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Now that cell phone subscribers have passed the one billion mark, we need to turn our attention to the new wireless economy. While the wearable device that includes mobile phone, voice recognition, palm computing, Web browser, Wi-fi radio, Bluetooth, video camera, streaming video and music, photo editing, and a GPS receiver hasn't come to market yet, early adopters in some parts of the globe are enamored with evolving technology. This month's outstanding column by J.P. Shim and Julie M. Shim questions whether all current handphone users across the world share the same vision of m-commerce technologies. Perceptions of users play a key role in the adoption of information communication technologies as well as in the development of innovative ones. This research is particularly valuable because of the variety of nations included and the varying demographics of the users' whose perceptions were surveyed in those countries.

M-commerce Around the World: Mobile Services and Applications in Japan, Korea, Hong Kong, Finland, and the U.S.

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One of the areas of electronic commerce that is rapidly expanding is mobile commerce (m-commerce), which involves the use of a handheld mobile device to conduct transactions through a wireless network. The wireless network technology (3G and 4G wireless network) areas have witnessed exciting innovations in recent years and will continue to represent the fastest growing wireless communication technology in the near future. This rapidly developing technology has increased an organization's ability to reach customers regardless of distance and has created a consumer demand for more advanced mobile devices with interactive features.

Expanding more on the wireless network technology, 3G mobile networks offer broadband transmission with speeds of up to 2Mbps, which allows for high-speed wireless access to the Internet, electronic commerce transactions, and information services, all from any location. The IMT-2000 standard, combining the features of the 3G networks (e.g., cdma2000, W-CDMA), was recently created to ensure the compatibility and interoperability of differ-

ent systems in third-generation (3G) (Jacobs, 2003). 3G network's higher bandwidth will allow for new wireless services, such as video conferencing and multimedia streaming.

3G wireless access systems provide basic data services along with voice and messaging capabilities. Telecommunication vendors and service providers are looking forward to a true wireless broadband cellular system (4G), which can support a much higher bandwidth, global mobility, and tight network security, all at a lower cost. 4G systems should be able to offer a peak speed of more than 100Mbps per second in stationary mode and an average of 20Mbps per second when in motion. It should be able to achieve at least 10 times the capacity of 3G at one-tenth the cost. The deployment of 4G technologies will allow the dream of a unified wireless Internet to become a reality.

Wireless service providers and application vendors will strive to meet expectations as new technology is created continuously to form tomorrow's wireless networks. What the next generation wireless technologies such as 3G, 4G wireless

networks, and broadband fixed wireless communications will offer generates great momentum on wireless services and applications such as m-commerce. Some of the major issues within the m-commerce field are entangled with the aspects of technological, human computer interaction (HCI), security, global usage, systems, social and legal, government policy, and customer issues.

Government's Role in Determining Mobile and Telecommunication Policy

In terms of government policy and its impact, countries such as Japan, Korea, and many European nations are moving quickly and successfully in the development and the establishment of m-commerce markets. However, the U.S. has found itself somewhat behind in the race to establish a functional and interoperable infrastructure for m-commerce. Culture is a relevant and critical dimension of m-commerce. Consumers from different cultures may differ considerably in perceptions, beliefs, selection, and use of m-commerce (Hofstede, 1980; Kim et al., 2002). To compete in this global market place, we need to understand and leverage subtle but important cultural differences exhibited by individuals. M-commerce offers consumers access to the Internet via cell phone from anywhere and allows them to perform tasks normally done through PCs. In the U.S., m-commerce is still in its infancy, but many analysts predict that by 2006 m-commerce will become more mainstream. However, many hurdles must be overcome to make that happen.

The m-commerce industries are concerned with the obstacle of having to stimulate customer demand, and demonstrate the user-friendliness of m-commerce, in addition to the long-term barriers of having to allay security concerns, and address astronomical connection costs. According to a study, a majority of consumers in the U.S. "did not care about the ability to buy things via wireless devices" (Shim et al., 2002). Given this attitude, the global nature of m-commerce is clear. On the other hand, it is less clear whether users across the world share the same view of mobile commerce. Research is required to address the following issue: Do users' perceptions

about mobile commerce differ according to various countries? A comprehensive and cross-cultural study on mobile commerce has been established for an understanding of security, and technological and managerial issues of m-commerce.

According to IDC, a research company, the number of wireless computing devices will increase rapidly from 13.6 million in 2002 to 70.9 million by 2005. Another research company, Yankee Group, also suggested that consumers would be very likely to spend as much as \$50 billion a year using their mobile phones to shop by 2003. The power of technological development and the strength of the different m-commerce applications determine the future of mobile commerce (Kalakota & Robinson, 2002).

Mobile commerce applications are paralleling the development of wireless technologies. The capabilities of wireless devices will determine the type of frequency of the m-commerce application development. TDMA, CDMA, GSM, and analog are the four major types of existing access technologies. 3G is able to support more advanced multimedia transmission, functionality of all widely accepted modes, routing flexibility, and operation at about 2GHz transmit and receive frequencies.

Continued expansion of m-Commerce and Internet services is forcing traditional telecommunications carriers to pay more attention to the Internet industry and its customers. These telecommunications carriers are developing their own Internet protocol-based networks for carrying voice, video, and data.

The future success of m-commerce depends on whether the wireless application developers are able to make good use of wireless technology and wireless devices and ensure that desired applications are delivered to the users. M-commerce applications can be complicated due to the increased customer demands and expectations. The success of m-commerce applications relies on the user's trust, which will play a critical role in acceptance and widespread deployment.

A Study of M-commerce Users from Five Countries

The authors conducted an exploratory and cross-cultural study on users' perception of mobile commerce in various countries

including Hong Kong, Korea, Japan, Finland, and the U.S. These countries were selected because all (with the exception of the U.S.), were based on higher mobile phone user penetration rate. Studies have found that the penetration rates for Hong Kong, Korea, and Japan are comparatively higher than other countries (Nomura Research Institute, 2001; InfoCom Research, 2002). In addition, these three countries have high penetration rates of the mobile Internet as well, which may account for the users' familiarity and usage with the mobile commerce service (Streaming Media Asia, 2001).

In late 2002, the lead author sent 150 copies of a one-page questionnaire to each country where his professional colleagues in various countries collected data. The following universities and company participated: Abo Academi University in Finland; Chinese University of Hong Kong in Hong Kong; Niigata University and Yokohama National University in Japan; Kyungpook National University, Kwangwoon University, E-Motion Corp., and Taegu University in Korea; and Boston University in the U.S. The survey users from each institution included university professors, university students, and business executives within that particular institution's advanced management programs. The questionnaire was designed around relevant literature and experts' feedback/comments. This research instrument consisted of 12 major questions pertaining to usage or non-usage of mobile commerce service and applications, the users' preference of mobile commerce service and applications, and usage of mobile commerce/service applications (i.e., m-ticketing and m-banking).

The questions also touched on important factors that users took into consideration for choosing a mobile phone, concerns on use of mobile services, expenditure on mobile phone services per month, users' satisfaction with mobile phone (e.g., service, cost of phone service, price of handset), frequency of selecting new phone or replacing the older model, and users' perception on countries' ranking in terms of its development in mobile services.

M-Commerce Usage Revealed

Table 1 contains a summary of the respondents with m-commerce experience and

handset owners in various countries. Over 95 percent of the respondents in Japan, Finland, Korea, and Hong Kong owned a cellular phone, and over 90 percent had experience with the m-commerce service/applications. On the contrary, only 88 percent of the respondents in the U.S. owned a cellular phone; in addition, only 65.1 percent had experienced m-commerce applications. These findings demonstrate that most cellular phone users in the U.S. rely on the mobile phone as a mode of communication purposes only, not for m-commerce transactions. This is most likely due to a limited variety of m-commerce service/applications, which are commonly available throughout Asia and Europe.

The limited exposure and availability of these mobile services in the U.S. have resulted in little experience or usage of mobile services, compared to the mobile phone users in the Asian countries or Finland. Since these mobile services are widely available in the Asian countries and Finland, the users are able to utilize the mobile phone for more than just communication purposes. Another cultural factor that distinguishes the Asian countries from the U.S. is the lengthy commuting time and dependency on public transportation. Thus, commuters who resort to spending increased time on mobile phone services/applications may account for this difference.

In regards to the age group issue, the under-30 age group was chosen as an age range because this defined the so-called "generation X" who are technology-savvy. Among the survey respondents, the highest number of mobile phone users in the U.S., Korea, Hong Kong, and Finland were found in the under-30 age group. This portrays a trend throughout all five countries that the younger age group has more exposure to recent developments in wireless and mobile technology, with no regards to

culture. In all five countries, the mobile phone users numbered the smallest in the 40-50 age group and the over-50 age group; however, the number of mobile phone users in the 40-50 age group and over-50 age group was found to be higher in both Asian countries and Finland than in the U.S.

The survey revealed that younger mobile users replace their mobile handset every year or two. Most mobile phone users in the U.S. in the under-30 age group had an average replacement rate of mobile phones of three to five years. This replacement rate spans a much longer time than the replacement rate in Hong Kong, Japan, and Korea, with most users (especially the 20 to >30 age group) replacing their handset every six months to a year. The cluster analysis of the Hong Kong group resulted in two groups: the first group consisted of over-30 age group on average replacing the handset every two years; the second group consisted of under-30 age group on average of handset replacement of less than six months.

Korea's statistics resulted in two distinct groups: males and females in the under-30 age group replaced the mobile handset on average of every six months to one year; males and females in the over-30 age group replaced the handset every two years, with some replacing every three to five years. The cluster analysis of Japan resulted in two groups: the first group comprised of males in the over-30 age group, which had an average handset replacement rate of two years; the second group comprised of the under-25 age group, which had an average handset renewal time of one year.

The handset replacement rate in Finland was found to be positioned between the replacement rate of the Asian countries and the U.S. The data shows that mobile

phone users in the under-30 age group replaced the handset on average of one or two years; the users in the over-30 age group replaced the handset on average of three to five years. The data in the U.S. resulted in two distinctive groups: the first group, over-30 group had an average handset replacement time of every two years. The second group, over-30 had an average replacement time of every five years or longer. The survey showed that all users in the 20-30 age group felt the most pressure to replace the cellular phone more frequently despite the high cost associated with a new handset and phone service. This age group was found to purchase a new handset model most frequently since it was a symbol of social status. In addition, part of the reason for rapid replacement lies in the release of new models of cellular phones by mobile manufacturers (up to several times a year) that entice the younger generation of mobile users with the prospect of new and updated features.

Mobile phone users, when asked to rank the five countries in terms of their advancement in mobile service, consistently ranked Japan as the leader in mobile services (see Table 2). Finland or Korea would commonly be listed second after Japan. In all five countries, according to the survey participants, both item content and security issues were found to be very important. This indicates that most mobile phone users consider these two factors important and common to their satisfaction of using mobile phones.

The significant factor, which differentiated the mobile phone users in mobile service concerns, was the users' willingness to pay for the mobile phone service (e.g., cost of monthly mobile phone service), which varied slightly for users in different countries. With the monthly mobile service fee, the mobile phone users in all five coun-

Handphone owner		Japan		Finland		Korea		Hong Kong		USA	
		No (n=5)	Yes (n=141)	No (n=1)	Yes (n=87)	No (n=7)	Yes (n=143)	No (n=5)	Yes (n=110)	No (n=10)	Yes (n=76)
m-commerce experience	Yes	0(0%)	132(90.4%)	1(1.1%)	86(97.9%)	0(0%)	135(90%)	1(.9%)	105(91.3%)	2(2.3%)	56(65.1%)
	No	5(3.4%)	9(6.2%)	0(0%)	1(1.1%)	7(4.7%)	8(5.3%)	4(3.4%)	5(4.4%)	8(9.3%)	20(23.3%)

Table 1: Handphone owners and their m-commerce experience in five countries.

tries agreed the acceptable price range as 25-55 U.S. dollars, with subtle differences in the price range.

However, most mobile phone users, regardless of their country, associated the most important concern of cellular phones with their monthly fee (financial), followed by security and privacy. The most important factor affecting the decision to purchase a new phone in all five countries was the price/cost of the handset. Interestingly enough, the Korean respondents rated the sturdiness of the handset and quality of the service as the important factors in choosing a mobile phone. In Finland, the brand name and popularity was chosen as a significant factor in choosing a mobile phone. In terms of speed of the mobile phone ser-

vice, the Asian countries saw this as pertinent, unlike Finland and the U.S. When the respondents were asked to rank countries in mobile services, the respondents from each country ranked Japan, Korea, and Finland (in no particular order) as leaders. The respondents in the U.S. ranked Japan as first, while they did not rank themselves as a leader.

The M-commerce World Today

In the U.S., the surveys revealed that the users in general were not so much concerned about social status as they were about the function of the mobile phone handset features and the service provided. The younger mobile phone users in Asian

countries (Japan, Hong Kong, and Korea) directly associated the cellular phone with social status. The younger mobile phone users in Finland and the U.S. were not as extreme as those in the Asian countries. On the other hand, the group with older users in all countries did not associate the cellular phone with social status, instead the group perceived it as a means of communication.

Japan, Korea, and Hong Kong once lagged behind the West in information technology. Despite its late development and entry into the market, and with the assistance of government policy, Asian wireless operators have been able to advance forward with 3G technology. The telecom-

Important factors for choosing a mobile phone					
Factor	Japan	Korea	Hong Kong	Finland	U.S.
Handset size/color screen appearance	1	5	1	4	2
Handset price/cost	2	1	2	1	1
Speed	3	3	3	6	6
Ease of use/function	4	8	4	5	5
Services available	5	6	5	3	3
Brand name & popularity	6	4	6	2	8
Memory	7	7	7	7	4
Others (e.g., sturdiness of handset, quality of service)	8	2	8	8	7
Important concerns for mobile services/applications					
Factor	Japan	Korea	Hong Kong	Finland	U.S.
Monthly fee of mobile phone service (financial)	1	1	1	1	1
Security	2	2	2	2	2
Privacy	3	3	3	3	3
Leaders in mobile service (providers)					
Countries	Japan	Korea	Hong Kong	Finland	U.S.
Japan	1	3	1	2	1
Finland	*	*	3	1	3
Korea	3	1	3	3	2
USA	2	2	*	*	*
Hong Kong	*	*	2	*	*
* no ranking					

Table 2: All handphone users' perceived values on several issues with mobile services.

munications market in Japan, Korea, and Hong Kong has always been highly regulated by the government. This contrasts with the telecommunications market and liberal policies set forth by the U.S. and Finnish government. The mobile services and applications have begun to experience some success, due to the Asian wireless operators' close relationship with their equipment makers, and their enormous influence over this value chain.

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