9
Contents and Services for Next Generation Wireless Networks

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1   Introduction

Next generation wireless services are very broad in scope. They include a range of user devices, for example, a new generation of cell phones, personal digital assistants (PDAs) with voice and wireless data capabilities, laptop computers equipped with cards to receive and send wireless data, and a number of hybrid devices. They also include many ways in which wireless networks can be configured, including 2, 2.5, and 3G wireless networks, as well as wireless local area networks such as WiFi. In order to manage the scope of issues associated with wireless networks, this chapter excludes wireless networks that are used exclusively within an office building or home.

What services do people want, what will they pay for, and how can innovative content be fostered in the new wireless environment? Further, what we can learn from existing behavior with wireless devices, in the U.S., Europe and Asia, to inform the design and development of new services? It is also useful to ground the analysis with an understanding of some historical patterns of new technology adoption and the process by which cellular telephone service moved into society. Will the next generation of wireless technology and services follow the same path of evolution as the cell phone: from business to consumer; from low volume to high volume usage; and from high-priced, purposeful communications and content with tangible value to lower-priced general communications and playful content? Some developers of content for 3G services believe that playful or entertaining content will be among the earliest applications that will be adopted (Dvorak, 2004).

2   Adoption and Use of Current Wireless Services

The cell phone has been widely adopted in many societies over the last decade and become a core component in everyday life for hundreds of millions of people. In 1990, the ratio of wired to cellular phones was 50:1. By 2000, the ratio had narrowed to 3:2, and by 2002 the number of cell phones exceeded wired lines world wide (ITU, 2004).

2.1   Changing Uses of Cell Phones

The ways in which cell phones are used has also changed over time. One change has been that more people have kept their cell phone on for long periods of time, to receive calls. In the U.S., this is an artifact of billing. Since people pay for both sent and received calls, many people used cell phones only to send calls when the price was high. Some in this group used pagers to receive messages, which they then returned using their cell phone. As the price dropped, more people used cell phones to both send and receive calls (Katz, 1999). This had an important impact on the so-called networking effect. That is, the value of a network is related in part to the number of people you can reach. Early in U.S. usage of cell phones, the network effect was limited since there were relatively few people whom you could call and reach on their cell phones. Over time, the number of people who keep their cell phones on has increased, thereby increasing the value of the cell phone network.

Another important change in style of usage over time has been the placing of cell phone calls to "stay in touch" and socialize. One example is a person who calls home from a train or airport not to report that they are going to be late but to say that there is nothing to report and that they are on time. Earlier, when cell phone service was expensive, usage was more deliberate—people called others from their cell phone because they had a specific message to convey. As the price dropped, people began to call others just to keep in touch, often with no specific message. This has helped the cell phone to become a regular habit for millions of users, sometimes to the annoyance of those nearby in public places who overhear constant chattering on cell phones. This pattern also parallels the early and later uses of wired telephone lines. In the late 19th- and early 20th-centuries, telephones were used primarily by businesses and wealthy people to convey specific messages; later, they were used by the mass public to convey messages and also to chit-chat or socialize (Fischer, 1992).

It is also noteworthy that people have accepted a lack of privacy in cell phone use and engage in behavior that would have been deemed bizarre only

a decade ago. On trains, in public buildings and in the street, they use cell phones for personal conversations that are easily overheard by others. The enclosed telephone booth has seemingly been abandoned as a way to maintain privacy while making a telephone call outside the home or office.

As the cell phone has become used more and more, some people have reduced their use of wired telephones and think of the cell phone as their main phone. Others have given up wired telephones at home (Tahmincliog-lu, 2004). It appears that these are largely younger people who have grown up with cell phones and use them in the household as well as in mobile situations. Often, they purchase a cell phone plan with thousands of minutes of use per month, so it is cheaper to rely on the cell phone exclusively and forego a wired phone line.

2.2   Short Messaging Service

Short Messaging Service (SMS) or text messaging is an abbreviated form of e-mail. It evolved from attempts to display e-mail on cell phones and other devices with very small screens. Long messages are very difficult to read on small screens and even tougher to type on the tiny keys of a cell phone or virtual keys on a PDA. Many SMS services limit messages to 150-160 characters or approximately 25 words. Further, they may cut off long messages sent through regular e-mail. In practice, most SMS messages are much shorter than 150-160 characters. Further, they use various abbreviations to reduce typing time and make more efficient use of limited screen space, for example "G2G" for "Got to go" or "WGD" for "What are you going to do?" SMS has also led to a new form of typing, sometimes called "thumb typing," in which people type with one or two thumbs. Many teenagers have become quite adept at thumb typing. A number of older users then followed the lead of the younger generation.

SMS is the most successful early wireless data service among the general public, particularly in Europe and Asia (see the discussion of wireless data services across cultures below). It is less common in the U.S., but had been widely adopted by users of the RIM Blackberry service. Further, many teenagers in the U.S. use SMS on their cell phones. SMS has also inspired a new form of advertising—short ads sent as SMS messages to cell phones and wireless PDAs. Early research indicates that the response rates to SMS ads are high, but it is unclear if this high response rate will continue: banner ads on the Web had high initial response rates, but they dropped over time.

2.3   Wireless Data Services Across Cultures

Among the general public, wireless data services have been more broadly adopted in Europe and Asia than in the U.S. However, a number of proprietary business applications of wireless data services have become commonplace within the U.S. and consumer adoption is catching up.

In Europe, SMS has been widely adopted in a number of countries and has generated significant revenue. Throughout Europe, approximately two thirds of the 450 million mobile phone subscribers use SMS. The SMS phenomenon began as a teenage and 20-something craze, then spread to older demographic groups.

On a smaller scale, there have been some trials and limited services in Europe that use the cell phone as a payment device for transactions at vending machines, car washes and fast food restaurants. For example, Sonera Corporation has developed applications in Finland and Sweden. In these applications, a cell phone user dials a special number displayed on a vending machine or service counter and authorizes a charge to their credit card for the soda, fast food, or service, which is then dispensed by a vending machine or provided by a merchant. It remains unclear whether these small transactions will be a viable business model for wireless devices and if this form of payment will be widely adopted. In addition, there has been modest use of premium content services such as paying for special ringer tones, sports scores, and stock prices.

In Asia, SMS is also common among cell phone users. Indeed, many cell phone users in Asia prefer SMS to e-mail . Much has been reported about wireless data services in Japan, notably the DoCoMo i-Mode service. Most of these services are inexpensive: $2.50 or less per month (some are less than $1). The fee is automatically added to the subscriber's cell phone bill. What are people paying for? Among the most popular services are customized ringer tones, virtual pets and animated characters downloaded to the cell phone. I-Mode also provides access to a few thousand Web sites that have been reformatted for i-Mode. Some of these are free and some are premium services. Reformatting for wireless data services is not easy or cheap. Nikkei, Japan's largest business daily, has a "Short Message Team" that designs software to automatically trim content for i-Mode and two competitive wireless data services (Shimbun, 2001). It is crucial that content in a long-form medium such as a newspaper or magazine be adapted to the requirements of small screen displays.

Wireless data activity in Japan is very strong in part because of the high penetration of cell phones. Japan has more cell phone subscribers than wired line subscribers: 86.6 million cell phone subscribers versus 71.1 million wired line subscribers in 2003 (ITU, 2004). Japan's commercial infrastructure also lends itself to potential wireless data services. For example, Japan has an

extraordinary infrastructure of vending machines—many more than in the U.S. or Europe. Over $55 billion in products are sold from vending machines in Japan each year (Yamada, 2001). This is an attractive base for developing wireless credit card applications. In addition, the i-Mode service is always on, which lends itself to location-based services such as tracking the movement of vehicles. As a result of all these activities, the wireless data industry has followed Japan very closely, looking for applications that are successful and which might be duplicated elsewhere.

In the U.S., the use of SMS was initially hampered by a lack of interoperability among wireless services but has grown in popularity, especially among teenagers. SMS has become very popular in the U.S. among a group of largely corporate users of the RIM Blackberry, which shares the 'always on' feature of i-Mode and is easier to compose messages on compared to cell phones. However, its relatively high cost ($40 to $60 per month for wireless data service) has restricted adoption to corporate users and some consumer aficionados of wireless data services.

There have also been some tests of mobile commerce in the U.S., using PDAs with wireless modems as well as cell phones and some attempts to set up wireless local area networks in coffee shops and airports where users with specially equipped laptops that can access the Web at high speeds. However, these early efforts have not yet turned into viable businesses. Nonetheless, interest remains high among service providers for these high-speed wireless local area networks.

Lost in much of the discussion about U.S. wireless data services are the many successful proprietary applications of mobile data services in business settings. These include Federal Express, UPS and many other businesses that equip delivery, sales, repair, and other personnel with wireless data terminals that can send and receive information. These applications track deliveries, record and transmit sales, provide access to inventory information and manage the movement of personnel in mobile settings. While there has been relatively little attention given to these wireless data successes, there may be important clues in these services for the development of next generation wireless applications.

3 Assessing Demand for Next Generation Wireless Services

Next generation wireless networks represent a broad array of end-user devices, network configurations and speeds. Service applications must take these dif-

ferences into account. For example, will the end-user device be a cell phone, PDA, laptop, or hybrid device? Each of these devices has different capabilities. Some wireless networks reach across wide regions; others are clustered within a few hundred feet of a coffee shop, airport, office building, or other locations. In the latter case, a person must know where the network is located and have the necessary equipment and account to tap into it. The tradeoff is that the clustered networks such as WiFi can have very high transmission speeds (up to 11 Mbps), while the broad regional networks will likely offer services at somewhat slower speeds. To add to the complexity, the actual speed that an end user experiences (and which a service provider must plan for) can vary considerably from advertised speeds. Planners must decide whether they can create a service for one device that will be used on one type of network at a relatively constant speed or if the service must support multiple devices, multiple speeds, and many types of locations. The latter places considerable constraints on the planning of new services. End users face a similar set of issues in deciding what device they will need, how it must be configured, where they can access services, and how those services will perform at various access speeds. Further, all of these parameters will change over time. Next generation wireless services are a moving target.

3.1   Core Issues in Assessing Demand

There are a few core issues that are relevant to an assessment of demand for most new technologies, including wireless networks. The first is whether next generation wireless networks will provide a host of new services or (primarily) enhancements to existing services? Many new technologies have thrived by providing desired enhancements to what already exists. Color television and graphical user interfaces are two examples. They made the experience of technologies that already existed (B&W TV and text-based computing) much more enjoyable and user friendly, leading to rapid adoption of a new generation of the technology. In the case of wireless services, desired enhancements might be as simple as greater reliability, improved voice quality, and quicker access to data services such as messaging.

Alternatively, widespread adoption of next generation wireless services may require some new applications. If so, what new applications? This leads to the perennial search for the 'Holy Grail' of new technologies—killer applications that are so highly desired, that many people will pay significantly increased fees for the service. Unfortunately, it is rare to find killer applications that are genuinely new. Communication appears to be the most important killer application for wireless, both in terms of voice and data services. However,

it is not new. Among content offerings, pornography, gambling, games, and shopping have been killer applications for many earlier generations of technologies such as the Web. None of these is really new. More commonly, it is a package of many service offerings, with a few standouts such as messaging, that attracts new users and converts existing customers of the earlier generation of technology.

It is also important to distinguish the reasons why people acquire a new technology or service and how they actually use it. This is particularly true for the earliest adopters who often acquire a technology in order to be able to brag about it with friends or for some exotic feature that they then use occasionally or rarely, e.g., handwriting recognition on PDAs. Similarly, a larger group of users may buy a technology for a core value, for example, women who acquired cell phones for "security," but then use it primarily for other functions such as coordinating schedules or socializing. This is not to argue that exotic features or highly-valued but rarely used features are not important. They are significant marketing tools. However, a service that has continuous monthly fees (versus a product that is purchased and then has no ongoing fees, such as a PDA) must give people a reason to pay each month for the service. Further, business organizations may be surprised to find that some salespeople demand next generation wireless services for access to inventory databases but then use the devices primarily for games.

When new service offerings are driven largely by advances in technology, it is necessary to ask if this is just technology being pushed at the marketplace or if there is an existing or latent demand? This question is often used to critique new technologies. However, a historical perspective on the introduction of many new technologies, for example, telephones, radio, TV and personal computers suggests that there was no existing demand for any of them. It may be argued that there was a latent demand but it appears more accurate to say that they created a demand. This may be the case with next generation wireless services. There does not appear to be a strong existing demand for these new networks. There may be a latent demand, especially to fix problems with current wireless networks. The challenge is to create demand by demonstrating services that people will want once they see what these services can do.

Two core questions facing developers of next generation wireless devices are: which devices will people favor; and will end users prefer one device that does many things or multiple devices, each of which does one thing primarily? The candidate receiving devices for next generation wireless services include cell phones, PDAs, pocket PCs, laptop computers, pagers, proprietary devices created for a specific application or user group (the Fedex wireless data terminal), or a hybrid of one of these. The shape and weight of some devices have limitations for certain applications, for example, current PDAs

are an odd shape to hold to the ear like a cell phone and require a supplementary earpiece and microphone for making telephone calls; a laptop weighs a lot and is not as easy to carry around as a PDA or cell phone. Does an all-in-one device make sense? In some of the author's research, many people initially liked the idea of an all-in-one device for next generation wireless services, until they realized that their all-in-one device built into a cell phone would add considerable weight and size, and that a laptop wouldn't be a convenient portable phone. This brought them back toward a desire for multiple devices, but hopefully two devices and not five. Adding to the challenge for designers is the obstacle of adding many features to a device such as a PDA or cell phone without creating usability problems due to complex interfaces that guide people to multiple services within the menu structure.

3.2   Applications

There is a broad range of applications under consideration for next generation wireless services. They include consumer applications such as messaging, mobile commerce, entertainment, videophones, medical applications, advertising, and location-based services; business applications such as management of workers in the field, inventory access, sales placement, remote sensing and monitoring, and shipment tracking; and government or military applications such as battlefield command, crime monitoring, and disaster recovery and assistance. A comprehensive assessment of all of these applications is not possible here. The discussion below emphasizes key elements that are likely to affect the success or failure of several prominent applications.

Messaging in the form of SMS or longer e-mails that will be possible on next generation devices will build upon the broad acceptance of text messaging for mobile devices in Europe and Asia, and by many in the U.S. Voice messaging services such as automated voice reading of a sent e-mail, voice-mail and providing audiotex services such as sports scores, stock quotes, and horoscopes have received less attention than text messaging but in the past, these have been popular.

Much attention has been given to mobile commerce services (m-commerce) such as buying train or movie theatre tickets, paying for fast food orders, checking-in at airports, and purchasing small items such as a can of Coke from a vending machine. Clearly, the carrot of a "wireless credit card" has enormous appeal for wireless network developers and there are many potential advantages for consumers. Think of two movie theatre lines: one in which people have to purchase a ticket with cash or a credit card; and one in which a person can pay with cell phone or enhanced PDA and walk directly into the

movie house. For merchants, the carrot is in fewer sales clerks, ticket agents, etc. However, the challenge will be in the implementation. For m-commerce to be successful, there will be a need for broad interoperability, wide adoption in the marketplace, a business model that works for small transactions, and transaction speeds that are faster than face-to-face transactions.

Entertainment is also high on the list of potential applications for next generation wireless services. Some envisage on-demand movies and live video over 3G networks (*The Economist*, 2004). However, this appears to be stretching the limit of what 3G can deliver. Further, the viewing experience on a two or three-inch screen may be less than appealing. Also, it appears to be an attempt to reinvent broadcast television, which does a much better job of delivering high quality video. Nonetheless, entertainment services, especially games, have received moderate usage in Europe and Asia (Dvorak, 2004). Next generation wireless networks could provide a platform for delivering higher-end games. In addition, audio entertainment is more feasible on 2G or 3G networks. A number of services offer music, turning a cell phone into an MP-3 player.

Location-based services would combine the features of 3G and global positioning system (GPS) to locate where a person is and then provide information such as a list of nearby restaurants or directions on how to get to grandma's house from wherever you happen to be. It has practical uses and also a 'cool' factor that is likely to appeal to males who do not like to stop at the gas station and ask for directions.

Advertising is everywhere, including plans for next generation wireless services. Ads will be necessary in services that are offered free, but it is hard to gauge the annoyance factor when screen size is so limited. A banner ad on a 17-inch PC Web screen can be relatively unobtrusive. It is hard to imagine any ad on a three-inch screen that would not be perceived as obtrusive. SMS ads are less obtrusive unless they are so numerous that they clog up menus of incoming e-mail. However, there may be clever alternatives such as electronic coupons or advertising information on request that people will accept. Early reports about high response rates to wireless ads need to be viewed in the context of early usage and early adopters. Response rates are likely to drop over time, as they did with banner ads.

There are many potential medical applications for next generation wireless services to provide greater mobility for people with significant medical problems. Many of these involve monitoring a patient's vital signs and communicating them in real time to monitoring stations at a hospital or other facility. Other consumer applications range from the curious to the far-fetched and include using a 3G device as a hotel key, placing electronic tags on children that use GPS to communicate back to a parent's PDA and tell the par-

ent where the child is, videophones, and dating services that keep profiles of members and light up cell phones or other devices when two compatible people walk near each other. It is difficult to judge which if any of these services might find widespread acceptance. However, it is important to understand the history of similar devices. The videophone, for example, has been tried several times and has yet to find consumer acceptance. New videophone services may experience a different fate but they will have to overcome well-known problems such as poor image quality, feelings of embarrassment by some people in being seen and difficulty in maintaining a consistent orientation toward the camera—it is very easy to inadvertently send someone a videophone image of your tie instead of your face. Still image transmission is technologically more feasible and has proven popular in Japan.

Enterprise applications may offer greater near-term opportunities than consumer applications, at least in the U.S. The list of potential applications is long and includes supply chain management, emergency communications, customer relationship management systems, maps on demand, re-routing trucks, managing the schedules of mobile workers, operating a completely mobile office, and providing assistance to mobile workers, among other applications. There are also many applications for specific professions such as the military and journalists. These groups have greater financial resources for applications that can demonstrate genuine utility and they can provide technical support and training that may be necessary for some applications. They also have a number of concerns. In research by the author, concerns about next generation wireless services by business users included battery life, weight, readability of screens, size of the device, and actual versus advertised speed of access.

4   Important Features and Design Challenges for Next Generation Wireless Services

One feature that is present in some current wireless services such as i-Mode and Blackberry, and which is planned in most next generation services, is 'always on.' That is, the device is always turned on to receive incoming voice and data services. Further, these can be sent to the device without any action by a user. 'Always on' appears to have had a significant impact on usage. Further, in Europe, where cell phone users do not pay for incoming calls, the billing structure encouraged people to keep their cell phone on and thereby increased the overall value of the cell phone network for users. In the U.S., where cell phone users pay for incoming calls, the billing structure initially

discouraged many people from keeping their cell phones on unless they were making a call (this changed, when prices dropped low enough for people to encourage incoming calls). An 'always on' state encourages more usage, speeds up the transmission of messages (since they can be received at any time) and supports real-time information services which also add value to the service (e.g., it is more valuable to receive a quote about a stock that has dropped in price as soon as the event occurs compared to an hour later).

Screen size, shape, color and resolution are also critical issues for next generation wireless services. There are a series of tradeoffs associated with these features. On the one hand, a larger screen with higher resolution and color will enhance the readability and visual appeal of services. On the other hand, these features will add cost and/or weight to a device. From a service provider's perspective, a major challenge will be to design services that are usable on a broad range of screen sizes, resolutions, color versus black and white, and screen shapes. It is unclear whether content can be adapted automatically to "fit" onto many different screens or if human designers must intervene. The latter will add significantly to the cost of providing services.

The user interface and navigation for next generation wireless devices also present a challenge. First, navigation options are limited on small screens. This can lead to multiple layers of menus, which users consistently dislike. Further, important features and services are often lost in the confusion and sheer work of navigating through multiple menus. Icons are often used to save space on menus but research on icons indicates that users are more confused by icons than helped (Kansas, 1993). User interface and navigation challenges for small screens can be solved. However, it is a costly and time-consuming process that many service providers do not value, or, put off until the last step in developing a new service, at which point options have been restricted because of software and hardware decisions that have already been made. Further, in the rush to get products to market, many product developers simply cannot afford the time to design and test user interfaces in a thorough way. We see the consequences of these inadequate efforts in many electronic products that are introduced into the marketplace.

Text entry and selection commands are also vital to the success of next generation wireless devices. As devices shrink in size, it is less feasible to use full size keyboards or a mouse to enter text and make selections. However, there has been considerable progress in this area, with better designs for micro-keyboards, thumb-controlled pads that replace a mouse, and voice recognition technology that works for many simple selections and commands. However, the proliferation of devices with many different text entry and selection features can create a burden for service providers who seek to support all of these devices and the many ways in which they organize and label choices. Imagine

creating software for a PC universe in which there were a dozen different key-boards, each with different labels for Backspace, Enter, and Shift and some of which replaced the Enter key with three separate keys, each of which was used for different types of Enter commands. Interoperability involves not just the ability of one network to talk to another but also for software and wireless services to support many alternative devices with different features.

All of these design challenges to creating functional and user-friendly devic-es must not get in the way of providing a feature that will sell the next gener-ation hardware to many early adopters, that is, a "cool look and feel." An "icy steel blue" body, a color coordinated faceplate, a shape that "feels good" in the hand, and other design features that have little to do with functionality often sell millions of devices. Technology reviewers for magazines and newspapers, as well as consumer and business users, often pay as much attention to per-ceived design 'coolness' as functionality. However, if coolness sells, good func-tionality is why a person continues to use a device a year later.

5   Discussion

A critic of next generation wireless services could argue that if one eliminates videophones, movies-on-demand and a few additional high-end services that appear to have limited appeal in a 3G wireless environment (or simply will not work very well even in a 3G environment), all of the other services dis-cussed in this chapter could be offered with the current generation of wire-less networks. Even in Europe and Japan, robust wireless services for a mass market require more bandwidth. How much extra bandwidth is the crucial question.

This review of research and marketplace experiences does support the argu-ment that the most feasible path to next generation wireless services is likely to be enhancements to current services that consumers and businesses want and use. That is, an evolution of services rather than a radical break from cur-rent to completely new services. Further, the next generation of wireless net-works will provide an opportunity to fix problems with current services and, generally, to learn from experiences to date. This path of development is not dissimilar to what has taken place with broadband Web services. Although broadband Web networks have provided access to some new services, most people have adopted broadband for faster access to services they were already using. Further, they are willing to pay for this faster access.

The review of research in this chapter also suggests that the best way to understand demand for new services is to focus on the core functionality of

a wireless network and the attributes of the mobile society in which we live. Specific applications and services can follow on this understanding of what wireless networks mean in people's lives and what are the broad needs of a mobile society.

5.1   Differences in Adoption Across Cultures

There are a number of differences in the adoption and use of current wireless networks across countries in Europe, North America and Asia. Differences are likely to continue with the next generation of wireless technology. Some of these differences relate to technology and regulatory structure; others to cultural differences. For example, Europe got started with the development of 3G networks (i.e., by assigning spectrum through license auctions) before the U.S. However, some argue that the U.S. is now in a good position to not only catch up with but avoid some of the mistakes made in Europe, for example, paying too much for 3G spectrum (Parker, 2004). In terms of infrastructure, the U.S. has more personal computers and Web access but fewer cell phones per capita than many European countries and Japan. So, the U.S. may be more inclined to use wired Web access for some applications, where Europe and Japan might turn to wireless networks. The differences, however, are narrowing.

Regulatory environments also differ and will affect how next generation applications are developed. For example, the U.S. has a more relaxed regulatory environment compared to Europe, so the U.S. encourages market forces to work out issues such as standards and is generally entrepreneurial in allowing multiple services to compete. Europe believes more in central planning and the adoption of single standards. The European regulatory model was clearly advantageous in supporting the fast rollout of 1G services. Will the same hold true for 3G?

Cultural differences are the most intriguing and probably the least understood in terms of impact on next generation wireless service development. Will Americans pay as much for premium content and customized services, as have millions of Japanese? What has been the role of off-color or slightly pornographic SMS messages in Europe and will these types of messages carry over to next generation services? What about the American penchant for gambling, for example, billions of dollars bet on major sports events? Will organizations exploit these habits in next generation wireless services? What about personal space and the need for privacy? It is reported that one reason Japanese teenage girls have adopted SMS is that it affords them privacy in households with limited personal space. What about evolving etiquette issues

such as the acceptability of people sending SMS during business meetings (Richtel, 2004)? These and many other cultural factors are likely to influence the adoption of next generation services in ways that few understand.

5.2 Pricing and Adoption of Next Generation Services

This chapter does not address the issue of business models or the economic prospects for next generation wireless services in the broad context of costs to acquire spectrum, build networks and develop services. The issue under discussion here is simpler: how should pricing for new services be.structured and are people likely to adopt next generation wireless services that cost more than their current wireless service? Japan and Europe have demonstrated that people are willing to pay more for enhanced wireless services such as SMS and some content services. In the U.S., people have shown a willingness to pay for higher tiers of wireless service that include extra minutes, no roaming charges and value added services such as caller ID. However, in all of these cases, the fees paid have been modest: $1-$3 per month for premium content services in Japan; 10p per SMS in the UK, and $10 to $30 per month for higher tiers of service in the U.S. The important point, which should not be overlooked, is that many people have shown a willingness to pay for extra services. By contrast, the wired Web has become an economic trap for many service providers who encountered an attitude of "We don't pay for content" from users. The Web provides another lesson: there is a danger from a service provider's perspective in giving away content for free in the hope that people can later be converted to paying subscribers.

Moving people up to next generation services may accompany replacement cycles for existing cell phones and cell phone contracts. In the U.S., the average cell phone is replaced every 14 months; the average laptop computer every three years. If next generation wireless services are viewed as an enhancement to current service, then the replacement cycle for the receiving device might be the decision point for change. Under this optimistic scenario, next generation wireless services might follow a path similar to audio cassettes that replaced long playing records and CDs which replaced audio cassettes. However, the picture is likely to be more complex. If the pricing of next generation services is high, there will likely be a need to find early groups who are willing to pay higher prices for these services. In the U.S., business users are an obvious target group and some service providers have already begun to target them. The same may hold in Europe and Asia, but in those markets some consumers have already shown a willingness to pay for enhanced wireless services, although spending on these services has been modest and based

upon inexpensive per use fees (in the case of SMS) or relatively low monthly fees for content services.

5.3 Content Models

There are many unanswered questions about the best way to structure services and content. One obvious question is whether some or all content should be free, supported by advertising, or paid for directly by end users. The advertising model is questionable given the screen size limitations of most planned wireless devices. How can ads be presented in a way that is appealing to the advertiser but not obtrusive for the end user? Further, it may be difficult to convert end users from free to paid content, if the advertising model is not successful.

A second question is whether there is a need for robust content offerings, for example, make the entire Web available through next generation wireless services, or offer limited content that is designed for small screens and whose quality can be controlled. The former will appeal to many potential users but the experience of trying to navigate and read voluminous content within a small screen environment may be disappointing. Web content must be reformatted for small screen access and viewing. The latter approach, which is sometimes called a 'walled garden' model, can increase the chances of a positive content experience but it must be presented very carefully so that a user's expectations are set appropriately and met successfully. The danger is that walled gardens might be perceived as weak and limited service offerings.

5.4 Open Networks and Creativity

There are many other applications under development for next generation wireless services. Some of these have been discussed briefly in this chapter, for example, wireless credit cards, emergency services, location-based services, video downloads, MP-3 phones and networked games, among others (Park, 2004). No one can predict which will be successful and which will not. The question is: Will they be allowed to test the marketplace? Next generation wireless network operators can create an environment where creativity flourishes and many groups can develop services or they can build a controlled environment which limits access. The history of other media, for example, the telephone, radio, television and the Web, demonstrates that early builders of technology infrastructures often have a myopic view of the potential for the technology. Creative ideas and, typically, successful models of content

and services, are often discovered after the technology has entered the marketplace. Further, they are discovered by creative entrepreneurs who are not technologists and who are outside the technology organizations that created the medium.

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