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WIRELESS SHOPPING: Using DoCoMo's wallet phone, customers can ring up purchases with a wave of the hand at specially equipped kiosks. The wireless wallet depends on a chip supplied by Sony Corp.

Here Comes The Wallet Phone

Japan's DoCoMo gets ready to put your money where your mouth is

NTT DoCoMo, Japan's largest cellphone system operator, best known worldwide for pioneering the wireless Internet in 1999 with its hugely successful i-mode system, looks to have another big winner on its hands. Having recast the cellular handset as an electronic wallet—in effect a prepaid wireless cash card—it's getting ready to make it a full-fledged wireless credit card.

DoCoMo is working with major travel and banking organizations to extend the

reach of its e-wallet service. Meanwhile, its two main Japanese rivals, KDDI Corp. and Vodafone K.K., are introducing competing products. (All three companies are based in Tokyo.)

The critical element in DoCoMo's Osaifu-Keitai, or mobile wallet, is a wireless smart card chip, FeliCa (from the English word "felicity"), which was developed by Sony Corp. and Royal Philips Electronics for close proximity, low-data-rate transactions. The wallet phones

JUNKO KIMURA/GETTY IMAGES (2)

By March, DoCoMo expects to ship around **10 MILLION** wallet phones. And by the end of 2006, it projects a figure of 15 million

can be used to make electronic purchases at stores or vending machines equipped with FeliCa readers; can act as boarding passes on certain domestic air flights; and can authorize entry through corporate security doors—all with a wave of the handset [see photo, “Wireless Shopping”].

Already, a year after DoCoMo introduced its first e-wallet, the company has shipped some 6 million of the handsets. “By the end of March 2006 we forecast DoCoMo will have shipped around 10 million mobile wallets,” says Shohei Sakaguchi, executive director of DoCoMo’s multimedia service department. “And by the end of 2006 we believe the figure will reach 15 million.” In addition, he says, competing carriers could ship 5 million more handsets, for a total of some 20 million mobile wallets by the end of next year.

SONY’S FELICA CHIP originated as the active element in its contactless smart cards, introduced in 1995. They dominate the market for such devices in Japan and are widely used in Asia as commuter passes and for making e-purchases. As of June, Sony had distributed 82 million such chips, including 53 million in Japan, 16 million in Hong Kong, 10 million in Singapore, and 1.5 million in China.

In January 2004, Sony and DoCoMo formed a joint venture to adapt the chip for mobile phones. Besides supplying DoCoMo with the chip, the venture is also shipping mobile FeliCa integrated circuits to KDDI and Vodafone, which launched their own wallet phones in September and October, respectively.

Users with FeliCa phones who have registered for the e-wallet service can load money onto the phone’s chip in two ways. They can feed cash directly into special machines found in convenience stores and other locations, or they can do it by phone, keying in a personal identification number and transferring cash from a credit-card account.

From a technical point of view, the FeliCa chip is part of a transponder system: it receives its power from the waves

radiating from read/write devices it communicates with, so a battery is not required. The chip, based on radio-frequency identification (RFID) technology, operates at 13.56 megahertz over a distance of 10 centimeters, communicating at 212 kilobits per second. The communications protocol, called Near Field Communication, was devel-

and a reader/writer is based on a key encryption system made up of randomly generated numbers. Information such as transaction histories and account balances can be presented on the phone’s display. And should the phone be lost or stolen, a subscriber can block transactions by calling the handset with a preregistered number or calling customer support to have the phone



SHOWING OFF: DoCoMo’s “mobile wallet” is used as a fare card at East Japan Railway’s gates. In effect, the wallet phone functions as a wireless cash card.

oped by Sony and Philips and has been standardized under ISO/IEC procedures.

A pioneering user of FeliCa technology is East Japan Railway Co. (JR East), the country’s largest rail company. Its Suica smart card is used both for e-purchases and as a commuter pass. Users simply flash the card as they go through turnstiles, and instantly the reader displays the cost of the journey and the amount of e-cash remaining on the card. JR East plans to extend the commuter service in January to wallet phones from DoCoMo and KDDI, and it is in discussions with Vodafone [see photo, “Showing Off”].

Mobile FeliCa application files and their data are managed separately in the wallet phone, and they each take up from 0.5 to 1 kilobyte. The number of applications is limited only by the amount of memory on the chip, which is currently 5 KB in DoCoMo’s phones.

Mutual authentication between the chip

locked. The user can opt for a personal identification number to be entered before transactions are made, an important feature given that up to 50 000 yen (US \$450) in e-cash can be stored.

Despite DoCoMo’s impressive shipment figures, the actual number of people using the wallet part of the phone might not be so high. Some reports estimate that the number is as low as 550 000; DoCoMo’s own figures are more optimistic.

“Some 20 to 30 percent of [the] total [number of owners] are registered to use their phones as wallets,” says Sakaguchi, whose boss, Takeshi Natsumo, managing director of DoCoMo’s multimedia services, played a major role in creating both i-mode and the i-mode FeliCa service.

To give subscribers more reasons to use their wallet phones, DoCoMo has asked a Sumitomo Mitsui banking group to help it develop its own credit-payment services. By the spring, DoCoMo plans to

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launch a plastic card in partnership with an international credit card company, and then in the first half of fiscal 2006 it anticipates including the service in its wallet phones.

DoCoMo hopes to help popularize the use of credit cards in a country that still relies mostly on hard cash for conducting everyday business. "Credit cards are usually used [in Japan] only to make large purchases," Sakaguchi says.

"But with our service, users will be able to make purchases as small as 100 yen."

In July, DoCoMo teamed up with NTT Data and the rail company JR East to set up a joint venture aimed at covering the cost of installing equipment for companies and stores wanting to implement the Suica e-cash service. They expect their investment costs to be recouped by charging a commission on transactions.

As for introducing the technology over-

seas, DoCoMo is keeping silent on the subject. Since 2002, however, it has been working with a dozen mobile operators in Europe, Taiwan, and Israel to create local versions of i-mode. Vodafone, though it refrains from commenting on plans for its wallet-phone business, has subsidiaries and alliances in 28 countries across five continents, giving it ample opportunity to introduce an e-wallet service when the time is right.

—JOHN BOYD

The Sky Is Falling

Chicken Little release heralds the end of movies on film

The decision by Walt Disney Co. and Dolby Laboratories Inc. to equip 100 U.S. movie theaters with digital projection systems for the 4 November premier of the three-dimensional film *Chicken Little* marks a turning point for digital cinema, a technology poised to completely change the way theaters show movies [see picture, "Digital Conquest"]. It may also turn 3-D movie projection from a seldom-used gimmick into the commonplace.

The technology for digital cinema—encoding and decoding software, file servers, and special projectors—has been available for years. But until now, only some 250 screens worldwide have used it. Two big hurdles have prevented widespread adoption. First was the lack of a standard—theater owners making the investment in a digital cinema system, at a cost of about US \$100,000 per screen, had no guarantee that the product they purchased would be compatible with the next theatrical release.

"I don't think we would be able to successfully migrate to digital cinema without a standard," says Steve Jacobs, vice president of engineering for Dolby in San Francisco. "You would wind up with too many competing formats."

Second was the problem of who pays that \$100,000 to convert each screen. Not too many theater owners were willing to open their wallets, and no one

else was stepping forward.

This year things changed. A group of seven movie studios, incorporated as Digital Cinema Initiatives LLC, finalized a standard on 27 July, with lots of input from the equipment makers and theater owners. And Disney and Dolby decided to pay the bill for complete digital cinema systems at 100 U.S. theaters, increasing by nearly 50 percent the number of digital screens worldwide. This is the first time a movie studio has paid the bill

for anything more than test systems in theaters, and it could be a sign of how the changeover may be supported.

The intrinsic desirability of using digital technology in 3-D projection gave Disney and Dolby a powerful motive to advance the technology. Digital projection makes 3-D movies cheaper, because instead of two film projectors, just one is required. A processor card interleaves two image files for 3-D viewing or simply drops one for 2-D viewing. Three-dimensional films done digitally also have the benefit of not being limited to 24 frames per second.

At 24 frames per second,

alternating images for the right and left eye, while barely perceptible, reduces the overall clarity of the movie; speeding up the frame rate eliminates that problem. November's release of *Chicken Little* will exploit this capability: theatergoers wearing 3-D glasses will see the sky falling in 3-D at 144 frames per second.

Of course, distributing films digitally reduces costs enormously. Instead of multiple reels of film being produced and shipped, distributors send the movie to the theater as a digital file on a hard drive. The digital data are then copied into a server, which feeds a digital projector and sound system. The projector fills the screen with a series of red, green, and blue rectangular pixels, in the same way computers and digital televisions display images.

Given the anticipated savings, expecting movie studios to foot at least part of the bill for the transition seems reasonable. A film print of a movie costs about \$1,000 to produce, and if a movie is an unexpected hit, it may take days to increase the number of prints in circulation. Digital copies can be added to new screens within a multiplex within an hour, on the other hand, and in the future, satellite transmission systems will make such distribution nearly instantaneous. Digital copies of a movie do not need to be replaced, unlike film, which wears out after multiple showings.

Once the world's movie theaters go digital, movie studios expect to save about a billion dollars a year.

—TEKLA S. PERRY



WALT DISNEY PICTURES