Tokyo Road trip 27 June – 4 July 2010

Company meetings in the Tokyo area

Meeting with Ministry of Internal Affairs and Communication

International Telecommunications Society Biannual World Conference 2010 Tokyo

August 29, 2010

Company and ministry visits organized by

Dr Niklas Z Kviselius, Science and Technology Office, Embassy of Sweden, Tokyo

Mr Shigeyuki Naito, Science and Technology Office, Embassy of Sweden, Tokyo

Prof Anders Karlsson, Science and Technology Office, Embassy of Sweden, Tokyo

Participants

Prof. Per Andersson, Stockholm School of Economics

Mr Jan Markendahl, Royal Institute of Technology (KTH), wireless@kth

Dr Bengt G Mölleryd, The Swedish Post and Telecom Agency (PTS), and guest researcher at Royal Institute of Technology (KTH), wireless@kth (edited this report)

Dr Christopher Rosenqvist, Stockholm School of Economics

Visited companies

- SonyFelica
- NTT Network Innovation Lab
- NTT DoCoMo
- KDDI
- Ministry of Internal Affairs and Communication
- Panasonic R&D Center Tokyo
- Research Center for eLearning Professional Competency, Aoyama Gakuin University

Summary

This report is based on impressions from a field trip that we made to Japan during a week in the end of June and early July 2010. We meet a number of companies, the Ministry of Internal Affairs and Communication and an e-learning center. The main impression from our visit is, unsurprisingly, that Japan is a highly advanced society when it comes to communication solutions, like NFC for the transport sector and payment solutions. The deployment of fiber in the access network is primarily hanged on poles, which reduces capex considerable. Moreover, mobile operators have succeeded to establish value added services with a ubiquitous usage of mobile email. But in comparison to the Swedish mobile operators Japanese operators have limited access to spectrum, which is illustrated by the fact that DoCoMo aim to launch LTE with 5 MHz.

Although ICT is extensively present in the Japanese society the domestic industry has not succeeded to export its solutions on the international market. Consequently, the Japanese Communications Ministry and Industry has set out to take a leading role in the post-internet area by developing a New Generation Network, which is planned to replace the currently rolled out Next Generation Network. The aim with the New Generation Network is that should be capable to manage the massive broadband traffic that is expected to flow in the networks around the year 2020. To what extent Japan will succeed to capture a leading role on the international communications market is an open question. But there is no question that Japan is regarding this issue as vital for its long term competitiveness. The relevant stakeholders in Japan have addressed the issue of country's inability to export its solutions to the world. This lack of success on the world market in is frased as the Galapagos effect in Japan. It could be described as the tendency to be a world leader in Japan, but unable to export its key solutions on the international market.

This report has no ambition to cover all aspects of our field trip, but rather be a documentation with high lights from a number of interesting meetings and formulate key issues that is of interest to follow up and discuss with a wider group of stakeholders.

Picture

Key issues

Communications strategy and the role of the Ministry and Regulation authorities

- Given that Japan has a long tradition with elaborated visions and scenarios for the development it was inspiring to see the vision of the Japanese communications market that MIC presented. However, there are reasons to be cautious on what impact these grand visions have on industry, market and society in the long run. A researcher like Martin Fransmann, has underscored that MITI, which laid out grand plans for the future during the 1980's, did not get much right in their choice of technology that was supposed to make Japan to world leader in the communication industry. This underscores how difficult it is to foresee which technology that will emerge.
- However, the Japanese operators have played a significant role in promoting the Japanese telecom industry by ordering equipment. This resembles the factor that played a significant role for the emerging of the Swedish telecom industry with a close collaboration between the Swedish state, Ericsson and Telia in Sweden, driven by the interplay of a demanding customer that motivates equipment manufacture to develop product and solutions.
- Given that Sweden is an advanced communications market there are reasons to explore the interest for working out a longer term vision for the Swedish communications market and highlighting factors that are vital for stimulating this development.

Near Field Communication (NFC)

- Japan has succeeded to implement Near Field Communication (NFC) in a number of applications, such as deploying RFID solutions for payment and automatic ticket solutions
- A decisive factor behind the success for NFC in Japan is that a number of large Japanese companies have been committed to implement payment mechanism with electronic solutions. Sony Felica, which was founded by Sony, NTT DoCoMo and JR (Japan Railway), has taken a leading role in this development.
- There are various payment cards for the transport sector, but they have reached agreements in Tokyo, enabling customer to load cards with money in the different machines. The payment card Suica could for example be used for other payment mechanism.
- Success or not for Sony Felica NFC solutions? A vast number of NFC chips used both for "cards" and for "Phones" have been shipped during the last decade, and a large number of NFC phones are sold annually. NTT DoCoMo has NFC in all their phones, however, not all customers use NFC in their handset despite that the NFC technology is used on a daily basis.
- The success factors for NFC in Japan are believed to be the following:
    - There were three committed partners that agreed to launch services. In addition to Sony, it was the train operator JR East and the mobile operator NTT DoCoMo, JR East had strong incentives due to problems and high costs for paper ticket machines and gates.

- A whole eco-system was formed with a "NFC value chain" including complete solutions with chipsets, equipment, software etc. FeliCa Networks manufactures chipsets and also acts as a trusted 3rd party for the NFC system.
- NTT DoCoMo does not charge end-users for the service, it is seen as added value to the customers that would increase customer loyalty and decrease churn. At the same time this is a problem as it does not give any incentive to operators.
- NTT DoCoMo entered the financial systems, first formed partnerships and then marketed it is own credit card brand. Hence, general payments are done using the traditional financial system and not through the phone bill.

- Operator way forward for NFC services?
  - In addition to NTT DoCoMo, the operator KDDI also look into NFC services and make a number of trails and tests with different types of services together with different partners.
  - KDDI said that "there is no business model" for the current NFC services since operators do not make any money. Activities are ongoing to find services that can generate revenues.
  - It is agreed that the third party role as Trusted Service manager (TSM) is difficult to define and implement in real business with an "open" architecture, like proposed in Europe.
- Electronic industry way forward for NFC services
  - NFC forum is looking into a number of non-telecom or non-operator services and solutions.
  - In the area of home electronics NFC can be used to initiate communication between devices, like phones, laptops, cameras, TV-sets. This so called pairing is based on NFC for triggering of the short distance communication but use of Bluetooth or WLAN for the actual data transfer
- The Japanese way in Sweden?
- As mentioned above reasons for the success of Sony Felica included the commitment of major actors and that there is no service fee added by the operator. This is in contrast to the situation in Sweden: i) where actors do not form alliances of committed partners and ii) operators consider fees for NFC and today use very high fees for similar services (SMS payments).
- Can the same strategy with committed partners be used in Sweden? That means that some partner(s) invest and make a business out of it? These questions have been discussed with major Swedish public transportation companies. Since they are "public companies" they are not "allowed" to extend their business due to: public funding is not intended to produce revenues and "dividend" to share holders should focus on transportation only (even if the transportation business itself would benefit form initiative similar to those in Japan). The question is therefore if there are any possibilities for new ways of thinking within this area?

The role of the Japanese communications industry

- It is striking that the large Japanese conglomerates has difficulties to adjust to new market realties. This has, during the last year, been the focus for the analysis group addressing what is called the Galapagos effect[1]. Japan has unquestionable lost competitiveness as inventions such as i-Mode, electronic money and Shinkansen remain largely confined to Japan without succeeding to make an impact on the international market.
- The different size of the Swedish and Japanese market makes it impossible for the large Swedish companies to relay on the domestic market. Japan is an important market for Ericsson as it is a key supplier to all of the three mobile operators: DoCoMo, KDDI and Softbank. Japan made up 4% of Ericsson's revenues during H1 2010.

On Mobile Broadband in Japan

- **Demand**: It seems like the usage volumes of Mobile Broadband is considerable lower in Japan compared to Europe, and Sweden in particular. For example some KDDI subscriptions are limited to 0.5 GB per month. The share of laptop users seems to be limited

- **Spectrum**: The provisioning of 3G services using an allocation of bands with 10 MHz seems very challenging compared to Europe and the Nordic Countries. Japan has large areas with very high user densities combined with limited amount of spectrum. This picture is underscored when we heard plans from operators to use part of the 3G bands (5 out of 10 MHz?) to deploy "4G", i.e. LTE. The benefits of LTE would be marginal, requires new radio equipment and terminals and leads to a fragmented situation of access technologies.

- **Femtocells**: Femtocells are of interest for the Japanese operators. The plan is to use the same bands as the macro layer. There is awareness about the existence of co-channel interference, and they have appreciated the KTH papers, which analyze this problem, which we have submitted to them.

The field trip has paved the way for new contacts:

- After the field trip contacts have been established and discussion is ongoing.

- Operators ask for information about the Swedish market; e.g. MBB pricing and spectrum

- Operators ask for research results e.g. femtocell interference, cognitive radio. We have sent KTH papers that analyze the problem of interference with Femtocell to KDDI, which have been appreciated

- NFCForum has asked a for partner that can host a NFCForum meeting during 2011

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1 Dr. Gerhard Fasol participated in the project as only non-Japanese. Fasol runs a consultancy in Japan, see http://www.eurotechnology.com/industries/telecoms.shtml

Mobile communications in Japan[2]

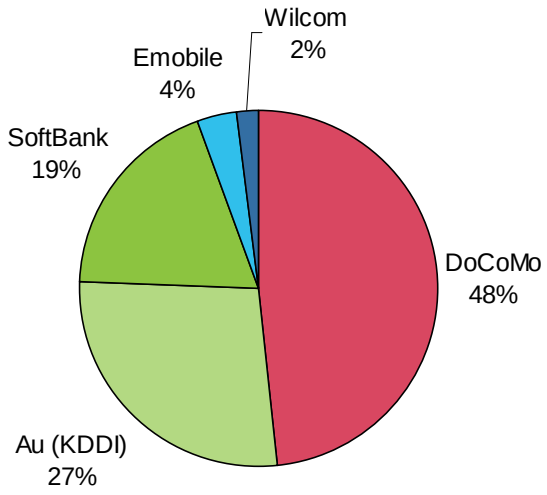
Japan launched its own 2G standard during the early 1990s, called PDC. The Japanese standard, which was developed in parallel to the GSM standard, had similarities to the US standard Digital AMPS. Although Japan had international ambitions with PDC it was never introduced outside the country. Consequently, the Japanese Ministry for Internal Affairs and Communication set out to take global leadership in the development of 3G. The Japanese view in the mid-1990s was that the new 3G standard not should be based on proprietary Qualcomm solutions. This implied that the 3G standard had to deviate from the narrow band CDMA, and paved the way for a wide band CDMA solution as both Ericsson and Nokia regarded it as an advantage to join forces with Japan. This would create an attractive business opportunity for the Nordic equipment manufactures on the Japanese market.

Japan had the ambition to launch 3G ahead of the 2002 Olympics in Sapporo. It was achieved by DoCoMo, which launched 3G services in 2001, one year ahead of Europe. But given that the 3GPP standard, Release 99, was not yet finalized it had to be completed with specific Japanese solutions. Although Japan had the ambition to take global leadership in the 3G development, which partly was materialized during a short time through the success of i-mode, DoCoMo has not succeed to become a world player. Neither have Japanese equipment manufactures, like NEC and Mitsubishi, captured any material market shares outside Japan. Moreover, the Japanese handset manufactures (besides SonyEricsson) have not succeed outside Japan, primarily explained by a lack of distribution power.

The were 115m mobile subscribers in Japan by the end of 2009. The total number of mobile handsets that was sold in Japan during 2009 was 31m compared to 36m in 2008, representing 3-4% of the total world market.[3]

DoCoMo dominates the Japanese mobile market with almost half of the customers.

Graph 1: Mobile operator used for the device used most frequently



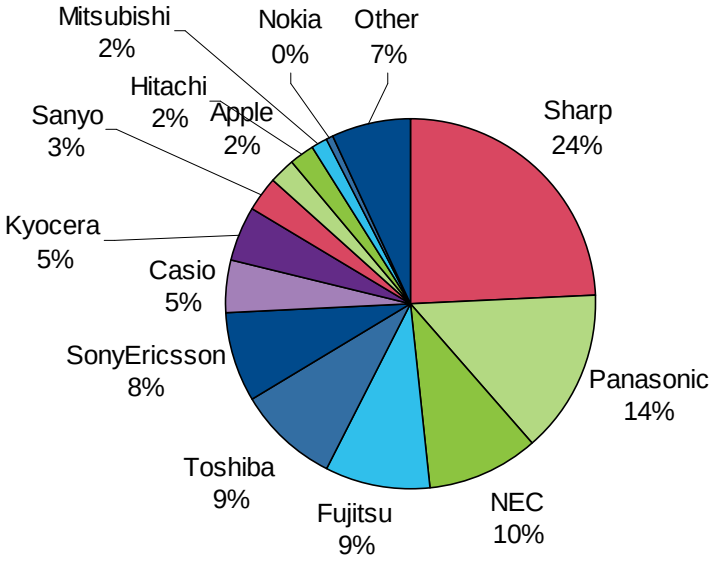
Source: White paper on Keitai-Communication 2010-2011, planned and edited by Mobile Society Research Inst, NTT DoCoMo

2 Source: Interview with Östen Mäkitalo July 8, 2010

3 Source: Credit Suisse, Japan Electronics and Information Technology Industries Association

The mobile handset market in Japan is dominated by the domestic manufactures, as the following graph illustrates.

Graph 2: Manufacture of the most used first device in Japan (web survey)



Source: White paper on Keitai-Communication 2010-2011, planned and edited by Mobile Society Research Inst, NTT DoCoMo

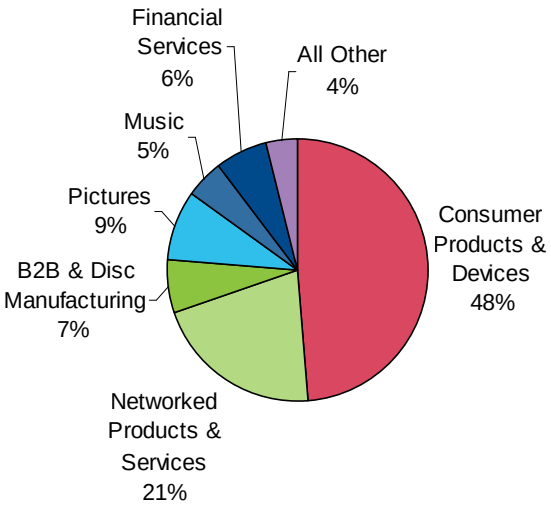
SonyFelica, Sony Corp Osaki East Technology Center

Koichi Tagawa	General Manager, Global Standards and Industry Relations Dept. FeliCa Business Development Division, B2B Solutions Business Group, Chairman NFC Forum
Yo Tabayashi	Technology Industry Relation Sect. Global Standards and Industry Relations Dept. FeliCa Business Development Division, B2B Solutions Business Group

About Sony[4]

Sony generated Yen 7214bn (EUR 67bn) in revenues and made an operating profit of Yen 32bn (EUR 300m) during FY 2009. It had 167900 employees by March 31, 2010. The largest part of Sony is consumer products and devices followed by networked products and services, see graph 3.

Graph 3: Revenue split Sony Corp FY 2009



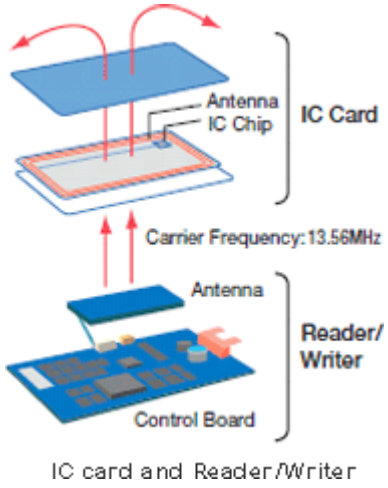
Source: Sony Corp Annual Report 2009

4 http://www.sony.net/SonyInfo/IR/library/8ido18000003fob8-att/FY09_20F_PDF.pdf

About SonyFelica[5]

FeliCa is part of the division Networked Products & Services and is a contactless IC card technology developed by Sony. The aim with the system is to make daily living easier and more convenient. The contactless communication between the reader/writer and the card is activated by electromagnetic waves radiated from the reader/writer. It communicates on a frequency of 13.56 MHz with the speed of 212 kbps. Mobile FeliCa is a modification of FeliCa for use in mobile phones.

Graph 4: The NFC card with reader



Source: NFC Forum

Key take aways from meeting NFC Forum, NFC and SonyFelica[6]

- NFC Forum was instigated by Nokia and Philips in November 2003, and Sony was subsequently invited to join. The aim with the Forum was to promote the entire NFC industry. Other members in NFC Forum are Visa, MasterCard, and Microsoft. Philips left the NFC Forum when the company divested their chip operation to NFX, now a member in the NFC Forum
- NFC Forum is an important vehicle for driving the development of NFC as it involves all key stakeholders and has a global scope. It comprises of 140 companies and involves 1700 people. Chipset manufactures are vital to the NFC development, as well as trusted 3rd party
- The NFC Forum is working with the standard and has published a large number of documents
- Although NFC is a promising business area it is a minor part of the overall Sony Group. Sony Felica provides the complete solution for NFC, and delivers the various subsystems, such as chipsets. The shipments have gradually increased from 81m in 2004 to 400 m in 2008

5 http://www.sony.net/Products/felica/, http://en.wikipedia.org/wiki/FeliCa

6 http://www.nfc-forum.org/home/, for more information see http://www.nfctimes.com/news

- Sony Felicia is a joint venture between Sony, JR East and DoCoMo, and its business revolves around all parts of the "NFC value chain", complete solutions with chipsets, equipment, manufacturing chipsets, developing software etc
- Koichi Tagawa (KT), currently chairman of the NFC Forum has been involved in this business for a number of years. Given that KT was on the board when the previous chairman, which was a manager at Philips, resigned KT was an evident candidate to be appointed chairman
- KT visited Sweden in mid June as the NFC Forum held its annual meeting in Karlshamn, Blekinge
- NFC consists of tags and is also labeled RFID; it is applicable to both consumer and industry applications.
- The WIMA event, which takes place in Monaco annually, is an important gathering of the players that have an interest in NFC
- There are a broad range of NFC project ongoing in Japan, and many are in commercial operation
- The business models for NFC have been established through trials and market introductions
- There is extensive collaboration between the NFC Forum, ETSI, Smart Card Alliance, EMCO, European payment council, GSM, and Mobey.
- The US is highly active within NFC, through various trials which involves companies such as AT&T, Rogers
- The plastic cards, through the Pasmo and Suica card, replaced tickets, and established a user pattern in Tokyo. The rationale for the NFC application was that the train company, JR East, had increasing operational expenditures to handle the cost of manual tickets and that the vending machines required extensive maintenance.
- The establishment of the Pasmo card has opened for wider applications, making it into a payment system. By the establishment of the plastic card, it is not a big step to include it in mobile terminals, making it into contact less application without any cash handling as the recharging of Pasmo card require

Mobile and NFC

- In order to provide mobile handsets with NFC capabilities it is necessary to insert a separate chipsets, which approximately cost USD 5 per piece. However, the NFC capability in chipset is likely to be integrated with WiFi and Bluetooth.
- Mobile users are reported to be comfortable with NFC applications, and trust seems not to be an issue in Japan with, for example mobile wallet applications
- There are roughly 60-70m handsets with NFC capability in Japan, but the share that is used is approximately 15-20%
- Handsets equipped with NFCs are widely used in the transport sector
- Nokia has stated that the company is committed to NFC, and we should expect Nokia to include NFC capability in their new models from 2011
- SonyEricsson's Experia handset has been positively perceived by consumers, and could be provided with NFC capability
- DoCoMo spearheaded mobile payment applications in 2004, and other operators followed the following year. DoCoMo acquired credit company and become a financial player
- DoCoMo equip all their mobile handsets with NFC
- DoCoMo is actively promoting NFC applications, but it has not generated any revenues as it has not taken any share from the payment handling, for example train companies.

Rather it has regarded it as a way to reduce churn and improve customer loyalty, and making the mobile terminal to the ubiquitous payment device
- The strategy for Apple and iPhone regarding NFC is unclear, but it has recently acquired patents within the NFC area.

Wider applications
- NFC is far from only relevant for mobile communications as it could be used in a broad range of consumer electronics equipment, like for example tags for TV applications, keys in lock applications, commonly used by hotels, and PC:s are equipped with readers enabling various NFC applications
- Another interesting and very simple application for NFC is to pair equipment, like headset with terminals. The NFC application initiates the set up which makes it easy to initiate the usage. Likewise, it could be used for a quick and secure WLAN set up.
- The NFC applications that are used for the transport sector, like the JR Train in Tokyo, are regional system. Although it could have a wider, like national or international usage, it is dependent on various political issues
- McDonald has launched an application with NFC in Japan which has been very successful. First, consumers sign up on the web, and subsequently receive discount offers from McDonalds. If the consumer push yes it turns into an order enabling the consumer to receive the food and automatically handle the payment over NFC when they come up to the cashier
- Nanaco is a prepaid card register using NFC as a payment system sites
- System applications could vary between a number of different areas
- Key words for the NFC value chain is interoperability and simplicity

Comments
- The meeting was particularly rewarding for the SSE/KTH project as General Manager Koichi Tagawa is the present Chairman of NFC Forum, the Global organization formed to advancing the use and spread of NFC technology. The meeting provided contacts into this global forum.
- The meeting at SonyFelica confirmed that NFC is a promising area, and that the research that have been conducted in SSE and KTH are relevant as it address key issues for the NFC value chain
- The meeting also confirmed the fact that all regions in the world, including Japan, will develop different roads into the use, application and diffusion of NFC technology. The visit at Sony and the accounts of the long-term Japanese experiences in NFC confirmed the fact that the initial investments and business models are important for the continued diffusion of NFC.
- The meeting also confirmed the fact that NFC success is built on strategic investments in relationships and cooperation between many involved actors in value chains and constellations.
- Based on the visit to Sony including discussions on the Sony Felica system and the present work within the global NFC Forum, a number of issues and implications for Swedish stakeholders within the field can be anticipated, for example:
- NFC, like many other technologies, has been the victim of some degree of over-hyping, and in Japan it is now becoming increasingly clear that NFC seems to offer real commercial benefits for service providers, for device manufacturers and for other stakeholders. NFC does seem to make new revenue-generating interactive and content-rich services easier and more convenient to users in Japan. One learning lesson from Japan is that it takes time, but once accepted by users, NFC-enabled devices simplify the

process of becoming aware of, purchasing, storing, playing and sharing service content. Convenience is a strong differentiator, and consumers will tend to adopt the most convenient way to access and pay for services, e.g. like the success in Japan for ticketing. In areas such as ticketing particularly, NFC will help reduce the cost of issuing tickets and of maintaining the ticketing infrastructure – as has already been proved in mass transport and airline ticketing.

- Based on the Japanese experiences, payment and ticketing applications were one of the drivers for the creation of the new near filed communication standard. Driven mainly by the Japanese operators, NTT DoCoMo, mobile network operators have successively also mobilized the interest of e.g. banks in putting payment and ticketing applications on NFC-enabled mobile phones.
- The timing for joining the process to develop end implement NFC might is probably very important, and for Swedish stakeholders it is important to note that NFC Forum (according to its chairman Mr Tagawa at Sony) "are well into the journey" in 2010. Phase One (up to around 2009) was the step of defining and stabilizing the technology. The present stage, Phase Two, which takes place now in 2010, include processes of supporting interoperability, enhancing the technology, and supporting the build-up of NFC ecosystems. Next comes the phase of refining the technology, expanding the ecosystem, and promoting a widespread end user usage. In other words, NFC development and the work performed by organizations like the NFC Forum is in an interesting phase of its development and the timing to join ongoing activities in the field might be right.
- Mr Tagawa mentioned also that the NFC Forum's priority for 2010 is to introduce a Certification Program and mechanisms to establish product and service interoperability. If the process to establish compliance and interoperability with the NFC Forum's open standards becomes important drivers, it is probably important for Swedish stakeholders to be aware of and maybe become associated to these ongoing processes.

NTT Network Innovation Lab, Yokosuka

Atsushi Takahara	Vice president, Executive Manager, Media Innovation Laboratory, NTT Network Innovation Laboratories
Ryutaro Kawamura	Senior Manager, Future Networking Research Group, Media Innovation Laboratory, NTT Network Innovation Laboratories

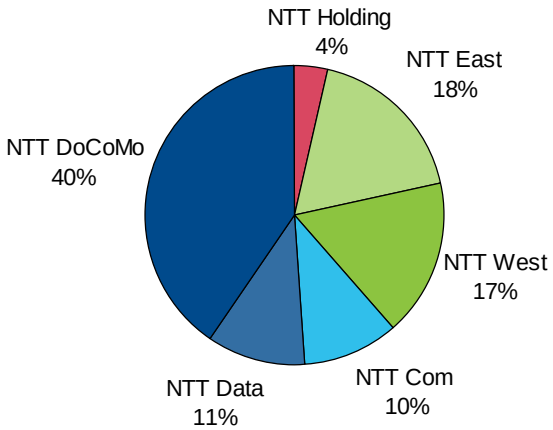
About NTT Group[7]

The main operation of the NTT Group is regional communications, long-distance, international communications, mobile and data communications. The NTT Group consists of 536 subsidiaries and 89 affiliated companies with the following main companies:

- NTT Holding Company
- NTT East
- NTT West
- NTT Com
- NTT Data and
- NTT DoCoMo

The Japanese state owns 34% of the NTT Group, while the remaining share is spread out among domestic and international investors. The NTT share is listed on the Tokyo Stock Exchange. The NTT Group generated Yen 10181bn (EUR 95bn) in revenues during FY 2009, making an operating profit margin of 11%. It has 190 000 employees

Graph 5: Revenue split NTT FY 2009



Source: http://www.ntt.co.jp/ir/library_e/presentation/2010/100514e.pdf

7 http://www.ntt.co.jp/index_e.html, http://www.ntt.co.jp/ir/library_e/

NTT's total expenditures on research and development during FY2009 were Yen 134 bn (EUR 1.3bn), representing 1% of total revenues. By March 2010, NTT had 38m fixed telephone subscribers and 16.6m fixed broadband subscribers of which 3.4m were connected by ADSL and 13.2m by fiber. This translates into a market share of 70% for fiber and 35% for ADSL. Interesting enough, fiber in the access networks, from splitters to the end customers are not connected by ducts but rather placed on poles with the fiber hanging in the air. This lowers the cost to connect end customers substantially.

Picture

The NTT Group has expanded the coverage of the Next Generation Network (NGN) providing commercial services with speeds up to 200 Mbps in Eastern Japan. In addition, NTT has worked extensively to improve customer services.

NTT is pursuing R&D for the technical advancement of IPTV, Digital Cinema, other video services, and cloud computing. Furthermore, NTT Group is engaged in R&D for commercialization of Home Information and Communication Technologies and has made efforts to develop technologies for mobile communication. It plans to launch LTE in December 2010. Moreover, NTT Group is also pursuing R&D on new encryption technologies, high-capacity optical transmission technologies, and quantum information processing.

In line with Japan's ambition to move ahead of the curve for Next Generation Networks MIC (Ministry of Internal Affairs and Communications) launched a plan in 2007 aiming to develop a New Generation Network that should replace the existing internet, and set the future standard. The ambition is to meet the user demand that has materialized by 2020, and make Japan to a leader in the post-internet technology. It is a broad project involving academia, industry, and government. NICT (National Institute of Information and Communications Technology) is coordinating the project. The New Generation Network set out to introduce post-IP protocol and apply "a clean slate network architecture".[8] The research revolves around the AKARI project. A vital part of the project is the green aspects, with the target to reduce energy consumption for broadband considerable.[9]

Key take aways from the meeting

- The NTT Network Innovation Laboratories is part of the Nippon Telegraph and Telephone Corporation. It has 12 R&D labs that cover a broad range, stretching from

8 Source: Sanchez-Loro, et al Future Information Networks 2009: A clean slate network architecture is designed to avoid hierarchical layering

9 Japan's New Generation Network – beyond next generation network, Anders Göthenberg, ITPS, link http://www.tillvaxtanalys.se/tua/export/sv/filer/publikationer-arkiv/itps/pm-serien/2009/japan-s-new-generation-network-beyond-next-generation-network-09.pdf

basic research to applications with, for example: Network innovation lab, Media innovation lab, Cyber communication lab, Access network service system lab, Wireless labs that work with mobile access, Near Field Communication and wide area communication

- The R&D labs, which employ around 3000 people, are located in different parts of Japan: Mitakka, Kyoto and Tokyo. The R&D work is partly financed by the state.
- The NTT Group is committed to R&D, however resources dedicated to R&D has recently declined somewhat, in line with the falling revenues for the Group.
- The R&D activities covers architecture design, terabit-LAN, network management for IP, Ethernet, NW, visual communication, applications. The research address multicore processing, physical limitations in optical layers, optical fiber, transmission power, limitation of data processing, power of a single chip, data processing
- A vital part of the research are the green aspects, like reduction of the energy consumption, and the carbon oxide footprint
- The Network Innovation Laboratory works with, for example, the New Generation Network, which is set to be the future carrier network.
- The aim with the R&D activities is that it should turn into commercial products and services. The aim is to work with solutions and network architecture that are capable to handle the future network traffic that will emerged around year 2020
- The Japanese equipment manufactures are very active in the project on New Generation Networks
- NTT is driving the development and has a very strong position within R&D. But collaboration is important. NICT analyze network requirements, www.nict.jp
- Other issues for research relates to system complexity, new kind of applications, application oriented network design
- Although it is a technical infrastructure the business aspects is highly relevant in order to establish user requirements
- NTT participates in various EU projects, and they underscore that collaboration is vital to the research process. NTT is very interested to develop the collaboration with EU projects
- The New Generation Network is a highly advanced network with a number of different layers, from physical layer to application layer, handling the tradeoff between security and open interfaces. The ultimately goal is that the network should be smart and that applications should be able to follow users' different needs, be simple to use, offer end-to end seamless connection, and handle vast complexity.
- NTT demonstrated one application with the New Generation Network, with a wide 3K x 4K cinema communicating with 800 Mbit, with a resolution of 4096x2160 pixels, roughly twice the resolution of digital high definition TV, creating a surreal TV image

Comments

- The meeting focused on the New Generation Network and the activities on the R&D lab. The projects are highly advanced, and the applications are very interesting. Given that there is collaboration with EU projects it could imply that there are opportunities for relevant researchers from Sweden to explore possibilities for collaboration with NTT.

NTT DoCoMo, Research Laboratories, Yokosuka

Yoshiaki Ofuji	Assistant Manager of Radio System Group, Radio Access Network Development Department
Hiroyuki Yamaguchi	Director of Information Related Planning R&D General Affairs Department
Tomoyuki Ohya	Executive Research Engineer, Research Strategy and Coordination Group, Research Laboratories
Shunji Miura	Senior Research Engineer, Research Strategy and Coordination Group, Research Laboratories
Hiroki Harada	Research Strategy and Coordination Group, Research Laboratories

About NTT DoCoMo[10]

DoCoMo has 56m mobile subscribers, constituting a 51% market share. The company reported Yen 4244bn (EUR 40bn) in revenues for FY 2009, a 4% decline compared to the previous year, generating an EBITDA margin of 37%. DoCoMo sold 18 m handsets during FY 2009, with an average selling price of Yen 28000 (EUR 262). NTT DoCoMo has 22600 employees.

The share of ARPU that is generated from data traffic increased from 42% to 46% during FY 2009, while voice ARPU declined. DoCoMo estimate that 20-30% of expected increase in data ARPU will come from smartphones. The traffic in the network nearly doubled compared to the previous year due increased usage of video and mobile data. DoCoMo plan to launch LTE in the end of 2010, and estimate to spend Yen 35bn (EUR 327m) in capex for the roll-out of LTE in FY2010. DoCoMo is planning to install around 1 000 LTE base stations to start services in high-demand areas, such as Tokyo, Nagoya and Osaka. The plan is to initially offer data rates up to 37.5Mbps as it can only use 5MHz, but it will, in some areas like railway stations in Tokyo and Haneda Airport, use 10MHz enabling it to market peak rates up to 75Mbps.

DoCoMo has spectrum in the following band

- 2 x 18 MHz in 800 MHz for 2G services
- 2 x 15 MHz in 1.7 GHz band
- 2 x 20 MHz in 2.0 GHz

DoCoMo plan to discontinue 2G services in 800 MHz by March 2012.

DoCoMo estimate that 3m smartphones will be sold in Japan during FY2010, of which DoCoMo aim to sell 1m. Market experts claim that IPhone has 70% of the smartphone market in Japan.

10 Source: http://www.nttdocomo.com/binary/press/FY2009_Earnings.pdf,
http://www.nttdocomo.co.jp/english/corporate/ir/binary/pdf/library/sec/20f_fy2009_e.pdf

During FY2009 DoCoMo gained 1.5m new subscribers, of which communication modules, such as PC data communications devices and digital photo frames, accounted for 30-40%. The aim is to increase this share up to 50% during this FY year.

DoCoMo plan to release some models of smartphones equipped with FeliCa capabilities during 2010. Given that Apple provides i-pads as a SIM lock-free device, DoCoMo intends to provide connections to those customers who wish to use our services.

Key take aways from the meeting
The meeting was held at DoCoMo's R&D center in the Yokosuka Research Park (YRP)[11] which was established in 1997. DoCoMo's facilities in YRP are located in four building and divided into development parts, device, terminal, and the radio part unit. The research park currently comprises 66 companies which altogether employ around 9500 people. Examples of companies in the research park are: Fujitsu, Hitachi, KDDI R&D Lab, Mitsubishi Electric Corp, NEC Corp, Nippon Ericsson, NTT, NTT DoCoMo, Communication, and Panasonic Mobile Communications.

- The company has laboratories in Germany, the US and China. The research center in Germany pursue radio related research
- DoCoMo demonstrated the basis for LTE and showed new services
- DoCoMo is pursuing research on cognitive radio, and is addressing the white space issue. It demonstrated some of this work during our visit
- The company is working with femtocell, and will test and potentially deploy femtocell in the 2 GHz band
- DoCoMo plan to launch LTE in the 2.0 GHz band, and allocate one carrier 5 MHz, and presumably also 10 MHz. It see the option for LTE in 800 MHz as well as 1.5 GHz
- LTE will initially be available on data cards. The roaming issue is unclear. DoCoMo has not yet finalized its plans for LTE services and what kind of bitrates it will launch. DoCoMo subscribe to the global LTE standard. DoCoMo did not give any indication when new handsets for LTE will be available.
- DoCoMo expect that the production cost will decrease with LTE as it is more efficient than WCDMA. It will expand the capability of 3G and smoothly evolve into 3.9G (LTE)
- It foresee a more flexible usage of spectrum with IMT-advance, and it is exploring the usage of spectrum over 3 GHz for IMT-Advanced
- DoCoMo's top management is dedicated to R&D, and the ratio of revenues in relation to the share of R&D is stable, but given that revenues are declining the R&D budget are shrinking in absolute terms

Comments
- The Japanese business for mobile communications has been controlled by operators as it has made specifications for handsets as well as infrastructure. This has forced handset suppliers to work intensively to comply with the standard specifications. This could be one factor explaining that it has locked up resources on the Japanese market leaving less resources and capacities to export.

[11] http://www.yrp.co.jp/en/

- The meeting focused on research on cognitive radio and white space which could be of interest for researcher at KTH.
- It is striking that the access to spectrum is limited and that a number of services are supposed to share a limited spectrum. Given that the company representatives did not work with the business aspects the meeting did not give any insight to the business strategy around LTE, and how it will be marketed.

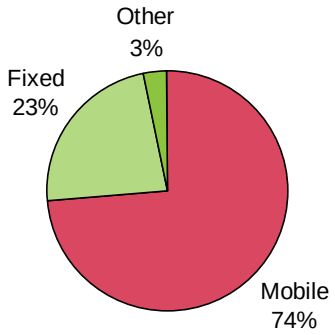
KDDI, Iidabashi, Tokyo

Kentaro Oki	Analyst, Foreign Market & Policy Group
Hiroshi Tanaka	General Manager, Industry Research and Standards Department, Emerging Technologies and Spectrum Division, Technology Sector
Yasushi Kawai	Manager, Regulatory Affairs Section, Government and Industrial Affairs Department, Corporate Communications Division
Haruo Takasaki	Cheif Analyst
Soichi Tsukui	Director, Research & Analysis Department

About KDDI[12]

KDDI, which has 17 000 employees, generated Yen 3 497bn (EUR 32bn) in revenues during FY 2009, with an operating income of Yen 443 bn (EUR 4.1bn). KDDI has 32m mobile subscribers translating into a 29% market share. It has 5.9m fixed line accesses of which 1.5m are connected by fiber and 1.0m by ADSL.

Graph 6: Revenue split KDDI FY 2009



Source: KDDI Annual Report FY 2009

Key take aways from the meeting

- The operating revenues declined by 2.5% during FY 2009
- KDDI sold 10.2m handsets during the year with an average selling price of Yen 36000 (EUR 336). The aim for the current year is to sell 10m handsets
- The company is reorganizing the usage of 800 MHz, requiring triband handsets which are expensive

[12] http://www.kddi.com/english/corporate/index.html

- KDDI is generating an ARPU of Yen 5000 (EUR 47). It is striving to increase the ARPU by pushing for Mobile broadband and increasing the share of smartphones among its customers, and go for new services
- Fixed broadband is a small part of the overall operation
- The company is looking for a emerging market expansion

KDDI are interested in the development in Sweden

- The company is continuously analyzing the development in foreign markets, and is curious about the functional separation, the development of copper wires, fiber deployment, the development of LTE and how new services are playing out in Sweden
- KDDI expressed interested to learn more about the factors that could explain Sweden's relative strength in the ICT area. This give us an opportunity to underscore the significance of advanced networks, high PC penetration and wide mobile usage
- The demand for broadband in Sweden was discussed, and we underscored the role of IT usage in public services, e-government, tax authorities, banking services, e-health services

About KDDI

- The mobil broadband traffic place spectrum in the center
- The usage of different spectrum for LTE could create a problem for global roaming
- The 800 MHz band is reorganized with 2012 as a final year for 2G as DoCoMo
- KDDI aim to spend Yen 80bn (EUR 747m) in capex this year
- The mobile data traffic is growing strongly. It is driven by YouTube and other web based application. KDDI estimate that traffic is increasing with 2-3x, and it is therefore taking measures to shape the traffic
- KDDI runs its network on CDMA and the EV-DO Rev A facilities 9.3 Mbps
- KDDI plan to launch LTE in 800 MHz and 1500 MHz by 2012, offering high capacity and high bit rate services, supported by Mimo.
- KDDI is examining to use femtocell, and the plan is to use the same carrier as the macro network. However, the opinion in the company varies and some of the managers regard WiFi as better than femtocell
- Access points has to be cheaper
- KDDI has launched WiMax through one of its subsidiaries
- KDDI is prioritizing environmental issues, with for example, solar panels in order to save energy. Of KDDIs power consumption 60% are derived from broadband site usage
- The company is planning to use SON, self-organizing networks

About NFC

- NFC is very interesting, and the estimate is that 410m Felicia chips have been shipped. Felica controls the entire value chain, and is a key player to facilitate the NFC development. Credit cards or Felica with mobile wallet, 120m shipment, duration 3 years mobile handsets, 40m handsets per year, 80m chips. Type A and B for NFC.
- Despite the interest for NFC the current business model for NFC does not give operators any incentive to support it, besides the usage of handset, as operators does not get any part of the revenuestream. It is therefore relevant to raise the question how the value should be divided.
- Trials are ongoing with NFC services with different applications, like ticketing, and payment

Comments

- KDDI is facing increased competition from Softbank, which is a clear challenger on the Japanese market. Softbank has had great success with iPhone which attracts the interest from the Japanese consumers. However, KDDI has a very strong position on the mobile market and is continuously monitoring the development on other markets, like Sweden, in order to benchmark and modify its strategy.
- The policy and R&D team, which works with regulatory issues and market analysis, are very interested in the development on the Swedish market and how Swedish operators are managing mobile broadband, and how it is prices and what kind of data volumes. We have a lot of communication with Kentaro Oki and Soichi Tsukui after our visit and establish a good relationship.

Ministry of Internal Affairs and Communication (MIC), Tokyo

Gaku Nakazato	Deputy Director, Land Mobile Communications Division, Radio Department, Telecommunications Bureau
Hiroyo Hiramatsu	Deputy Director, Radio Policy Division, Radio Department, Telecommunications Bureau
Shiraishi Masayoshi	Deputy-Director, Radio Policy Division, Radio Department, Telecommunications Bureau

About MIC[13]

The Ministry of Internal Affairs and Communications (MIC) has jurisdiction over various systems involved in the framework of the nation, including administrative organizations, the public service personnel system, local administration and finance, electoral systems, fire fighting and disaster prevention, information and communications, postal services, and other systems fundamental to the people's economic and social activities.

The MIC is striving to promote the reform of the socio-economic system and to build and install a new foundation for development. MIC is committed to promote administrative reforms, disclosing administrative information, advancing regional decentralization, ensuring stable sources of local tax, promoting municipal mergers, activating regional economies, securing people's safety, and building increasingly sophisticated systems for information and communications. MIC consists of the following departments:

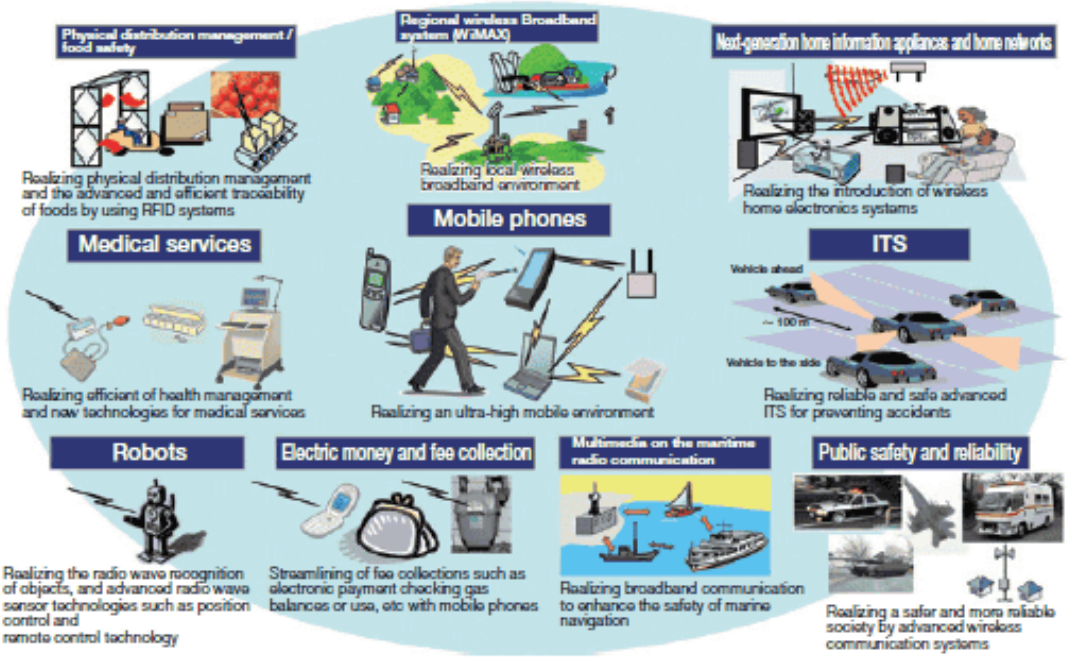
- Minister's Secretariat
- Personnel and Pension Bureau
- Administrative Management Bureau
- Administrative Evaluation Bureau
- Local Administration Bureau
- Local Public Finance Bureau
- Local Tax Bureau
- Global ICT Strategy Bureau
- Information and Communications Bureau
- Telecommunications Bureau
- Statistics Bureau

About the Telecommunications bureau

13 Link: http://www.soumu.go.jp/english/index.html, http://www.stat.go.jp/english/

The Telecommunications Bureau works to promote competition in the telecommunications business, the development of a secure and reliable environment for using information-communications infrastructure, efficient use of radio waves and establishment of a globally-advanced wireless broadband environment. According to the use of both broadband and mobile IP networks, rapid structural changes have been proceeding in the information communications field.

Fig. B: Using Radio Waves as Part of the Social Infrastructure in Various Fields



Source: http://www.soumu.go.jp/english/ib/index.html

Key take aways from the meeting

- The Ministry is actively working with planning of the mobile communications sector, how the future use of spectrum should develop. This work is linked to the overall strategies and visions for the Japanese society.
- The Telecommunications bureau bases its strategy work on scenarios. These scenarios have been carried out in a number of study groups which consists of representatives from the Ministry as well as external organizations, like industry and operators. The aim with the study groups are to set out a direction for how ICT can transform and develop the Japanese society as a whole and make a difference in various areas. The work involves exercises to extrapolates trends, incorporate expectations, in order to formulate how the future wireless system should look like
- Moreover, the study groups also estimates how the communications market is expected to grow, which segments that have the potential to grow and how it could impact the overall economy
- MIC is closely monitoring how the communications market is developing, what kind of services that are introduced and the requirement of additional radio spectrum
- Of specific interests are new services that are introduced by operators and content providers. MIC underscored that content providers and new mobile players are vital for the development of the Japanese market.

- MIC underscores that the private sector plays a vital role in this development and supports collaboration and communication between the different parties
- The long term view, capturing the development up to 2020, revolves around the idea of the ubiquitous Japan

About spectrum

- An important issue for MIC, which have been difficult, is the release of spectrum previously used for terrestrial TV which is facilitated by the digitalization of the terrestrial TV
- MIC has always allocated spectrum through administrative decisions and there has not yet been any spectrum auction in Japan. The MIC recognizes the merits with spectrum auction, but has not regarded it as the most appropriate measure to use. It has by no means discarded spectrum auctions as a principal allocation mechanism.
- The users of spectrum are paying a radio use fee
- MIC is in favor for global harmonizing of spectrum allocation for 900 MHz for UMTS, but has often chosen other spectrum
- DoCoMo is going for LTE in the 2.0 GHz-band initially allocating 5 MHz to this application in the 2.0 GHz band

Comments

- MIC's scenario work is impressive. Not only for its creativity but also as a method to show a possible direction for all actors involved in the telecom sector. Scenarios provide interesting projections which do not need to be true in themselves but certainly create discussions and set minds to work to find new products, services and business models. This method could be useful for Swedish companies which tend to solve issues closer in time and space.
- We followed up our meeting with a couple of questions to MIC, and there are good reasons to strive to establish an exchange of views on the market and capture a better understanding of how the Japanese regulator is working.

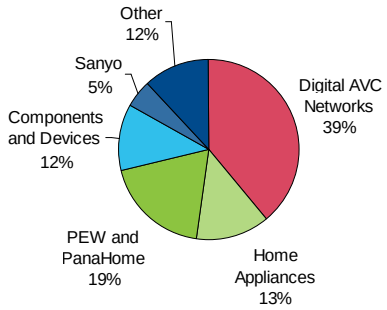
Panasonic Corporation, Tokyo R&D Center, Yokohama

Makoto (Max) Miwa	Senior Councilor, Director
Akira Ishikawa	Councilor
Katsuhiko Hiramatsu	Director
Thomas Micke	Managing Director (Panasonic R&D Center Germany)

About Panasonic[14]

Panasonic Corporation has annual sales of Yen 7418bn (EUR 69bn), an operating profit of Yen 190bn (EUR 1.8bn) and 384 586 employees. It is one of the largest electronic product manufacturers in the world, consisting of over 680 companies. It manufactures and markets a wide range of products under the Panasonic brand all around the globe. The revenue split show that consumer electronics dominates (39%), and components make up 12% of sales.

Graph 7: Panasonic revenues split in FY 2009



Source: Panasonic annual report FY 2009

Panasonic spends about 7% of revenues on R&D. The Company has launched initiatives to accelerate R&D in order to create common platforms for technologies relevant for different products and business segments, and to develop energy-saving and environmental technologies.

14 http://www.panasonic.net/ir/

Key take aways from the meeting:

- The group that we meet focus on R&D related to LTE. The issues of interest are for example Quality of service (QOS) and video applications. Their focus are in the time frame of 3-5 years with a global scope
- Professional users require high video quality which creates an opportunity for Panasonic
- The researchers are involved in different 3GPP projects related to their area of expertise, and the goal is to contribute to the standardization process
- Panasonic manufacture chipsets for handsets and the R&D activities are linked to the input specifications for chipset design and signaling
- Panasonic are working with different scenarios for the development in order to be able to respond to market opportunities that will emerge

About mobile

- DoCoMo strived to cut the mobile data traffic and introduced price caps
- WCDMA makes the transition towards LTE, partly using the same frequency band
- Applications and new services are playing a key role
- Operators are investing in pico cells
- LTE is on the agenda for all operators, and the range of solutions, services and terminals, are very broad
- LTE has a different radio management, and it will require chipset for different areas
- There is intense competition on spectrum and spectrum aggregation creates an opportunity, and will have an impact on services, and it is an issue for the development.
- The mobile ecosystem continues to develop, but the Japanese market has specific characteristics compared to other markets. I-mode was an operator controlled system that formed the market.
- Operators in Japan decide everything, and it has been a closed system. But it is changing and is gradually opening up
- NTT DoCoMo dictate the game, with billing in the center, and a fair interpretation is that it want to keep it as a closed system
- However, Softbank is making an impact in Japan, supported by the success of iPhone, which is contributing to a more open Japanese market
- NFC in Japan is introduced in for example supermarkets, and it is primarily driven by Japanese operators. Next step for NFC involves credit card companies, mobile operators, like DoCoMo

Comments

- Although Panasonic is one of the largest consumer electronics companies, which implies that LTE could be applicable to a very wide range of devices and equipment developed by the company, the meeting did not give any insights to what role the company will play in this development.

Aoyama Gakuin University, Research Centre for eLearning Professional Competency

Kinnya Tamaki	President, Research Center for e-learning, Professional Competency
Shoichi Naganuma	Research Center for e-learning Professional Competency (eLPCO)

About Aoyama
Aoyama Gakuin's history dates back to 1874 when missionaries from the American Methodist Episcopal Church established three schools which eventually became the present Aoyama Gakuin University. Aoyama Gakuin is this year celebrating its 135th anniversary

Key take aways from the meeting

- Aoyama has an e-learning program where it educates teachers that use e-learning in their work, providing key skill sets for conducting and managing e-learning courses. One cornerstone of their work is quality assurance as it is regarded as critical for the learning process.
- The eLPCO's e-learning program has a project team which covers four domains and has conducted courses since 2006. It offers 26 courses, and a total of 500 students have so far gone through the program
- The center has a structured process for design of courses and how to evaluate courses.
- Content specialists are active in the preparation of teaching material. The design is based on feedback, implementation is carefully monitored in order to meet quality requirements.
- The center has examined 37 students, which are teachers that have been granted certificate for providing e-learning courses in their work
- The software tools are carefully developed in order to meet high standards and to support the learning process
- The center has ambition to spread its program outside Japan and see a great potential in Asia

Comments

- This university effort is very ambitious. One key take away is that they believe that good e-learning courses require well trained e-learning teachers as well as organized processes for creating content. Their presentation concentrated mainly on these two topics while little was said about the actual e-learning experience of the teachers and the effects on cost, or implementation issues. SSE would be very interested to learn more from this since the school is starting to think of the next generation of education technologies.

Unfortunately their demo was not running which made it difficult to get a "feel and touch" of their training program.

- Asia is way ahead of Europe in using e-learning. Therefore it would be of great interest to see in practice the use of e-learning training for professionals at different corporations in Asia and in particular in Japan. For the next visit to Japan/Asia it would be fruitful to locate a number of corporate visits in order to learn more of how e-learning is implemented, evaluated and developed to keep corporations competitive.

ITS conference Tokyo June 27-30, 2010, hosted by Waseda University.

About the conference: The conference had about 350 participants that presented around 150 papers in 35 sessions covering a broad range of papers with relevance for the ICT sector.

http://www.its2010tokyo.com/