East Asian supply chains: designer mobile phones

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Abstract: This paper explores the unique events surrounding the launch in 2007 by KDDI, Japan's number two mobile telecommunications firm, of mobile phones that are fashion accessories. Reasons for their popularity are described, and with it the concurrent development of a unique global production and supply chain system. The contribution to the literature is the extension of existing theories on completion and value creation.

Keywords: Japan; mobile phones; mobile commerce; supply chains; KDDI; NTT DoCoMo.

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1   Japan's mobile phone market

With a population of 120 million in 2007, Japan had over 94 million mobile phone subscribers, making it the world's highest market penetration (Steinbock, 2003). With this high degree of market saturation, and with arguably the world's most sophisticated technological features available (followed closely by South Korea and Hong Kong), Japan's top mobile carriers – NTT DoCoMo, KDDI, and to a lesser extent Softbank (previously known as Vodafone-Japan) – faced continual challenges of product design and managing inbound logistics and outbound distributions of new phone models.

Even with the continued technological advancements of longer battery life, smaller size, and the potential for new mobile services with the implementation of the 3rd generation (3G) digital phone networks, these companies faced the challenge of successfully competing and growing revenues in a market like Japan. Given the already widespread adoption of mobile phones, how could these firms gain new market share, as they would be forced to try to woo existing mobile phone users away from their competitors? KDDI's approach to these issues was to turn the mobile communication

device into a 'fashion phone', in effect a fashion accessory that needs to be changed and updated like other accessories.

Ironically, atypical to the Japanese consumer electronic manufacturers' traditional emphases on designing for the consumer, early mobile phones were designed for the carriers. Models offered in the late 1990s by market leader NTT DoCoMo were designed internally, with the specifications then dictated to the manufacturer, NEC (Anwar, 2002; Kodama, 2003; Steinbock, 2003). Because engineers dominated NTT DoCoMo's corporate culture, their designs tended to depend upon engineering functionality, with little thought to the consumer's preferences, let alone fashion or style.

In early 2001, KDDI – Japan's second-ranked mobile service firm – realised it had to take action to compete effectively with its larger rival NTT DoCoMo. Creating new technologies and features alone would not be enough to draw in new customers. To meet the challenge, KDDI sought to emulate the classical dictum of 'form follows function' (from the famed Chicago School of the USA architects, best exemplified by Louis Sullivan and Frank Lloyd Wright) and design and develop cutting edge 'fashion phones'. KDDI wanted mobile phones that would appeal to the Japanese aesthetic sensibilities, as well as be easy enough to use so that customers would be encouraged to try the new technologically advanced (and revenue generating) services and novel features.

Figure 1 KDDI's debut fashion phone – the 'Infobar' (see online version for colours)

Source: Designed by Fukusawa Naoto in 2001, and manufactured by Sanyo, http://www.kddi.com/corporate/news_release/2003/1006a/sankou.html

Under the maverick leadership of President Tadashi Onodera, in 2001 KDDI took the then-considered revolutionary step of launching the 'AU design project'. Headquartered in the fashionable Harajuku district of Tokyo, through a series of strategic alliances, KDDI paired up top fashion designers with handset manufacturers. In 2001, KDDI

debuted its first offering, the wildly popular 'Infobar' (see Figure 1). This first fashion phone successfully met the challenge of an exciting design combined with advanced technological wizardry, which encouraged the use of the sophisticated (and profitable) technological features offered by KDDI's 3G AU service.

2   KDDI AU and the Japanese mobile sector

In terms of general mobile telephone service subscribers, KDDI was smaller than its giant rival NTT DoCoMo. In the advanced 3G mobile telecom services, however, KDDI had nearly closed the gap with NTT DoCoMo and was within striking distance of the market leader (see Table 1).

Table 1   Relative market positions of Japan's mobile telecom companies

Mobile company	Market sizes					
	Overall mobile		*3G services*		*Mobile data*	
	Subscribers (millions)	*Share (%)*	*Subscribers (millions)*	*Share (%)*	*Subscribers (millions)*	*Share (%)*
NTT DoCoMo	52.2		33		(i-mode) 47.2	
KDDI/AU	27.4		25.5		(EZ web) 22.7	
Softbank	15.6		6.6		(Yahoo!) 13	
Total	*94.2*	*100*	*65.2*	*100*	*82.9*	*100*

Source: Estimates as of January 31st, 2007 from Wireless Watch Japan, available at http://www.wirelesswatch.jp/

KDDI achieved this through an aggressive strategy of deploying 3G technology throughout their network. From 2003, they proceeded to convert all existing 2G customers to 3G, with over 95% of them upgraded by close of 2005. All new KDDI subscribers are automatically on the 3G network. The 'AU' service's faster data transfer speeds-up to 2.4 Mbps – enabled the development of cutting edge applications.

In order to compete with its chief rival NTT DoCoMo, KDDI adopted a strategy of differentiation. By utilising the 3G's wider bandwidth and faster download speeds, KDDI's internet service 'EZ web' offered a robust multimedia experience. Accessed via a graphically rich interface, KDDI was first to market a number of services such as online auctions, books and video, which were unavailable from its competitors. New, exciting services such as the wildly popular music download system *Chaku-uta* seduced consumers to sign up for AU service.

To take advantage of these offerings, however, users had to have new mobile phones with enhanced technical capabilities such as GPS and JAVA.

3   KDDI'S winning competitive model

Before exploring in detail the supporting supply chain management systems for the fashion phones, it is instructive to review briefly how these phones fit into the overall

KDDI AU successful business model. Since the KDDI AU 3G services were in fierce competition with market leader NTT DoCoMo, a mix of creative strategies had to be developed and implemented to enable KDDI to grow its 3G market despite NTT DoCoMo's dominance in 2G and 2.5G.[1]

3.1 Turning technology into a strategic advantage

The Japanese are some of the most technically savvy and sophisticated consumer electronic purchasers in the world, who demand state-of-the-art innovation. Since the 1960s, Japanese electronic manufacturers have been at the forefront of either the invention of new, core consumer technology or the adaptation and commercialisation of existing technologies. From the early pocket-size transistor radios to the Sony Walkman, and more recently handheld digital cameras, Japanese manufacturers have been pioneers. Prior to export, the Japanese domestic consumer market is typically the 'testing ground' for new products, and thus many Japanese consumers constitute the 'early adopter' vanguard segment of new electronic gadgetry (Abernathy and Utterback, 1975).

While not the original inventors of mobile telephone wireless communication technology, Japanese firms had been able to successfully improve and then deploy to their advantage the world communication standards of group special mobile (GSM) developed by the Europeans (Steinbock, 2003) and code duplex multiple access (CDMA) developed by US-based Qualcomm (Steinbock, 2003; Qualcomm, 2001).

Following the historic practice of Kaizen, or continuous improvement (Nonaka, 1988), Japanese firms have been able to augment and then improve on these technologies, eventually becoming pioneers – often the first to market cutting edge mobile telephone applications. As early as 1999, KDDI's main competitor NTT DoCoMo – through an ingenious use of an existing technology infrastructure – was able to debut the world's first mobile internet service and succeed beyond most expectations, well ahead of its US, Asian, and European competitors (Ratliff, 2002; Lindmark et al., 2004).

Using a unique business model, and deploying an existing 2G mobile standard wideband CDMA (W-CDMA – a localised variant of the Qualcomm technology), NTT DoCoMo was able to enjoy first-to-market advantages (Schumpeter, 1950) and could capture over 47.2 million customers (http://www.wirelesswatch.jp/) with their 2.5G 'i-mode' mobile internet service.

This early success, however, came at the price of being locked into legacy systems, and this hindered the advancement of NTT DoCoMo's 3G and 4G product development. Because its network relied so heavily on the older 2G/2.5G W-CDMA technology, to remain competitive and offer more elaborate mobile applications, NTT DoCoMo was forced to go through the expensive and laborious process of converting its network to the newer 3G technology (NTT DoCoMo, 2004). Meanwhile, NTT DoCoMo became a victim of its own 2G/2.5G success – for to compete with the rise of the 3G KDDI AU services, NTT DoCoMo was forced to 'cannibalise' (Nault and Mark, 1996) its profitable 2G/2.5G customer base and induce them to adopt the newer 3G service.

In contrast, through a '2nd mover advantage' KDDI embraced the newer 3G technology from its inception and therefore avoided the problems that NTT DoCoMo

faced. Unusual for a Japanese company and contrary to the historically xenophobic Japanese business practices (Reischauer, 1988), KDDI saw the advantages to license foreign made technology (Teece, 1987; Hill, 1992). For its AU service, KDDI chose the more robust US-based Qualcomm's 3G CDMA-2000 standard. This enabled KDDI to seamlessly update its entire network to 3G, and then even migrate to 3.5G. This allowed KDDI to offer a wide range of cutting edge mobile phone features and products, such as state-of-the-art GPS, a satellite global positioning system, considerably ahead of US providers.

3.2   New technology equals new revenue streams: location-based services

With this built-in GPS technology, by being able to pinpoint the mobile user's exact location, the KDDI AU 'EZ-Naviwalk' service gained widespread popularity with the Japanese denizens of the oft-confusing urban sprawl of mega-metropolises like Tokyo and Osaka. Through the use of location-based services (LBS), a plethora of ancillary, tangible, consumer goods and services – ranging from restaurants to bookstores – could be targeted to the mobile consumer. This provided convenience to the users and additional revenue streams for KDDI (Lennon, 2006).

3.3   Mobile music

Unlike the automobile-based culture of the USA, the far more congested Japan has a state-of-the-art, well integrated, and extraordinarily punctual public transportation system.[2] The typical Japanese urbanite spends two to three hours daily as a commuter riding in trains. In line with the traditional Japanese virtue of *Wa* – group harmony (Reischauer, 1988) – excessive talking (particularly on mobile phones) is forbidden (and frowned upon) on the subways and trains. Instead, Japanese commuters have long passed the time by listening to music on walkman or other personal electronic devices. Recognising this opportunity, KDDI took the 'innovator's attacker advantage' (Foster, 1986) and successfully offered music as a feature on its mobile phones.

As part of the build-out of its 3G antennas to support its communication and GPS network, KDDI shrewdly chose to also place FM radio receivable antennae underground in the major public commuter train systems. By building in an FM receiver into its fashion phones, KDDI AU customers could listen to free FM radio during their long commutes (KDDI Factbook, 2004).

Building upon this success and with the advancement in memory capacity for mobile phones, beginning in 2004, KDDI AU launched a downloadable music service similar in practice and billing structure to Apple's popular i-Tunes service. Starting with initial widespread acceptance of *Chaku-uta* (or ring tones), KDDI AU expanded the service to music clips and songs. Dubbed *Chaku-uta full*, the KDDI AU customers could download full versions of two to three minutes songs, by using the 'EZ channel' internet browser and navigating to dozens of music websites. The costs of the MP3 files were charged to their monthly phone bills. In an even further ingenious move, KDDI teamed up with popular Japanese radio stations. This allowed the Japanese commuters to listen to a song on the radio for free, then with the push of one button purchase and download the MP3 file to their handsets. Figure 2 shows a screen shot of how a *Chaku-uta full* website appears on a KDDI fashion phone.

Figure 2 Screen shot of *Chaku-uta full* (mobile music) (see online version for colours)

Source: Website as it appears on KDDI AU fashion phones,
http://smooth.blogs.com/photos/uncategorized/musicjp.jpg

3.4   Competitive pricing: flat fees and Gaku Wari

Realising that these various graphically rich 3G services were data download intensive, KDDI saw a flaw in their initial revenue model, which had been modelled on NTT DoCoMo's 'pay-for-play' (Lennon and Dholakia, 2006) system developed in 1999. In the early NTT DoCoMo system, consumers were charged not by the minute of talk or the internet access time (as is most common in the USA), but rather by the number of data packets downloaded to the handset.

KDDI feared (and rightly so) that if consumers were unable to 'guesstimate' the amount of data packets to be downloaded, they would be unwilling to face the risk of being charged exorbitant fees, and therefore avoid trying new services, such as the graphics rich 'EZ-Naviwalk' with its LBS features. Therefore, in 2002 they introduced a hybrid system of all-you-can-use flat monthly fee for downloading images and data (KDDI, 2003)[3], while charging separate fees for the downloaded mobile music.

Figure 3   'Gaku Wari' (student discount) advertisement (see online version for colours)

Note: Targeted to junior high school students

Source: http://www.kddi.com/corporate/news_release/2003/1006a/
sankou.html

To further encourage new users, KDDI also targeted a younger market segment. By being the first to offer *Gaku Wari* (literally 'school discount'), students could get their own mobile phones at extremely discounted rates. Figure 3 is an illustration of an advertisement aimed at incoming Junior High School students.

4   Arrival of fashionable phones

All of these various business strategies had to be facilitated by a product that would appeal to the consumers and encourage them to try the new features. This was the impetus for the establishment of the 'AU design project' in 2001, which first launched the stylish Infobar phone, designed by Fukasawa Naoto and manufactured by Sanyo (see Figure 1):

> "KDDI Corp. kicked off the Japanese competition (for fashionable phones) in October 2001 with Infobar, a phone shaped like a candy bar. Compared with other phones around at the time, the Infobar was low-tech and had just a small screen and simple camera. But it grabbed the attention of fashion-conscious Japanese with its glossy red, white and black exterior and keypads like shiny tiles." (Kane and Yuan, 2006)

In designing the prototype Infobar phone, veteran designer Fusakawa Naoto wanted to achieve a fusion of person and product in a handheld device. According to his design concept notes for Infobar:

> "Large square keys are user-friendly and easy to press with a thumb. The thin chocolate bar-like (mobile device) fits in your palm. This is a new information device that respects the individual." (http://www.au.kddi.com)

After 2003, the race for phones designed by top designers became intense. KDDI and rival NTT DoCoMo scouted for the best design talent to come up with new phone concepts. In neighbouring South Korea, even the consumers were pulled into the act, with a design competition by KTF inviting consumers to come up with their own innovative phone designs.

5   KDDI fashion phone supply chain

5.1   Mobile phone manufacturing facilities

According to Mr. Daisuke Mitani, KDDI's executive in charge of AU global planning, most of the handsets offered by KDDI were designed in conjunction with manufacturers such as Sanyo, Sony-Ericsson, Casio and others; and the actual manufacturing occurred in their facilities scattered throughout Asia.

While most of the initial design work is still done in the original Harajuku-based 'AU project design centre', additional KDDI facilities have been established in the greater Tokyo metropolitan area, with representatives from the manufacturing firms maintaining a presence in these facilities. These manufacturers decide independently the locations of final production of each of the individual phone models. KDDI manages the design process through the communication of its requirements in terms of specifications, features, and functions. In the case of the pioneering Infobar phone, KDDI collaborated

tightly with Sanyo, but KDDI itself did not handle the manufacturing of these phones. What KDDI required was a tightly-coupled Sanyo-to-KDDI supply chain that ensured the timely delivery of Infobar phones.

5.2   Distribution centres

After the handsets are manufactured by the various firms, these firms independently manage the logistics of how they are shipped to the KDDI distribution centres. KDDI operates four large distribution centres in four major cities, on three of the four major islands of Japan, from which it supplies inventory to its retailers. From this point however, KDDI fully controls the outbound supply chains.

In the Northernmost Island of Hokkaido, there is a centre in the prefectural capital (and most populous city) of Hokkaido. The main island of Honshu contains two centres. As the Island of Honshu is traditionally divided into two major regions (based on deep, historic and linguistic divisions – which are reflected in the locations of paths of the highway and train networks), KDDI maintains distribution centres in both 'Western Honshu' – the Kansai Region, in the largest industrial city Osaka, and in 'Eastern Honshu' – the Kanto Region, in Tokyo. Finally, there is a facility in the Southernmost Island of Kyushu's largest city, Fukuoka.

5.3   Inventory delivery systems

After the finished phones are delivered by the respective manufacturers to one of the four major centres, KDDI then distributes them as needed to their sales outlets. Due to the lack of storage space typical in most urban Japanese stores (see Figure 4), KDDI practices the well known Japanese delivery process of JIT or 'just in time' delivery, often times making several trips a day to the busier locations.

Figure 4   Display (and storage) area for KDDI mobile phones (see online version for colours)

> *Source:*   In a Yokohama electronics store,
> http://www.ishimaru.co.jp/images/store_images/
> 20050516-yokohama_0101.jpg

While exact figures about the numbers of mobile phones distributed from these four KDDI centres to the various retail outlets are not available, Table 2 provides calculations of market size and share by the authors based on e-mail and phone interviews with KDDI executives.

Table 2   KDDI's estimated handset sales volume and market share

KDDI's estimated volume and market share in sales of Japanese handsets for fiscal year 2006	
Total shipments for all Japanese carriers in fiscal year 2005 (April 2004 to March 2005)	46.92 million handsets
KDDI projected sales figures, fiscal year 2006 (April 2004 to March 2005)	14.92 million handsets
Calculated estimate for KDDI market share	Approximately 32%

Source: JEITA (2006)

6   Need for responsive, flexible supply chains

With the increasing trend toward fashion-oriented, designer-developed mobile handsets, KDDI had to move to inbound as well as outbound supply chains that were far more responsive to new designs and market reactions to these designs.

Logistics service providers to the mobile telecom industry had come to realise the dynamic, fashion-driven, and deal-driven nature of the mobile phone market the world over. To enable mobile operators to provide prompt service to the mobile phone customers, logistics providers had geared up their systems to be dynamic as well. For example, TNT logistics had achieved a prominent position in the inbound and outbound logistics of mobile phones. According to TNT logistics:

> "Today's mobile phone market is highly seasonal, product lifecycles are growing shorter, and fashionable models are often in short supply. On a daily basis, mobile network operators offer special promotions on combined products, to drive sales and create new subscriptions…Our solution for mobile network operators is aimed at absorbing peaks in demand by designing simple processes supported by state-of-the-art information technology facilitating effective use of temporary staff. When our customer needs special kitting, we supply it. When the market demands a sudden shift, we shift along with it." (Mr. Daisuke Mitani, KDDI)

For inbound logistics (wherein components arrive for assembly of mobile phones) as well as for outbound logistics (of assembled handsets), the generic supply chains for contemporary mobile devices require a few essential steps, shown in Figure 5.

This need for flexibility is also reflected in the seasonal nature of mobile phone sales in Japan. According to KDDI's Mr. Daisuke Mitani, there is some similarity to the seasonal sales cycles of the USA, with purchases made during the Christmas/Oshogatsu (January 1st, New Year's – Japan's major holiday) season. However, Mr. Mitani emphasised that the peak sales occur during the beginning of the Japanese fiscal (and academic) year:

> "Generally speaking, the demands for cellular phones increase during end of fiscal year, March. People start new life from April, preparing everything during March."

This emphasis on the start of the school year may account for previous described marketing phenomenon of *Gaku Wari* (student discount) as illustrated in Figure 3.

Figure 5 Generic supply chain for mobile device assembly and shipping (see online version for colours)
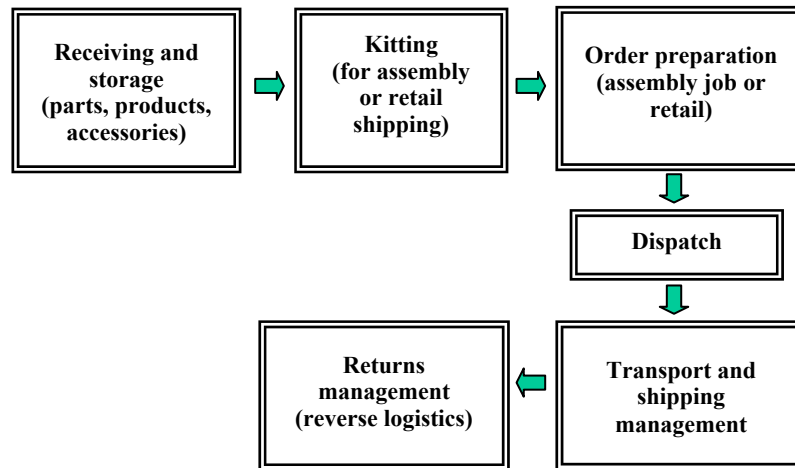
Source: Authors' research

7 Multiple suppliers, global production

Mobile phone makers the world over face the challenge of whether to keep the production operations under a unified corporate umbrella or to outsource all or some of production, inventory management, and order fulfilment activities.

Nokia, the world's largest mobile device maker, i.e., prefers to keep all of its production under its own corporate control. It does provide fast customisation of designs and features for the mobile operators it servers, but the process is controlled by Nokia at its ten global factories. Hardly anything is outsourced (Reinhardt, 2006).

With outsourced manufacturing, while costs savings are often achieved, there is a problem of 'poor visibility' into the upper reaches of the supply chain. In particular, when something that is outsourced is further outsourced to a second level supplier, the visibility of the production process and the logistics becomes problematic. Third-party logistics (3PL) providers try to mitigate such problems by means of information systems that can help to track, in near-real time basis, products and components moving along the supply chain.

8 Business model underlying fashion phones

8.1 Supply chains

Given the highly competitive nature of the mobile phone market in Japan, it is imperative that KDDI remain on the cutting edge of technological advancement. KDDI Corporation therefore spends generously for research and development. Through continuous

'morphing' of its technology, KDDI constantly develops new features (and potential revenue sources – such as the *Chaku-uta* music service) that can be added to their handsets. KDDI's recognition of the importance of fashion and design as competitive advantages enables its products to compete dynamically in terms of form as well as function (Rindova and Kotha, 2001). Figure 6 illustrates this business model.

Figure 6   Business model underlying fashion phones supply chains
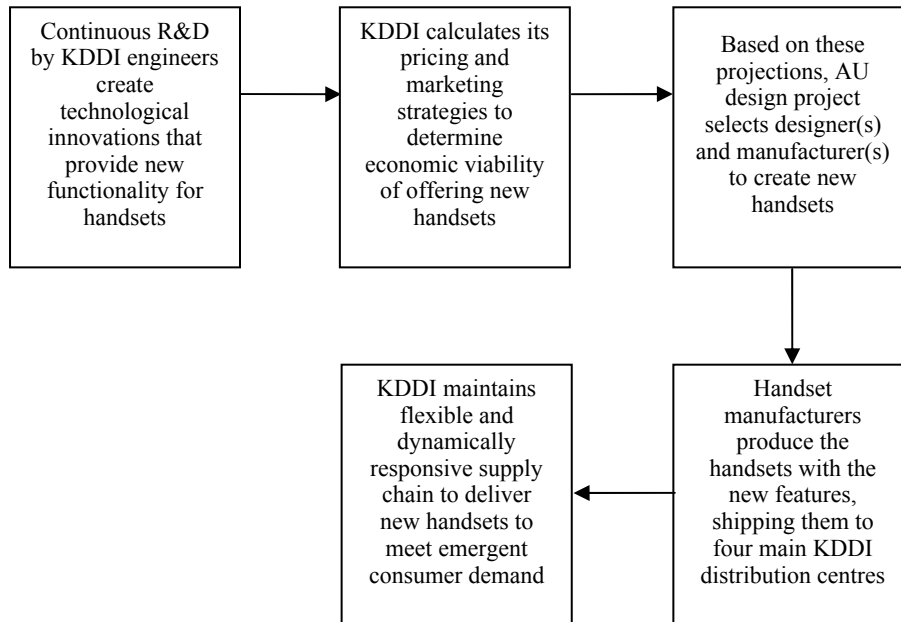
Source: Authors' research

While maintaining the standard 'technological platform' (Kim and Kogut, 1996) of the handset, KDDI continually diversifies the features available on this platform. KDDI has realised that through the offering of new features, increased market share can be gained, and with it profitability (Buzzell and Bradley, 1975). As in any business, before the development and release of a new product, a cost/benefit analysis must be done. Fashion for fashion's sake is not good business. A determination as to whether the capital investment for the design and production of a fashion phone will be profitable has to be made before proceeding further.

It is at this point in the cycle that KDDI's AU project truly shows its value. AU design project's innovative (and now proven) system of *coopetiton* (Brandenburger and Nalebuff, 1996) between the customer (KDDI) and the handset producers (the designers and manufacturers) has been honed into a new KDDI core competency (Prahalad, 1990). This has enabled KDDI to reduce its development and distribution costs, and bring its new offerings to market quite rapidly.

Such KDDI-designer-manufacturer strategic partnerships have helped to mitigate the inherent risks of new product development, with the inevitable paradox of a company having to balance its core capabilities with its core rigidities (Leonard-Barton, 1992). Because of the reduction in these rigidities, KDDI and its suppliers are thus empowered to complete the cycle, by maintaining flexible and dynamic supply chains to meet the

emergent consumer demands for the new fashion phones, and their profitable new features.

9 Looking ahead – fashions phones for 4G

The next major phase in mobile telephony technology is the so-called 4th generation (4G) technology, which would enable unparalleled speeds in data transmission, and a plethora of new products. These will of course require the design, production and distribution of 4G fashion phones that support these features. As a precursor to this, and following the business model described in Figure 6, in late 2006, KDDI and Okinawa Cellular did a 'technological leapfrog' (Schilling, 2003) over the main competitor NTT DoCoMo by introducing 'au my page', a full-fledged personal web portal service offering 100 MB of free data storage.

The fashion phones that support these features enable access to a web portal that can be customised in accordance with the usage patterns of individual users. The mobile portal allows users to retrieve information at no charge**,** enhancing accessibility to the world of EZ web (KDDI's mobile data service) and making it easier than ever to use an array of EZ web services and contents. By building up stores of personal items such as e-mails and photographs while they use their mobile phone, users have the possibility to enjoy creating their own personal history as well as customising their portal screens freely according to their usage patterns. Data or portal sites saved from a PC could also be stored at this mobile portal.

These technological capabilities to customise personal content are clearly illustrative of the value of KDDI AU's design project. For once again, KDDI's cutting edge fashion phones are able to merge 'form' and 'function' in order to deliver a superior product and experience to the Japanese mobile.

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Notes

1 Adapted from an industry white paper, 'KDDI's success story', ©2005 By Eurotechnology Japan K.K.

2 In Japanese subways, it is typical to have posted – and strictly adhered to – departure/arrival schedules with entries like 'Train departs 8:01 AM, 8:06 AM, 8:11 AM, etc.'

3 Interestingly, NTT DoCoMo followed suite a year later, with its all you can use 'Pake-Houdai' system.