personal medical record browsing. The Latin-derived word, *ubiquitous*, originally used to describe future techniques of computing by M. Weiser [1], has become accepted in Japanese and a buzzword at Japanese and international IT expos. From this further concepts are being derived, leading to the ultimate 'Ubiquitous Concierge', which is a future service providing appropriate information based on stored personal profiles and context information obtained by various networked sensors in real time. While numerous positive demonstrations and service proto-types are displayed at expos, there are others which identify risks which should also be studied to help in the design of social and technical provisions to avert these potential problems. This paper reports on the results of research-in-progress, which studies characteristics of new emerging so-called ubiquitous services by focusing on a) information characteristics, b) information flow and c) changes in information quality.

After presenting our methodology in the next section, we examine the u-Japan strategy and initiatives in section 2. Then in the section 3, definitions of ubiquitous services and classification are discussed as the starting point of this research. Section 4 presents an information quality based examination of a representative example of future emerging ubiquitous services. From this a hypothesis on user acceptance is derived, which is then tested in Section 5 through a quantitative survey and correspondence analysis. Our conclusions are presented in Section 6 of the paper.

1. METHODOLOGY

As indicated above, this paper adopts three approaches. The first is a review of the policy initiatives undertaken by the Japanese Government in establishing the infrastructure, deployment and acceptance of digital technologies and services. This culminates in a review of their most recent set of initiatives which specifically focus on 'ubiquitous' services.

The second approach taken began with discussions with companies involved in the development of various aspects of the envisaged 'Ubiquitous Networking Society'. This and an associated review of the relevant technologies resulted in our classifying these services from an information quality perspective. This was applied to a typical example of an envisaged new services.

Lastly, to test our derived hypothesis on user acceptance of services and information quality expectations, a survey was undertaken of users to assess their understandings of ubiquitous services. The responses were broken into age group cohorts and examined using correspondence analysis.

2. NATIONAL POLICY & THE 'U-JAPAN' STRATEGY

The 'u-Japan' strategy was launched by the Japanese government in 2004, following the two phases of the 'e-Japan' policy. The e-Japan strategy was set forth in January 2001 with the goal of "turn[ing] Japan into the most advanced IT nation in the world by 2005." [2][3]

2.1 e-Japan Strategy Phase 1 and 2

Like many other industrialised countries, Japan is facing a number of challenges, including environmental concerns, a rapidly ageing population, a falling birth rate and increased urbanisation. The introduction and rapid diffusion of information and communication technology, hereafter ICT, is seen to be an essential factor in overcoming these challenges. However, prior to 2000, there was no national policy on IT, in contrast to other countries in Europe and Asia. In light of this, in January 2001 the government put forward its 'e-Japan Strategy', with the primary objective of making Japan the most advanced IT nation in the world within five years, i.e. by 2005. The e-Japan Strategy focused on the 'e-Japan Priority Policy Programs' and 'FY2002 Programs'. In order to enable a rapid and focused policy implementation related to establishing an advanced information society, a Cabinet-level IT Strategy Headquarters to enforce the Basic Law on the Formation of an Advanced Information and Telecommunications Network Society of January 2001 (commonly referred to as the 'IT Basic Law') was established and led by the Japanese Prime Minister. The Headquarters announced the 'e-Japan Strategy' in January 2001 and revealed the 'e-Japan Priority Policy Program' in March 2001 with a view to clarifying a set of specific action plans. This program, which is to be reviewed every year, sets out five policy areas for the country to concentrate on: 1) infrastructure, 2) human resources, 3) e-commerce, 4) e-government and 5) network security.
In line with the e-Japan Strategy, the goal of providing high-speed Internet access for 30 million households and ultra high-speed access for 10 million households is being reached. Furthermore, Japan's monthly consumer broadband prices are the lowest in the world.[4]

In 2003, the IT Strategy Headquarters adopted the second phase of the national IT policy, 'e-Japan Strategy II', with a target date of 2006. The second stage shifts its focus from infrastructure to user adoption and aims to create a "society that is fully energetic and lets people lead secure lives as well as enjoy new sensations and unprecedented convenience." The strategy cites four key principles for realizing such a society: structural reform, new value creation, individual perspective and new international relationships. Although, the e-Japan Strategy II includes specific infrastructure targets, as did the first phase, this is not the focus. It defined leading models and activities for the adoption of ICT in the following seven fields: 1) medical care, 2) food, 3) daily living, 4) small and medium-sized business financing, 5) knowledge, 6) work and employment and 7) government administrative services.

2.2 u-Japan Policies

'u-Japan' is the policy package released by the Ministry of Internal Affairs and Communication (MIC) in December 2004 as extension of the e-Japan Phase 2. 'u-Japan' sets three goals, which are: a) to construct an environment for the utilization of broadband, b) to contribute to the solution of Japanese social problems and the realization of expectations and c) to make the strategy serve society by using information and communications technologies, both wired and wireless, in all aspects of living and business. Japan is a leading user and developer of ICT, as represented by work in information appliance development including IPv6, RFID and digital broadcasting technologies. As part of this policy, the development and launch of new services, such as food traceability, home care, welfare systems and home security, is envisaged through the use of enabling ICT and ubiquitous networks.

One typical example described in the u-Japan promotional video [5] is remote monitoring using vital sensors, wireless networking technologies and multimedia technologies. A brief summary is as follows:

> *An elderly man is jogging and a doctor monitors his vital condition via a pulse oxmeter and wireless technologies. He receives a warning message and stops jogging. Then the doctor appears on the screen of his mobile terminal to explain his vital condition that he should slow down as his pulse has lately quite often exceeded the healthy range, as recorded in his recent vital sign records.*

The ‘u-Japan’ strategy also stresses the resulting social aspects and changes expected to happen in peoples’ daily live and values. MIC described its social impacts by the three words starting with ‘*u*’:

(1) *Universal* means friendly for all and assumes a society where anyone including the elderly and the disabled can easily use ICT.
(2) *User-oriented* means “oriented towards the users’ view-point” and assumes a society not based on the goals of suppliers but in which products and services accommodate users’ needs and offer convenience.
(3) *Unique* means ‘producing originality and creativity’ and assumes a society where creative businesses and services as well as new social systems and values are created so that originality can flourish.

As described in point (2), ‘user-oriented’, or in other words ‘user-centric’, has been a keyword of newly emerging ubiquitous services. Ubiquitous computing technologies connected by various wireless networks will make data collection much easier, sometimes even through a fully automated process. Then intelligence built in the ubiquitous service applications will analyse users’ demands to customise or personalise services for more ‘user-oriented’ environments. But such envisaged mechanisms will quickly collapse if and when a) initial proper data collection is not possible or b) the applications fail to correctly assess users’ demands. A ‘positive feedback loop’ is essential for high service satisfaction from users and services sustainability of the service.

Although there are discussions on whether the goals of these policies can be fulfilled, we continue this analysis based on the assumption that the technical environment will continue to develop as intended in the published policy.

3. CLASSIFICATION AND MODELLING OF UBIQUITOUS SERVICES

3.1 Information Quality within Total Quality of Information Services

We consider the *Total Quality of Information Services* (TQoIS) within which *Information Quality* is a key factor. This is illustrated in Figure 1, which shows that the Total Quality of Information Services is the combination of Information Quality elements and other elements. Information Quality elements considered include Believability, Interpretability, Timeliness, Completeness, Traceability and so on, as described by Wang and Long.[6] In addition to these there are also other characteristics of the service, including Suitability of Price, Physical Accessibility, etc.

Let us examine the TQoIS with the example of an on-line train schedule and route-finder service, one of the most popular information services available over the Internet. This service achieves *Believability* by using official train timetables issued by railway companies, achieves *Timeliness* by updating the on-line versions with latest timetable as soon as any change is announced, achieves *Ease of Understanding* by showing the result graphically, achieves *Appropriate Amount of Information* by presenting the top 3-5 routes based on the user’s inputted priority (cost, time, number of transfers), achieves *Accessibility* by accepting simple query of starting station and destination and achieves *Completeness* by covering all the railway companies timetables. But the TQoIS can’t be determined by those IQ elements alone and is also a factor of price (this service is provided by paying 300 JPY/month), physical accessibility (this service is available also on the mobile Internet), etc. These other elements play important roles in the determination of TQoIS. Here it is also pointed out that a) there is a close correspondence between TQoIS and IQ and b) there is a mutual correlation between IQ and the other elements. Therefore we simply approximate TQoIS by the use of IQ in further discussions.

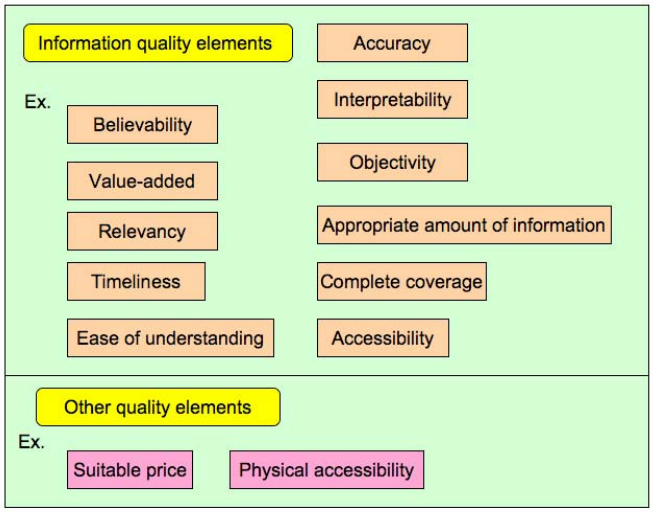

Figure 1: Information Quality Elements as Elements of TQoIS

3.2 Classification of Ubiquitous Services

In the Ubila Project [7], ubiquitous services are described as either context-based or profile-based depending on the time when the referred information for service is collected. As discussed in many cases of RFID based services, it is necessary to consider the issue of the users' consent when describe services. Therefore, prior to the discussion of ubiquitous services, we did a survey on previous definitions of ubiquitous services. The result of this is shown in the Table 1.

	Definitions	**Examples**
Presence	• provides a means for users to find, retrieve, and subscribe to changes in presence information of other users • control over the dissemination of own presence information to other users and services (explicitly identify the users and services with which own presence status is shared) [8] • ability to control an indicator of presence state which is shared [8]	User's status: online/offline, idle/active, available/busy [8] • Service examples: buddy list, person's location information service, personal profile information services, etc.
Context	• user specific information such as location, identities of nearby people and objects and changes to those objects [9] • More general contextual information time of day, season, temperature [10] • user's emotional state, focus of attention, location and orientation [9] • any information that can be used to characterise the situation of entities (i.e. whether a person, place or object) that is considered relevant to the interaction the user and an application, including the user and application themselves	• Service examples: video from live cameras, services based on data acquired from the Automated Meteorological Data Acquisition System (AMEDAS), traffic information systems, video surveillance
Personal Profile	• information based on personal attributes such as names and address • stored context and presence information for use to provide personalised services • processed information by analyzing stored context and presence information such as user's preferences regarding fashion, food, music, movies, etc.	• Personal information such as name, date of birth, address, family structure, telephone number, occupation, hobby, service log, health status, etc. • Service Examples: EBM (Evidence Based Medicine), EBH (Evidence Based Health)

Table 1: Definitions of Presence, Context and Personal Profile

The result of this survey is summarised as follows:

a) User's awareness or willingness to provide his/her own information is the key feature of presence services. In other words, the user's attitude to provide presence information is active.
b) Context includes information other than the user's own status, including information on the user's environment such as location, weather and nearby people. This information can be detected by sensors and other people's presence with or without of the user's consent. In contrast to presence information, user's attitude to provide context information can be passive and sometimes beyond his/her control.
c) The personal profile is defined here as a stored set of data, previously collected as both presence information and context information.

From these features, we classified ubiquitous services into the following 4 categories by setting time on the x-axis and information controllability by the user on the y-axis. Figure 2 describes the categorisation of ubiquitous services. Here services can be divided into either *profile* type or *non-profile* type depending on the use of the previously stored personal profile that is described along the time axis. The other way to categorise services is to judge whether information input for services is only given with the user's permission or consent. If this applies, the service is described as having high 'information controllability' by the user. Conversely, a service based on environmental information, whose flow is not controllable by the user, is described as having low information controllability on the part of the user.

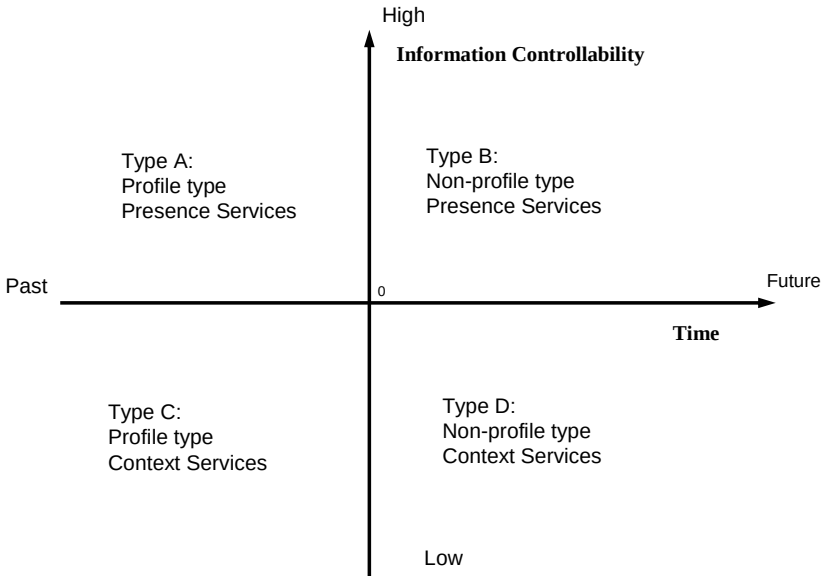

Figure 2: Classification of Ubiquitous Services Based on Information Controllability and Time

a) Type A [profile type presence services]: Services based on previously stored personal profile based on the user's awareness, understanding or willingness.
b) Type B [non-profile type presence services]: Services based on present information collected based on the user's awareness, understanding or willingness.
c) Type C [profile type context services]: Services based on previously stored context information collected automatically regardless with or without the user's awareness, understanding or willingness.
d) Type D [non-profile type context services]: Services based on present context information collected automatically with or without the user's awareness, understanding or willingness.

Of course, services can overlap between these classifications.

The flow of information within ubiquitous services is conceptualised as Figure 3. Firstly, the *service initiator* (SI) gives *information input* (I1) as presence type information with expected output O(t), a function dependent on the time axis. Here the SI is sometimes identical to the *service recipient* (SR), but

sometimes not. Besides the presence of *context information* (I2 or I3) and *personal profile information* (I4 or I5) can be also given as input through various actors, which are sometimes *inner actors* (IA1, IA2, …, IA4) within services, sometimes *outer actors* (OA1 or OA2). Finally service is provided to the SR by processing all the input information. The actors can be a real person, but also be a 'cyber agent' acting the role (various projects use different terms for this, such as Watcher, Agent or Concierge).
Here the fundamental and important issue is raised in the question of whether the *real output*, or *quality of service*, described as O'(t+τ) can reach the expected output O(t). If not, that can indicate critical quality degradation in the ubiquitous service.

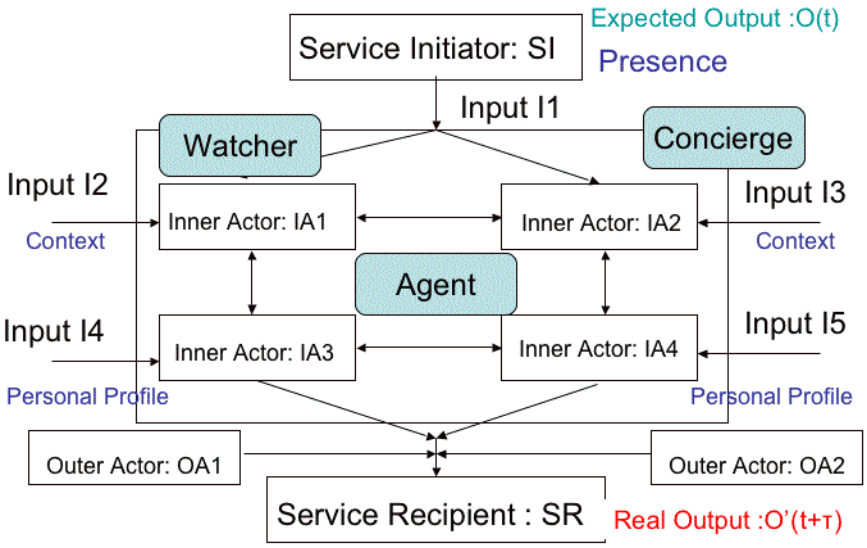

Figure 3: Information Flow and model of ubiquitous services

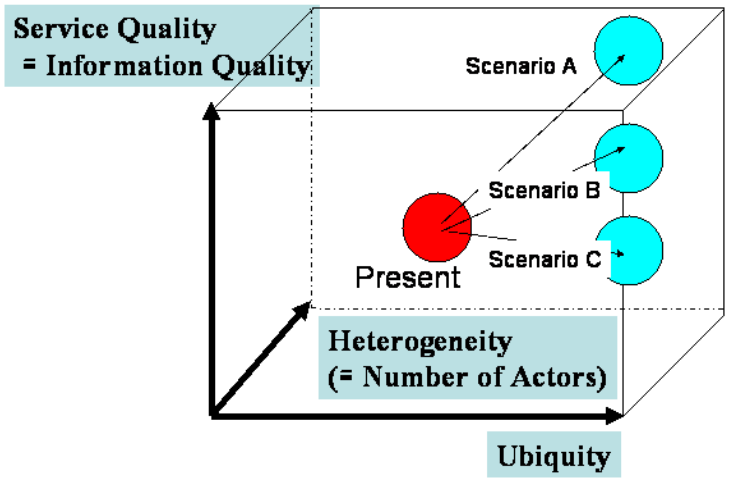

Figure 4: Future Scenarios for the Relationship of Information Quality to Ubiquity and Heterogeneity

Figure 4 also illustrates our fundamental question of whether a) improvements in ubiquity (x-axis) and b) increases in network heterogeneity (y-axis), in other words the development of multi-actor participation, will lead to the improvement of information quality (z-axis). Scenario A is very optimistic by predicting that the increase of ubiquity and heterogeneity will bring information quality improvements as presented by many potential ubiquitous service providers. Scenario B is less optimistic but still positive about information quality improvement. Meanwhile Scenario C is an observation that increase of ubiquity and

heterogeneity will cause information quality degradation. This fall in information quality depicted by scenario C may be explained by the information flow of the service becoming complex and more difficult to manage. At the same time, this will worsen the users' understanding of services. Besides service providers can hardly explain all the use cases for which they can take responsibility. At this point, negative side effects may be generated which can be sometimes very critical or crucial.
Based on the hypothesis above, we undertook a case study of future emerging ubiquitous service and part of the results is described in the following section.

4. REPRESENTATIVE INFORMATION SHARING EXAMPLE

Within our research, we looked at the typical 'buddy present profile information service' as an example of a new emerging ubiquitous service and conducted an analysis focusing on the information flow and changes in information quality. The member's present profile information service is classified as a type B service in the Table 1, that is a non-profile presence service. Though the scenario created is fictional, the service (of a group often referred to as Mobile Social Software - MoSoSo) itself is very realistic as launch of similar services was just announced on June 2, 2005 in Japan [11] and the similar Dodgeball service was launched in the US as well. The storyboard of this case study is described in the Figure 5.

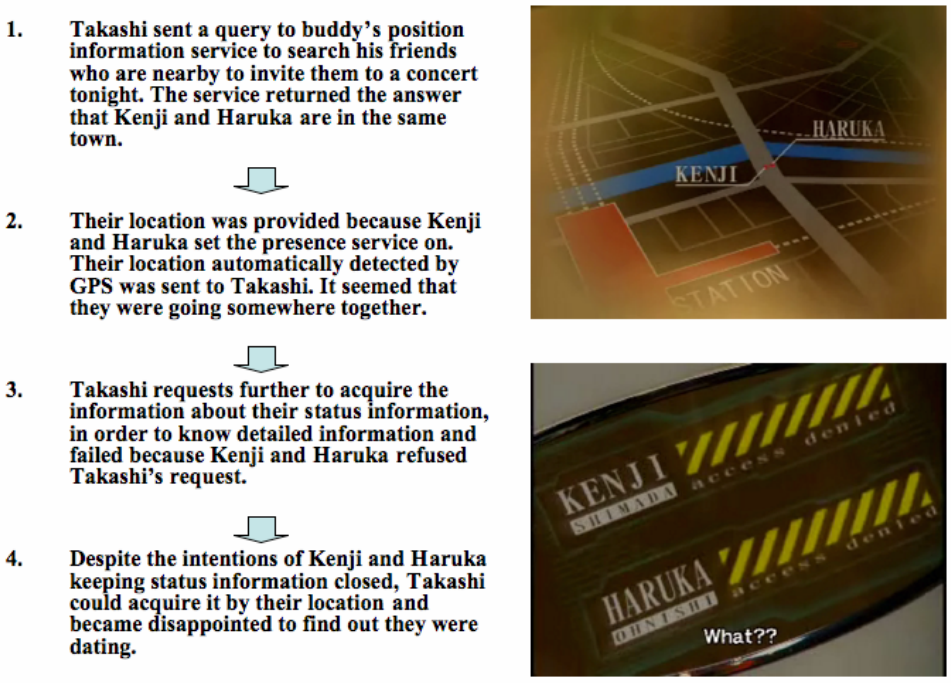

Figure 5: Storyboard of ubiquitous buddy list service (Screenshots from Ubila Project [7])

In the example presented in Figure 5, the actors engaged in the information flow within the service are Takashi, Kenji and Haruka. All of them are the service initiators, in the sense of being providers of presence information. Takashi is the only service recipient. In the story, Kenji and Haruka voluntarily provide their location information, but choose to not make any status information available. At the beginning when the information was generated, each actor's location information and status information were all independent. As time went by, independent information items could be inadvertently combined and a change in the quality of the information occurred automatically. This resulted in a significant gap between the expected output and actual output.

Figure 6 and Figure 7 explain how the transition in information quality can occur irrespective of the intention of all the actors. Individual presence information was collected in the process and even the closed status information was ultimately revealed, i.e., became open. The information mediator, that is the ubiquitous network in the case of ubiquitous services, can inadvertently change presence information into context information. If the presence information can be easily stored independently, the service type itself described in the previous section and Figure 2 can be changed without permission or awareness of the service user. This decreases the customer satisfaction very much and the ubiquitous service could incur a significant degradation of information quality.[12] This service example represents real-time applications in which people do not intervene in the process of information flow. Information quality is changed rapidly as a result and therefore users cannot verify whether the information quality is maintained as intended at each stage of the information flow.

Findings from this case study are summarized as follows:

- an increase in ubiquity makes the collection of information easier,
- an increase in heterogeneity enables multi-input of information in a service,
- a transition of information quality can occur even more rapidly within ubiquitous services,
- understanding services will become more difficult not only for users but also for providers,
- gaps between the expected service output and real output might be a significant barrier,
- to realise user-centric services, it is essential to understand each user's demand (expected service output) correctly and reflect it in the information quality to minimise the gap.

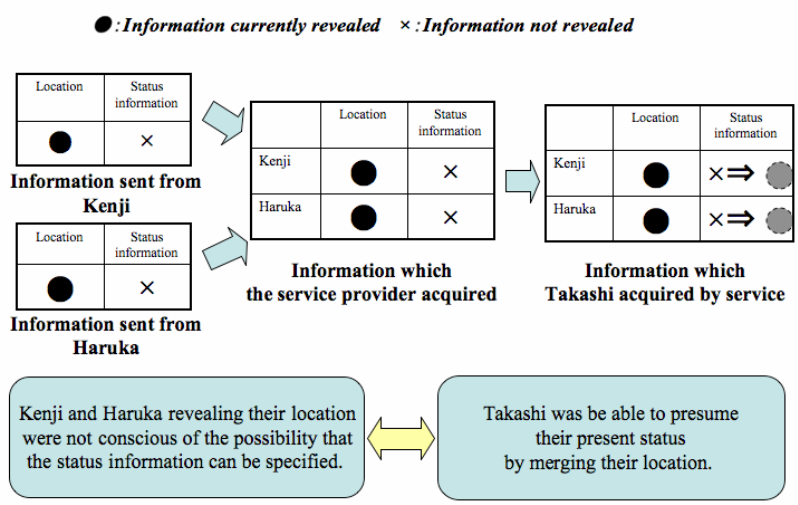

Figure 6: Transition of Information Quality in the Example

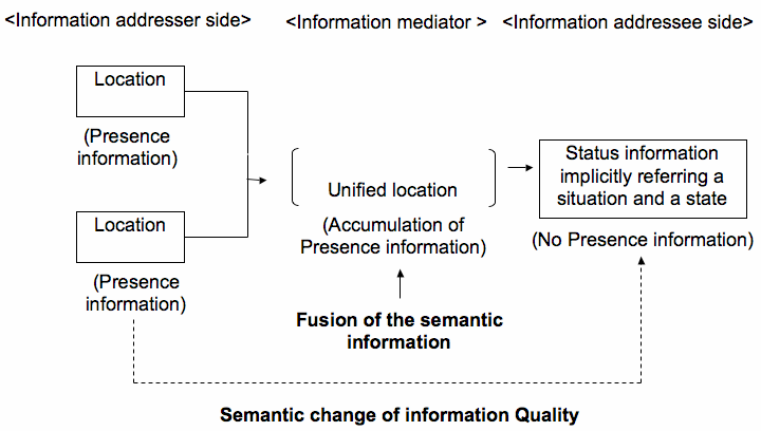

Figure 7: Process Diagram of Semantic Change of Information Quality

5 USERS' UNDERSTANDING OF UBIQUITOUS SERVICES

Based on these findings of the previous section, we conducted a survey to assess various users' understanding of ubiquitous services, as this is an essential factor in service quality and information quality.

As seen from the example used previously[13], 'age' is expected to be a very influential factor, along with other attributes such as 'sex' and 'occupation'. Based on this hypothesis, we distributed a questionnaire and conducted analysis on the collected results by applying correspondence analysis, a frequently used tool in marketing. Correspondence analysis is a descriptive/exploratory technique designed to analyze simple two-way and multi-way tables containing some measure of correspondence between the rows and columns. The results provide information which is similar in nature to that produced by factor analysis techniques and allows one to explore the structure of categorical variables included in the table. The most common kind of table of this type is the two-way frequency cross tabulation table.

5.1 Survey Design & Analysis

5.1.1 Step 1: Design and Collection of Questionnaire

The details of questionnaire are presented in Table 2. We picked up 16 typical conventional and ubiquitous information services and for each asked respondents to rank the applicability of 16 different descriptions listed in Table 2 on a scale of 1 to 5. For each service listed, each respondent was instructed to choose a score for the relevancy of each description. For example, for "S1: Fixed-line Service" a respondent could choose a relevancy score of 1 (the lowest) for characteristic "D1: Use at any time" as fixed-line service can be used only at a home or office. But for "S2: E-mailing on mobile phones" a typical relevancy score was 5 (the highest) for characteristic "D4: Everyday application", as it was really an "everyday application" for him. The paper-based survey was done by post and had 92 respondents ranging from teens to people in their 50s. Of these, 76 responses were complete and valid response.

Survey Period	December 16-23, 2004
Target Population	Residents in Tokyo greater metropolitan area
Number of Respondents	92 (valid response: 76, retrieval rate 82.6%) (By age group: teens: 15; 20s-30s: 36; Over 40: 25)
Format	Mail-in survey

Services being questioned about	S1: Fixed-line phone S2: E-mailing on mobile phones S3: E-mailing on PC S4: ETC (Electronic Toll Collection) System S5: RFID integrated mobile handset (mobile wallets) S6: Mobile buddy list service by GPS S7: Kid's safe commuting support system by GPS or RFID S8: E-government S9: Traceability of beef (food-safety) S10: Location-based (mobile) advertisement delivery S11: The Internet shopping (e-Commerce) S12: Street video surveillance S13: On-demand content delivery for mobile phones, e.g. ringtones S14: Personal health support S15: Blog S16: Personal status (presence) information system
Descriptions items each service is to be ranked on	D1: Use at any time D2: Use only when it is necessary D3: Use place is limited D4: Everyday application D5: Use for fun D6: Sense of being monitored D7: Use for secure feeling D8: Use is indispensable D9: Use to improvement QoL (Quality of Life) D10: Use to record/store data for profiling D11: Optional or possible to refuse information reception D12: Unexpected disclosure of information D13: Leakage of Privacy D14: You may offer individual information when it is necessary D15: You may offer individual information for QoL improvement D16: Able to control the accessibility by oneself

Table 2: Details of Survey

5.1.2 Step 2: Correspondence Analysis

We conducted a correspondence analysis [14], which identified the most corresponding description for each service and mapped the result onto a 2-D space of time-axis and information controllability-axis described in Figure 2. The results of correspondence analysis are obtained by solving eigenvalue problems with matrix calculations. Through the calculation, both values of information controllability and time are obtained along the continuum within the range of -1 to 1. Here the important thing is the distance between each service and description. If it is close, then the correspondence between the two is regarded as very close. The results are shown in Figure 8 through Figure 11. As assumed before the survey and analysis, there are significant differences in responses by age groups, which is explained in the following section.

5.2 Results of Correspondence Analysis

5.2.1 Teens Service Understanding

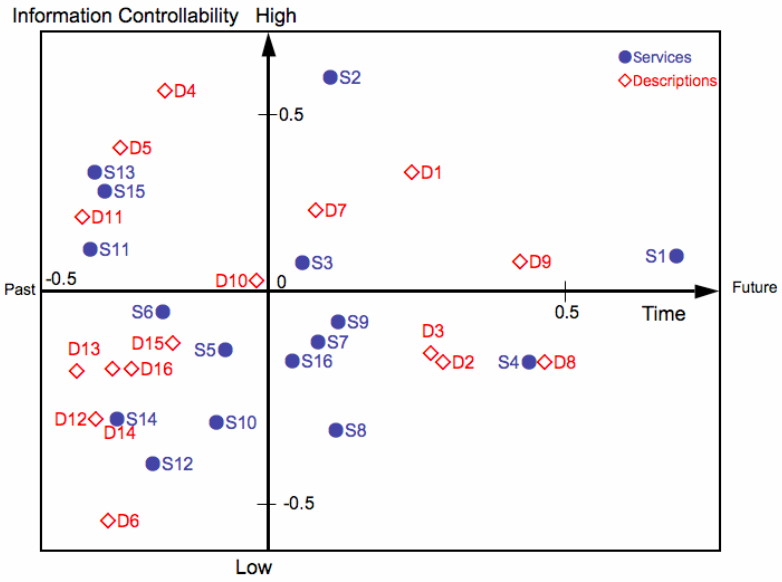

Figure 8: Result of Correspondence Analysis for teenagers

Figure 8 shows the result of the correspondence analysis for the teenagers in the sample. Here S1 to S16 represents each service, D1 to D16 represents each description, as described in Table 2. From the relative distance between services and descriptions, we can tell the proper description for a certain service. For example, from the fact that S4 and D8 are very close to each other, S4 (ETC) is regarded as D8 (use is indispensable to life). The characteristics are described as follows:

- Already existing services are classified as type B services (non-profile type presence service), which have high information controllability. This means teenagers trust their abilities to control their own information for those services.
- Other services are classified into Context or Profile services, which is where typical new ubiquitous services are likely to be. From the descriptions, D12 and D13 were closely related to Context type services. From the fact that these and profile type services are positive, it appears the respondents are aware of the dangers of information leakage.

5.2.2 Service Understanding by those in their 20s & 30s

Figure 9 shows the result of correspondence analysis for people in their 20s-30s. Their characteristics are described as follows:

- They assumed many ubiquitous services as type A or C service (Profile-type Presence or Context Service).
- The services S4, S5, S8 were closely related to descriptions D14 and D15. Common features among these three services are: a) facilities are installed more ore less as public infrastructure and b) related to real civil busy daily life. For example, main users of S5 are in this age group and they can be regarded as early adopters of new ubiquitous services for real life support, not for fun.

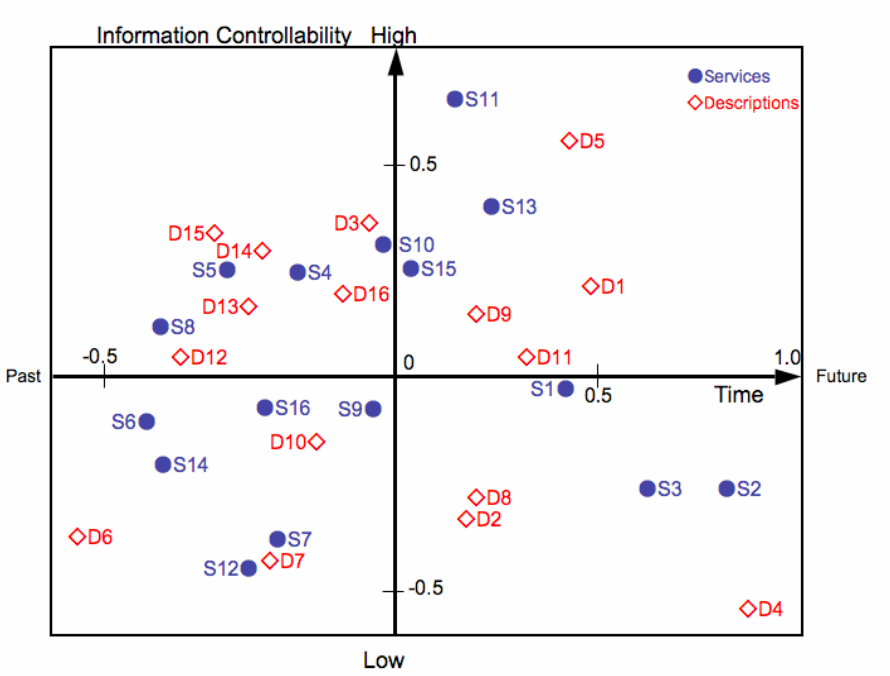

Figure 9: Result of correspondence analysis for the 20s & 30s age group

5.2.3 Over 40s Service Understanding

Figure 10 shows the result of correspondence analysis for the over-40 cohort. Their characteristics are described as follows:

- As with the result for the 20s-30s cohort, they assumed many ubiquitous services as type A or C service (Profile-type Presence or Context Service).
- Remarkably, D16 is one of the most important descriptions for ubiquitous service. This fact shows that this cohort has a strong desire to only accept services with user consent. In other words, they are wary of type C (profile-type context service) services, in which information is provided and processed in an uncontrollable manner.
- They have also opinions that these very privacy sensitive services should be operated by reliable bodies, such as the public sector.

5.2.4 Comparison of Service Definition and Users' Service Evaluation

Figure 11 shows the result of comparison of a) service classification by definition and b) users' evaluation. The result a) was given by mapping services along the Figure 2 definitions and b) was obtained by averaging the users' evaluation result shown from Figure 8-10. The characteristics are described as follows:

- As highlighted by arrows, there were great gaps were in acceptance of S4, S6, S12 and S16. By the service definition, while S4, S6 and S16 are classified into type B (non-profile type presence service), S4 belongs to type D (profile-type context service), S6 and S16 belong to type A (profile-type presence service). And S12 belongs to type D, though it was classified into type C (non-profile type context service) by the definition. These result may show that a) users are anxious about leakage of privacy related information, b) users are aware of possibility to enhance the non-profile type services into profile type service by utilising the past usage record or stored data.
- The importance of Information Controllability as a scale to describe services is shown. To fill the gaps, it is necessary to provide more information controllability to the users for more user-centric services.

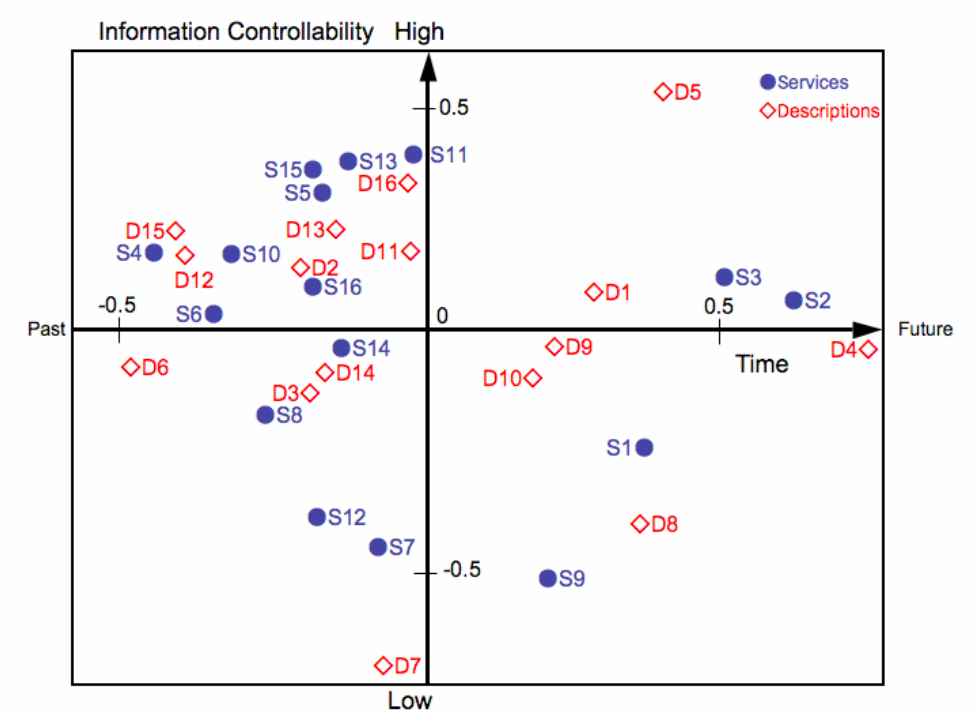

Figure 10: Result of correspondence analysis for respondents over 40 years of age

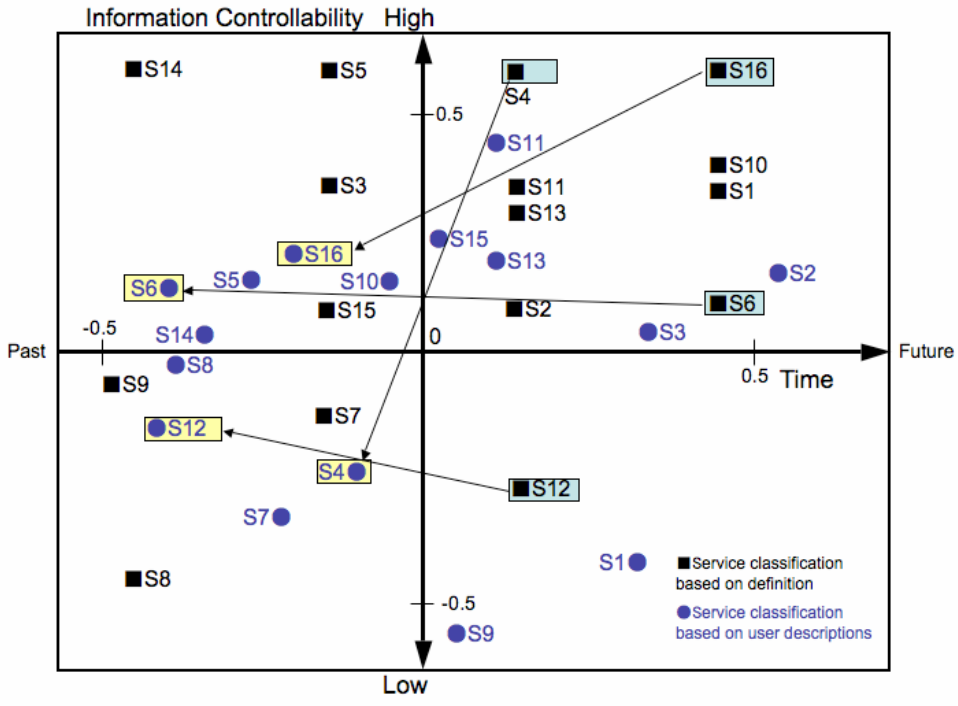

Figure 11: Comparison of service definition and users' service evaluation

6. CONCLUSIONS

Based on a literature review, we provide a definition and propose a classification of information services along a time axis and information controllability axis. Then, through the case study of a fictional scenario presented in 'Small Stories in 2008', we pointed out the key features of ubiquitous services as follows:

- an increase in ubiquity makes the collection of information easier
- an increase in heterogeneity enables multi-input of information in a service
- a transition of information quality can occur even more rapidly within ubiquitous services
- understanding services will become more difficult not only for users but also for providers

Based on these, we undertook a survey by distributing a questionnaire to measure the gap between the service definitions and users' service understandings that will influence the information quality of these services. And as a result, the importance of information controllability as a scale to describe services is shown. For more user-centric services, there is the stated goal described in the 'u-Japan Strategy' of giving more information controllability to users in the developing ubiquitous network society. But there is a contradiction in that it is not possible to give full information controllability to users, as there are many different types of users, as seen in the range of results between the age cohorts. Therefore a mechanism is needed to support individual users, sometimes acting on their behalf as a 'ubiquitous concierge' service. Currently, we are continuing this research into information quality issues to better understand the requirements of such services both from technical and social perspectives.

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