Ubiquitous Society – Cultural Factors Driving Mobile Innovations and Adoption in Japan

Henning Breuer

Waseda University Tokyo & Bovacon Berlin
10119 Berlin / Tokyo
henning.breuer@bovacon.com

Abstract. Streets without names, golden silence on the subway, cables installed above-ground, experimental drive of developers and nosy customers prepare the ground for ultimate perfection. This article analyzes and describes culturally embedded usability scenarios, research activities and geographical and political frameworks of developing mobile technologies in Japan. Furthermore, decisive factors contributing to the development of a mobile and ubiquitous scociety in Japan are outlined. This aims at raising awareness for new starting-points of mobile innovation in Europe.

Keywords: Cultural factors, mobile applications, innovation management, intercultural design.

1 Background

In Asia Japan is still leading with regard to economic power and technological innovation. Additionally, it is the second-largest national economy of the world. New technologies are considered to offer a promising way of meeting modern challenges such as globalization and demographic change. Consequently, since the 1990's the investments of Japanese government and private enterprise into research and development exceed those of any other industrial nation. Due to national funding programms, entrepreneurial strategies and customers' needs mobile technologies are omnipresent. Entrepreneurial investments often focused on feasability. However, scepticism against possibly ill-conceived services and products has usually been ruled out by customers' interests. A mobile ecological system which is far apart from the developments of the rest of the world arose out of network effects between heterogenous services. The following data, analyses and thoughts are derived from interviews and discussions with experts as well as literature reviews.

2 Usage and Prevalence of Mobile Applications in Japan

The car phone was introduced in 1979, followed by a shoulder phone in 1985, and an almost not affordable handheld in 1987. The mobile internet service i-mode was introduced in 1999 and shortly afterwards NTT DoCoMo launched FOMA being the first mobile communication service of the 3rd generation worldwide. By now its penetration

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rate exceeds two thirds and one third of the total ARPU corresponds to the data segment is above. Contactless payment systems are integrated in mobiles and allow for a new range of user services. Leading telecommunication companies such as NTT DoCoMo have entered credit card business. 2D "quick-response" barcodes make targeted online information related to the users' locality available via mobile phones. At public places, products, advertising materials, posters, and journals, even buildings and gravestones barcodes are found pointing to further information or disclosing interaction. Social networks, blogging, games, and even literature is transferred to mobile devices. In contrast to the European market applications such as mobile television, location-based GPS-services and mobile learning are well-established in Japan. Currently, further requirements regarding the infrastructure of mobile communication are derived from remote-control and interaction with auto-mobile robots.

3 Keitai Is "Something You Carry Along"

"Keitai" is not just a phone (denwa) but literally refers to a "snug and intimate technosocial tethering", a personal companion supporting communications that are "constant, lightweight, and mundanely present in everyday life", a new cultural paradigm [1]. In contrast the American term „cellular phone" alludes to the technical infrastructure, while the British expression „mobile" emphasizes the untethering from a fixed location. Keitai cultures arose out of youth street practices and visual cultures and a history of text messaging from early pager [1]. In the 1990's Ketai became (in)famous under the suspicion of NOT serving a particular task to their lead user groups.

Describing these groups Matsuda [2] characterizes Kogyaru and Jibetarian as young urban individuals being eyed suspiciously. Kogyaru refers to young women ready to meeting men for financial rewards. Jibetarian refers to individuals of both sexes spending their time at crowdy crossroads seemingly without reason or obvious goal in life. Both largely relied on Keitai to organize their social relations. Thus, well established ways of social control are jeopardized.

No matter how sceptical the youth culture has been regarded, the youths and the abandonment of task-orientation were crucial for starting mobile applications' triumph in Japan. While the US and Scandinavia lead the deployment and adoption initially NTT DoCoMo launched its i-mode mobile internet service in 1999, driving Japan to the forefront of the mobile revolution. As early as 2001 3G was introduced achieving a subscription rate of 72.3 percent by the end of the year and of 79.2 percent in 2002.

4 Mobile Manga and Literature

In 2007 half of the 10 most sold novels in Japan have not only been read but as well been written on mobile phones [3]. Mobile literature is booming particularly within youth culture. Using pseudonyms like „Mika" or „Yoshi" hobby authors publish on blogs, mobile internet or the Maho i-Land site that provides specialized rankings, editing and searching functions for mobile literature [http://ip.tosp.co.jp]. The main audience consists of young women aged 13 to 18 years [4]. Most novels deal with

love, sexuality, drugs and aggression, depicting a fatefully tragic and melodramatical plot. Technical constraints of small display screens and comparably laborious typing resulted in a characteristic style. Thus, typically first person narratives are published predominantly using dialogues and quotes. Furthermore, sentences are concise and syntactically simple, occasionally even in note form. Additionally, abbreviations and emoticons are used. Even though "Keitai"-literature has been criticized for sketchy plots and occasionally primitive linguistic style, some works have been printed or picturized. Mangas for mobile phones delivered by different network providers are very popular as well.

5 Social Network Services

Mobile service usage trends are led by social network services (SNS), blogs, HTML mail, video, gaming and train connection information. Mobile Social Software (MoSoSo) adapting web 2.0 applications such as social networking services, blogs and wikis for mobile phones are becoming increasingly popular. They are used to negotiate identity issues, and to find others for social, dating or business networking. Relying on mobile devices MoSoSo makes the trend towards social online software ubiquitous. Mobage-Town [http://www.mbga.jp] has been optimized for mobile phones and provides blogs, forums, games, horoscopes, online-literature and much more. On Mixi [http://www. mixi.jp] mobile page views overpassed PC page views for the first time in August 2007.

6 Navigation Systems

There are rarely more than a dozen of streets carrying individual names in Japanese cities such as Tokyo. Even locals are challenged by finding adresses organized by administrative districts, blocks and years of construction. Roland Barthes refers to Tokyo as a city without categories, "made of rooms without names… To visit a place for the first time requires starting to write it. Since its address has not been written yet an individual signature needs to be created" [5].

Up to now these signatures originate from visitors scetching directions and landmarks on a sheet of paper. Consequently, navigation systems integrating innumerable direction scetches are more popular in Japan than anywhere else. Asian doption rates in exceed those of Europe and the US. Up to 2012 a yearly growth of 8 percent is expected for the Japanese in-vehicle navigation market.

Besides entertainment features, navigation devices are going to integrate more functions, such as voice recognition and driving assistance. "Navigation devices are not just navigation devices any more: The introduction of new technologies will help lower-priced competitors to differentiate themselves," said Wang Tao [6]. Navigation devices in Japan focused on navigation and real-time information originally. But over time, besides infotainment, driver assistance systems, functionality and interactivity will become the major differentiators in the Japanese market. „Device connectivity and the integration of several functions will provide the best penetration as these markets evolve"[6]. Regarding mobile information and communication devices in general terminals with new performance characteristics emerge.

7 Mobile Marketing

The Sony-developed FeliCa standard has been introduced as „Osaifu-Keitai“ (money-bag-mobile) and it is available by now on one third of all Ketais. Contactless transactions via RFID enable users to make payments at participating retailers and vending machines, as well as online on mobile shopping sites. Other applications include passing through train gates, using the handset for credit cards transactions, checking into airplanes and redeeming electronic coupons - all of it just by a touch. Furthermore, in 2006 digital terrestrial broadcasting to mobile (called 1seg in Japan) has been introduced and is now available on 41 million devices [7]. A data feed below the TV content window links to programming-related websites and promotional offers. Thereby, it provides an advertising platform to marketers without interrupting the users' media experience. More than 70 major partners have signed up with FeliCa so far. Since revenues from mobile commerce already surpassed mobile content revenues three years ago, the mobile phone is fastly turning into a full-fledged shopping and payment device [8]. NTT DoCoMo has been running trials combining both 1seg and FeliCa technologies: During a baseball game, consumers could participate in a mobile game, betting on the outcome of innings. They received promotional coupons in return, which could be redeemed at McDonalds. A similar concept involved coupons which could be cashed in by simply touching the handset to Coke vending machines.

The prevalence rate of these machines already represents a highly visible difference to Europe. Furthermore, there are many "convenience stores" in Japan within walking distance for everyone beeing open all day. Due to limited space for selling and storing daily deliveries are well calculated and items with low sales volumes are sorted out on a weekly basis. Consequently, products need to be made known within a week. Therefore, mobile advertising provides an effective marketing strategy which is increasingly being combined with traditional techniques like TV-spots and interactive advertising panels. A growth rate of 300 percent by 2007 has already been predicted in 2001 [9]. However, its success depends on the availability of fast 3G access and the prevalence of high-end mobile phones.

8 Research and Developmental Perspectives

Japanese research and developmental departments, specifically NTT DoCoMo and KDDI laboratories are global market leaders with regard to numerous innovations [10]. In particularly, research about robotics and Human-Robot Interaction (HRI) attracts worldwide attention. Following recent advances in locomotions and mechatronics focus has been shifted towards designing HRI. HRI aims at enhancing human and robotic skills by allowing both sides to interact with and to operate on each other. Automobile companies being highly experienced with regard to industrial robots invest in the development for private usage as well. There are numerous projects teaching robots for example how to walk, run, swim, hike, play the flute, or other instruments.

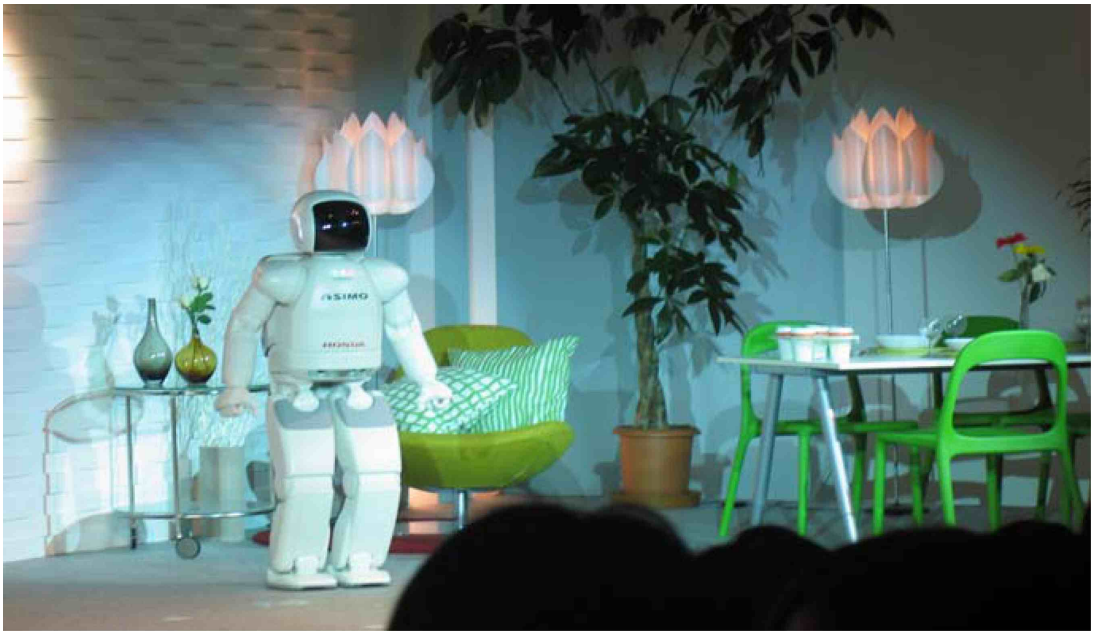

Fig. 1. Asimo at home, Great Robot Exhibition 2008

As an interdisciplinary science HRI promotes innovation in different disciplines. A project at Waseda University explores how humans and robots may live together. Being part of a multi-agent P2P-network, WaBot-House robots are able to react intelligently and dynamically to changing circumstances within households. Nowadays or in the near future robots are supposed to rescue victims of earthquakes, to execute military actions, to sort department stores, to safeguard and clean buildings and above all to entertain and to assist in elderly care.

Partially due to historical reason there is a certain retentiveness in Japan to let workforce from neighboring countries such as China enter Japan in order to care for elderly people. Also in this line of reason one answer to the rapidly aging society is a developmental focus on robots' potentially supporting functions in household and everyday life. In 2008 robots (about 15000) were more frequently sold for caring than for entertaining purposes for the first time [11]. Humanoid ways of communicating and behaving are particularly demanded in everyday surroundings like offices, households, stores or museums.

Anthropomorphic robots operating in corresponding contexts are increasingly presented in an audience appealing way. They are expected to be found in every Japanese household within the next 10 years (similarly to South Korea). There is nothing sinister or uncanny about this vision in Japan. Western dystopias of revolting robots are ignored by Japanese researchers and consumers. In contrast, robots may be cute or „kawaii", which in turn is considered to be cultic. According to the deep-rooted and prevalent Shintoism everything has a soul, trees, rivers, mountains, as well as dolls and stuffed animals. When they are not needed anymore they are considered death and are burned to pay one's last respects. Regularly, useless toys are burned in Shinto shrines. So, we may wonder when (since the first Aibos, Postpets, Tamagocchi already did) outdated robots find their way onto the pet cemeteries. From this point of view, robots

Fig. 2. Therapeutic robot PaRo und announcement of burning toys in a Shinto shrine

are not only extreme cases of formalized interaction and relational maintenance, but postmodern representatives of shintoistic pantheism. Since everything is part of the overall nature humans and robots are not entirely different.

9 Ubiquitous Society

Japan's confidence in the blessings of technological and civilizing progress is still unbroken. What appears to be manageable should be tried out before someone else arrives first.

Following the economic depression of the 1990's Japanese government relied on new technolgies for economic recovery and new affluence. When the national funding program „e-Japan" 2005 expired successfully in 2005 „u-Japan" succeeded in 2006 [12]. Moving from a digital („e") to a ubiquitous („u") society should be accomplished by providing high speed or ultra high speed network access for the whole population. Whereas "e-Japan" [13] mainly aimed at promoting digitalization, "u-Japan" focuses on informational technologies. They are supposed to be the key element of coping with the challenges of the 21st century, such as health care issues due to a rapidly aging society, environment and energy, public safety, etc. By 2010 80 percent of the population is expected to appreciate the problem solving potentials of informational technologies.

10 Contextual Peculiarities

Japan is an island with scarce resources, difficult environmental conditions and a highly spiritual population believing that god is found in every item. Given these circumstances, Akio Morita, founder of Sony, argued that technological development has offered the best way of surviving. Additionally, the meticulousness needed for writing may have been advantageous for technological development requiring precision as well [14]. Japanese design and aesthetics such as the preference for "elegance of simplicity" [15, 16] have nowadays been integrated into user-oriented designs.

Japanese technicians' unique focus on minimizing products has been traced back to spatial narrowness of surroundings [17]. Finally, the unexcelled curiosity of Japanese regarding new technical gadgets is frequently pointed out ("otaku", a nerd thrilled by media, is amongst others characterized by this relation). In contrast, European and German customers tend to wait for the third generation of a product and a seal of quality by Stiftung Warentest (a well respected German customer-oriented trust). Comparably, Japanese customers are an incarnation of curiosity: New products are not suspiciously considered as ill-conceived but are tested immediately. From the author`s perspective this curiosity may even partly compensate for the neglect of user research and integration at the onset of product development. Many new products, except for branded ones, are firstly offer in Akihabara in Tokyo, which has been labeled "electrical city" due to the high prevalence of electronic shops. This test market enables companies to estimate sales volumes before large-scale production is started.

It would be quite interesting to analyze cultural differences and similarities and their correspondence with technological developments in detail. Unfortunately, this goes beyond the scope of this article. Therefore, only a few selected observations and perspectives have been discussed. Some aspects have already been mentioned, such as streets without names that may have forstered navigation systems or traditional Shinto beliefs that may have reduced cultural scepticism against robotics.

Commuting has been discussed frequently as a major factor for exceptionally high data transfer rates and the success of mobile services. Compared to traveling time (more than an hour for more than 50 percent of the inhabitants) regulations for Ketai usage on trains and busses are more decisive. As already mentioned, usage of Ketai in public places had a bad reputation for a long time. In particular when Ketais became quite popular among youths in the 1990's their usage on trains was discussed controversly. Towards the end of 1995 inaudible vibrating alerts were introduced and since 1997 travelers were requested to refrain from talking by loudspeaker announcements. Finally, since 2001 talking on the Ketai has been strictly forbidden. Consequently, many travelers exchange text messages via e-mail instead [18]. This social norm made a considerable contribution to the popularity of mobile internet and its variants such as mobile literature and social network services. Furthermore, Japanese companies frequently do not allow navigating websites (especially for private purposes) during working hours. This certainly adds to the popularity of texting on trains.

Fig. 3. Prevalent usage of mobile data transfer in public tansport systems

Additionally, there are geographical particularities. Numerous earthquakes may have contributed to the ingrained knowledge that nothing lasts forever and beauty is most frequently found by looking at the perishable presence. In any case, due to earthquakes cabels have been run above ground. Though it might seem disadvantageous from an aesthetic point of view it is highly convenient for modernizing infrastructures. Regionwide fiberglass was rapidly installed right to the doorstep (FTTH / Fiber-to-the-home) and more than 50 percent of the households (28 million connections) were supplied by 2007. While new broadband services are being introduced, analog TV is to be abandoned by 2011. Last but not least, low costs of running cabels above ground contribute to Japan's ability to adapt so fast.

11 Conclusions

Considering the embedding variety of geographical, cultural and political factors innovation and adoption of new applications and technologies is a complex undertaking [also 19]. Strong connectivity to a unique cultural ground must be given. Mode and structure of usage barriers and beneficial conditions are partly grounded in cultural beliefs (such as Shintoism) and physical infrastructures (such as cables above ground). Therefore, general conclusions regarding other countries may not easily be derived. However, a heightened sensitivity for the geographical, cultural and political characteristics of a market may inspire technical development and sucessful merchandising. Cultural aspects do not only affect acceptance but their analysis may promote innovation as well. In any case, services need to fit aspects whose significance is rarely obvious. Nevertheless, hypotheses about general factors of success and solid methods for designing services may be derived. In the following, two hypotheses are presented to illustrate this point.

The first hypothesis refers to conceptualizing the Ketai as a personal companion. Instead of pointing to the technical features of mobile media („cellular phone“) their personal impact on the user should be analyzed and adressed by merchandizing. This applies particularly to technologies "handled" in such a way as mobile phones.

Lessons learned from the history of the Ketai [1] contrast with the paradigm of task-orientation in designing HRI. The historical experience exemplifies that deficiency of blatant usefulness to accomplish specified tasks or rather openess to interpretation and usage allows answering the mobile medium's purpose. Though the Ketai had been discussed controversely initially it is hypothesized that such openess contributed to its success.

The second hypothesis refers to the emergent features resulting partly unexpected from integrating new and existing services and functions. Network effects (with number of nodes increasing value exponentially) are not only caused by the number of devices and users contributions (as in web 2.0) but by combining known and innovative functions as well. It may be questioned whether a combination of technologies such as mobile television delivering coupons, quick-response barcode readers and Near Field Communicationfor mobile payment, ticketing and email is still akin to a phone. However, the combination of technologies certainly enables new use cases and business models that may increase users' overall value of portable devices for users. When conceptualizing and developing new functions and services network effects should be considered. So, it may be worthwile to simulate possible combinations in

advance. Taking in account cultural contrasts robust measures may be derived to formulate guidelines of an intercultural "design-for-all". These include the necessity to meet a variety of preferences, habits, and competencies. Additionally, facilitation of intercultural interaction and communication is considered to be essential in order to provide tourists and business travelers' easy access to information and communication services. Technologies do not only depend on technical feasibilities and infrastructures but on cultural realities, preferences and coincidences as well. These aspects shape, delimit and inspire our technological progress at all times.

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