

DOCOMO AS NATIONAL CHAMPION: I-MODE, W-CDMA AND NTT'S ROLE AS JAPAN'S PILOT ORGANIZATION IN GLOBAL TELECOMMUNICATIONS

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ABSTRACT

Japan's leading wireless telecommunications provider, NTT DoCoMo, has attracted global attention with the success of its i-mode service, the first commercial packet-switched wireless Internet service in the world, attracting more than 10 million subscribers in its first eighteen months of operation. I-mode, embodying impressive innovations in both technology and business model, has achieved for DoCoMo first-mover advantage in defining and developing practices in mobile e-commerce, or m-commerce. The i-mode success is of special interest in Japan, following a decade of frustration by Japanese information and communications firms, who have been unable to match their global competitiveness in consumer electronics in key high-value-added PC and Internet technologies. After analyzing the reasons for Japanese innovative struggles in the 1990's, this article argues that NTT DoCoMo has addressed many of the problems of the Japanese approach to high-tech innovation through an innovative approach to management, technology and marketing, as well as building a network of global alliances based on its i-mode success. Evidence of DoCoMo's ability to sustain its global first-mover advantage in the key new industry of wireless Internet could serve as an inspiration for the entire Japanese IC sector, and herald a reshuffling of relative national high-tech innovative competencies.

Introduction

NTT DoCoMo, the wireless subsidiary of Nippon Telephone and Telegraph, has recently become the focus of worldwide attention with the success of its i-mode service in Japan. Demonstrating an aggressively innovative approach, DoCoMo constructed a packet-switched network alongside its existing digital cellular network that allows a constant connection with the Internet, the first commercial service of this kind in the world.¹ In less than eighteen months of operation, this service has attracted over 10,000,000 subscribers. But i-mode's innovation is not chiefly technological, but centers on a sophisticated business model, which charges users by the amount of information they download rather than their time online, while at

the same time allowing service providers to charge small, incremental fees for services that then appear on DoCoMo's monthly bill, eliminating the need for credit card billing. This business model, embedded in i-mode's packet-switching technology, means that i-mode is producing Internet-related revenue for DoCoMo out of its core competencies as a telecommunications service provider, a feat of great interest to other telcos around the world. I-mode is the first mass experience with *m-commerce*, or mobile e-commerce, and in this sense gives DoCoMo the opportunity to play a central role in forging institutional relationships and practices that will help define the new social and technological space created by the convergence of mobile telecommunications and the Internet.

DoCoMo's efforts take place within the larger context of the explosion of wireless telephony as a global phenomenon and the anticipation of the migration of many Internet functions from the PC to mobile devices. Mobile-Internet convergence is shifting relative national technological competitiveness, with the U.S., long dominant in PC and Internet-related technologies, seemingly in third place behind the EU and Japan.

NTT DoCoMo's i-mode success has a deeper significance in Japan, occurring as it does after a decade of disappointment in Japanese high-tech innovative competitiveness. After playing a role of innovative market leadership in areas such as automobiles and consumer electronics in the 1970's and 1980's, Japanese high-tech firms were much less successful in key, high-value-added PC-related markets like microprocessing and packaged software in the 1990's, with U.S. firms like Intel and Microsoft controlling standards and thus dominating the market. Analysis of this "reversal of fortune" in high-tech innovative competitiveness reveals a number of limitations rooted in Japan's experience as a *late developer*, long committed to catching up with the West by means of *innovation through learning*, the effective

adaptation and incremental improvement of technologies invented elsewhere.

NTT DoCoMo's i-mode strategy embodies a concerted response to the weaknesses of the Japanese approach to high-tech innovation on both an organizational and a strategic level. While making full use of the advantages offered by its status as subsidiary of Japan's largest telecommunications provider, DoCoMo's top management constructed an overtly entrepreneurial corporate culture, recruiting for top positions on the basis of merit and creativity. The i-mode approach was founded on a commitment to creating a branded standard that embodied an innovative business model--above all in effective methods of offering and billing services--that guided technological development. The i-mode standard was perfectly positioned to take full advantage of a Japanese domestic market environment that offered a springboard for global competitiveness in wireless Internet. Finally, DoCoMo has begun to build a set of global partnerships and alliances based on the attractiveness of its i-mode standard that demonstrates an organizational flexibility on a global level seldom seen in Japanese corporations. All of this argues that NTT DoCoMo will be able to sustain and globalize its present first-mover advantage in mobile Internet technologies and service.

The Crisis of Japanese Innovation

Throughout the 1970's and 1980's, the global advance of the Japanese industrial juggernaut seemed virtually unstoppable. Attainment of world competitive status in steel and shipbuilding was followed by great advances in global competitiveness in automobile markets in the wake of the energy crisis of the early 1970's. But most impressive were the rapid advances in consumer electronics and semiconductors, resulting in world domination of these markets by Japanese firms by the early 1980's. The Japanese political economy has been deeply shaped by over a century of struggling to catch up with an already industrialized West. As a

“late developer,” the Japanese state, society and economy were organized around a central, coordinated effort to maximize economic growth through the development of high levels of competitiveness in increasingly high-value-added industries.² A central feature of the Japanese system of “catch-up capitalism” has been the development of an approach to technological innovation that focused on the effective learning, adaptation and incremental improvement of technologies already pioneered in the industrialized West. Japan has shown great creativity in maximizing the “advantages of backwardness” in developing a manufacturing system that has demonstrated great skill in the incremental improvements of process and product: refining the production process, driving down per unit costs and making higher quality and more consumer-friendly products, but leaving the pioneering of new technologies to others.³

In the postwar period, this took the form of government-led industrial policy, typically directed by the Ministry of International Trade and Industry (MITI), or some other bureaucratic “pilot organization,” to maximize the ability of private firms to adopt new technologies in order to increase their competitiveness in key global markets as quickly as possible. Key firms were linked to one another through organization into *keiretsu*, in which a number of industrial firms were linked by common stock holding, interlocking directorates and by having a significant amount of their stock held by a single bank that provided ready capital, insulating the system from capital markets and pesky shareholders. *Keiretsu* organization was tied to the development of the “lean manufacturing model,” maximizing the efficient use of factor inputs through rapid model and tooling changes and effectively coordinated supplier relationships and plant flows.

Reversal of Fortune in the 1990’s

Coming out of the 1980’s, there was a general expectation on both sides of the Pacific that the

Japanese system was in the process of moving smoothly from technological follower to technological leader.

Japanese prowess in consumer electronics and semiconductors was expected to flow into domination of emerging advanced information and communication (IC) technologies, above all computing. But by the mid-1990s, it was becoming clear that Japanese firms were demonstrably less successful in the most dynamic--and high value added--areas of the PC industry than they had been in consumer electronics. While Japanese companies established strong international competitiveness in commoditized PC components, such as DRAM memory chips and flat panel displays, in the key components that defined the PC and related product architectures, such as the microprocessor and operating systems for personal computers and networks, they were not able to pose a serious challenge to companies such as Microsoft and Intel.

The resurgence of Silicon Valley and the rise of the Internet, occurring as Japan has experienced a decade of slow economic growth, has caused consternation in Japanese corporate and political elites, and raised questions about the limits of the Japanese system of innovation.⁴ Why have Japanese firms failed to be globally competitive in these markets? A critical reexamination of the Japanese system of innovation reveals a number of interrelated factors that have inhibited competitiveness in PC and Internet-related technologies: difficulty in competing in standards-based, or “Wintelism,” markets, the failure of domestic market as a springboard to international competitiveness in PCs, and the limits of the Japanese “lean” production and *keiretsu* system as it affects the ability of Japanese firms to network globally. Each of these will be examined in turn.

Standards Based Markets: The Triumph of Wintelism⁵

The institutions and practices associated with *innovation through learning* are deeply imbedded in

Japanese society, and highly legitimated by their success. It should be no surprise that those industries where Japanese manufacturers have been most successful have tended to be those with a technological profile amenable to this “traditional” Japanese approach to innovation. Japanese firms have been most successful in areas where the theoretical parameters of the technology are well known, and thus technological trajectories are predictable, and product advances can be made in continuous or incremental steps. This stability and predictability allows small adaptations in proprietary designs, such as miniaturization, to create new opportunities. The industries where this has been most effective are characterized by mature technologies with stable product architectures, such as automobiles, TVs and VCRs. Standards in these industries tend to be set by government or industrial organization. Thus technological change is slow, evolutionary, and predictable, allowing incremental improvement based on long-term planning, at which the Japanese excel, to pay off.

In the PC industry, on the other hand, the pace of development is frantic, with product architectures rapidly evolving. In this environment, the most successful firms have been able to develop and control de facto standards in key components of product architecture, most notably the microprocessor in hardware and operating system in software. In technologies characterized by open, proprietary, de facto standards, the firm that controls the standard is able to collect rents, and, more importantly, control the direction of technological development. Success in standards-based industries also requires that the standard-setter engage in complex and tension-filled ongoing interaction with those firms that adopt the standard to facilitate rapid and effective innovation.⁶ This involves organizational structures and strategies that allow a great flexibility in managing a complicated global network of partnership, cooperation and competition, skills

associated with Silicon Valley firms, not Japanese *keiretsu*.

This “Wintelist” model has spread throughout computer and Internet-related industries and has been the area where Silicon Valley firms have shone. Japanese firms have struggled to develop competitiveness in standards-based markets, but as yet with little success. The predispositions that so aided Japan in catching up technologically with the West now seem to be impeding the transition to leadership in markets where competitiveness is based on sustainable first-mover advantage.

Domestic Markets as a Springboard to Global Competitiveness

Another key variable in explaining the contours of Japanese high-tech competitiveness is the degree to which the characteristics of the Japanese domestic market serve as an effective springboard for global competitiveness. “The Japanese market acted as a powerful conditioning environment which shaped the competencies of the Japanese IC companies. In turn, it was these competencies which determined the international strengths and weaknesses of these companies.”⁷ In the case of consumer electronics (and auto), postwar growth in the domestic market was extremely rapid. Moreover, the preferences and practices of Japanese and foreign consumers of cars and TVs tended to be very similar, indeed, with Japanese consumers often in the vanguard. Products like Sony’s Walkman were test-marketed in Japan, and then went on to become global standards.

The situation was quite different in the personal computer industry. The complexity of the Japanese writing system, based on thousands of Chinese kanji characters, retarded the growth of the PC market in Japan, where dedicated word processors were in use far later than in the West. Moreover, the inability of early PC systems to handle kanji encouraged the development of Japanese proprietary personal computer

standards, incompatible with the emerging world standard. By the mid-1990's, when more powerful PCs made a Japanese Wintel system possible, NEC, Fujitsu and other Japanese computer makers were already locked out of the global market. Conversely, Intel and Microsoft were successful internationally (including, ultimately, in the Japanese domestic PC market) because the rapid growth and open standards characteristic of the domestic American market provided a firm base for global competitiveness.

“Lean” vs. “Modular” Modes of Production⁸

Japanese shortcomings in PC-type industries can be further explained by the system orientation toward the lean production system and *keiretsu*-style firm structure. The Japanese lean production system can be seen as an expression of the longstanding constraints of energy and space in Japanese society facilitating a manufacturing system that is focused on efficient use of inputs by removing all redundancies from the system. This was best achieved by *keiretsu*-style organization that located and coordinated the entire production process within a single organization. This approach continues to work well in industries where making efficient use of space and energy--consumer electronics and automobiles, respectively--are key considerations.

Space and energy consumption have not, typically, been key constraints in the PC industry, where the ongoing collapse of the price of the key inputs--computer power and memory--has encouraged a dynamic, future-oriented approach that builds in redundant capacity. The key scarce resource becomes time, and “economies of speed” organize production. This has encouraged a “modular” firm structure, in which relatively small startup firms, focusing on a limited set of core competencies, are involved in constantly shifting alliances and collaborations, the classic Silicon Valley firm structure, as remarked above, essential to

success in standards-based markets.

What has emerged from this brief overview of Japanese innovative competencies is a set of limitations within which the Japanese economy was once able to flourish, but that must now be transcended, if Japan is to regain global competitiveness in the most advanced Information-Communications technologies. A widespread sense emerged in the 1990's in Japan that the PC and PC-based Internet technologies represented a lost round for Japanese firms, that what was needed was a new opportunity to get back in the game. What high-tech opportunity would allow Japanese competencies in energy and space efficient production to shine, and be based on Japanese domestic market conditions conducive to global competitiveness? And what firm would demonstrate ability to nurture competitiveness in a standards-based market through effectively building flexible global alliances around its standard? Wireless communication, especially as it converges with the Internet and goes broadband, may be the break they have been waiting for, and NTT DoCoMo, through its i-mode service, may be the agent to lead the way.

Revolutionary Development of Global Wireless

In a world where high-tech competitiveness has focused for a generation on the PC-Internet platform--and been concentrated in Silicon Valley--the incredibly rapid emergence of wireless in the last few years has the potential to reshuffle the technological deck, leading to new, complex modes of global hi-tech competition.⁹ The rapid emergence of mobile Internet services, facilitated by the imminent move to broadband wireless networks, represents the convergence of two dynamic technologies into a new technological and social space with, as yet, undefined characteristics. This rapid turn of events has led to a reshuffling of relative national technological competencies, creating new opportunities and challenges.

The wireless market has experienced staggering growth in the last five years. In the five years between 1994 and 1999, annual mobile phone sales grew *ten-fold*, from 26 million units to 278 million. Goldman Sachs estimates that mobile phone subscribers will expand from 475 million to 635 million this year, with the number reaching 820 million by the end of 2001. No other technology--not the PC, not the TV--has been adopted as quickly, on such a global scale. Now the wireless industry is abuzz with the rollout in the next few years of broadband Third Generation, or "3G," wireless networks. 3G promises to make possible mobile multi-media services, such as streaming audio and video, as well as full access to the Internet at speeds of up to 2 million bits per second, far exceeding those of DSL or Cable Modem. Mobile Internet is generally viewed as the next great technology platform, on a par with the PC itself. The rapid convergence of mobile telephony and the Internet into a new industry is partially a matter of coincidence with e-commerce and a mass consumer base for the Internet emerging at the same time that mobile phone technology makes high speed data transfer possible. It can be safely said that the emergence of the mobile Net will change the nature of the Internet economy, making the PC platform less important, and attracting many new users to the Internet.

A new business model is now being bandied about: *m-commerce*, or mobile e-commerce. The number of wireless handsets in the world already far exceeds PCs, and is much more user friendly. Wireless offers the potential to access services on the Internet with much less need to have knowledge of the technology delivering them, more like most people use their car. The potential to use a wireless device to make small value payments offers convenience for consumers who in a few years will commonly use their mobile phone instead of a credit or debit card. With the addition of Global Positioning Satellite (GPS)

capabilities, services tailored to a user's specific location are also expected to emerge.

The new mix of technological and marketing competencies embodied in mobile Internet has allowed a reshuffling of relative national strengths. There is a general consensus that it is the European Union and Japan that are vying for leadership in this area in both services and innovation, with the U.S. a distant third.¹⁰ Ironically, the very advantages of the U.S. in the 1990's in PC-based technologies may serve to inhibit its competitiveness in mobile data services.

Early agreement in both the EU and Japan on a common standard for digital wireless (GSM in the case of the EU, PDC in Japan) has facilitated rapid innovation and network growth. In the U.S., on the other hand, FCC policies resulting in as many as four conflicting standards in regional wireless markets have confused customers and retarded the pace of development. It may also be argued that the great U.S. lead in PC-based Internet usage lowered the incentive to develop another approach. At any rate, while broadband 3G wireless is still several years away in the U.S., NTT DoCoMo will deploy it in May of 2001, with the EU following in 2002. And, as we shall see, Japan's lead in successful wireless Internet service is even more formidable.

Successful innovation of a new technology occurs not when it is invented, but when it is made accessible and useful to society. Playing a key role in determining the patterns of social contextualization and utilization of a major new technological convergence, such as wireless Internet, grants the innovator a "first mover advantage" with powerful long-term implications. This is why NTT DoCoMo's pioneering success with its i-mode service looms so important.

I-Mode: What Is It? Why So Important?

NTT DoCoMo launched its i-mode service on February 22, 1999.¹¹ I-mode was technologically interesting in that it was the first packet-based, always-on, mobile Internet service available in the world. Europeans and Americans are able to access the Internet from their cell phones or Palm Pilots, but both of these systems must establish a new dial-up connection every time. With i-mode, users are constantly connected, albeit at a modest 9600 bps. But wide bandwidth is not the story here. It is the structure of services available, the ease of payment, and the attraction of mobility that have made i-mode such a phenomenal success.

It is the unprecedented popularity of the i-mode service that has attracted attention worldwide. On August 6, 2000, less than eighteen months after its inception, the number of i-mode subscribers topped 10 million, and is growing at a rate of 250,000 new customers a week. As a result, i-mode is now the largest Internet Service Provider (ISP) of any kind in Japan ... three times larger than Fujitsu's Nifty-Serve, the second leading provider. Millions of Japanese are getting their first Internet experience on their i-mode equipped wireless phone.

Many of i-mode's unique features spring from its being a packet-based network completely separate from the voice channel also on the phone. Offering a simple display of text and color graphics, i-mode phones are constantly connected to a wide array of web-based services, including email, financial service, games, news and other forms of information. Users can afford to keep i-mode on all the time because they are charged for the amount of data they download, not per minute. They pay a flat fee of 300 Yen (about \$3.00) a month, plus 0.3 Yen per 128-bit packet, or about 4 Yen for sending a 500-letter e-mail or 20 Yen for downloading a weather report.

NTT DoCoMo has carefully designed the menu system that greets the user, with menus linking the initial display to official DoCoMo content partner sites, numbering about 600 in August 2000. One of the great attractions of official sites is that DoCoMo handles the billing for any transactions done on them. But i-mode is an open system, allowing the user to key in any compatible site. In addition to the 1000 official i-mode Web sites, there are more than 20,000 independent sites, accessible through several i-mode search engines.¹²

Many different types of services are offered to i-mode users. In addition to email, they can buy and sell stocks, do banking, read news headlines, buy movie and plane tickets. Game software maker Bandai, which provides a new animated character every day as i-mode screen wallpaper, offers one of the most popular services. Over 2 million i-mode users have signed up for the service and are paying 100 per month, netting the company more than \$20 million a year.¹³ Plans are in the works between NTT DoCoMo and Sony Computer Entertainment to allow i-mode users to play PlayStation games with each other over the phone. A positive feedback loop is now in operation for i-mode, with new subscribers and content and service-providers drawing each other in at an exponential rate. Services like those offered by Bandai and Sony are at the heart of an i-mode marketing strategy which has focused on the young, urban Japanese consumer market as its top priority. In important ways Japanese youth are in the global cultural vanguard, determining fashion in areas like animation and games, which play an increasingly central role for “Generation Y” teens and preteens worldwide.

DoCoMo: Innovative Management and Business Model

I-mode’s success is grounded in a combination of marketing and technological innovation that is a

product of a distinctive strategy by NTT DoCoMo's leadership, a strategy that in many ways represents a sharp break with traditional Japanese corporate practices. This is especially surprising, given that NTT DoCoMo is a subsidiary of Nippon Telephone and Telecommunications Co. (NTT), until 1985 the government telecommunications monopoly. Though DoCoMo stock is now traded on the Tokyo exchange, NTT still owns 67% of DoCoMo.¹⁴

By any standards, NTT DoCoMo is a huge company. Controlling almost 60% of the Japanese wireless market, it has a total subscriber base of over 50 million, second in the world only to Vodaphone Airtouch. DoCoMo's 1999 operating profits are expected to hit \$5 billion, on revenues of \$36 billion. Even more impressively, DoCoMo's stock has soared in the last year, resulting in a market capitalization on July 1st of this year of almost \$250 billion dollars, greater than that of parent company NTT, and making DoCoMo the eighth largest company in the world.¹⁵

But DoCoMo's origins are somewhat more humble. DoCoMo was spun off from NTT in 1992, at a time when Japan's wireless market seemed to offer little potential. The market was heavily regulated, subscription fees were extremely high, and handsets could not even be owned, only leased. NTT DoCoMo's first president was Koji Ohboshi, who had gained quite a reputation in NTT for not being a team player, often in sharp conflict with his colleagues.¹⁶ His appointment as DoCoMo president was seen as a kind of punishment--exile to an unpromising division. But in 1994, partially as a result of pressure from the U.S. government at the behest of Motorola Corporation, the Ministry of Posts and Telecommunications liberalized the cell-phone market. Individuals could now own cell phones, and DoCoMo faced formidable competition from a number of competitors with strong corporate backing. This was not a familiar situation

for NTT, accustomed to monopoly status, but ironically, Ohboshi proved to be the right person in the right place at the right time.

With the advent of deregulation, the Japanese wireless market exploded. Plummeting prices and expanding services resulted in what was, for several years, the fastest growing cellular market in the world. Wireless subscribers in Japan leaped from 2.13 million in 1993 to *31.4 million* in 1997, 1500% in four years! (It has since again doubled, to top 60 million subscribers this year.)¹⁷

Rising to the challenge of aggressive market competition, Ohboshi fostered a corporate culture in which marketing decisions came first and shaped subsequent engineering decisions. In response to declining market share in the mid-1990's as his competition introduced newer and cheaper voice technology, Ohboshi looked for other ways to differentiate DoCoMo service, making development of an innovative wireless Internet service a top priority. He appointed NTT electrical engineer Keiichi Enoki to direct the data network business project.

The idea of a packet-switched network for data separate from the voice network had been floating around NTT for a long time.¹⁸ It was a technologically appealing solution, not crowding voice circuits with data, making it possible to charge for data traffic by packet rather than by the minute. Enoki decided to develop i-mode as a dedicated packet network (PDC-P) alongside DoCoMo's company's existing PDC voice network.

But, like any technological parameter, DoCoMo's packet-switched network could have taken many concrete forms. Following Ohboshi's innovative lead, from the beginning decisions about the character of the i-mode network were shaped by the prioritization of marketing strategy. Enoki defied traditional Japanese

business practice by reaching outside of NTT for marketing specialists, many with MBAs from American universities. He recruited Muri Matsunaga, editor of a magazine on entrepreneurial job opportunities and one of Japan's few leading women executives, along with Takeshi Natsuno, an Internet entrepreneur running a successful startup (with an MBA from the Wharton School of Business) to design i-mode's business model.¹⁹

Unlike the typical Japanese approach involving lengthy and painstaking planning, speed was of the essence in deploying i-mode as rapidly as possible. This led to a pragmatic utilization of existing technologies, rather than waiting for more elegant solutions. First, this meant going with a lowband, 9.6 Kpbs bandwidth and shaping the service around its limitations. This was offset by i-mode's always on feature, eliminating dialup time. But more daring was DoCoMo's decision to go with an HTML-based system for i-mode websites. Wireless Application Protocol (WAP) has been put forward by a consortium of European and American concerns as the new standard for wireless websites, but the i-mode team decided to go with C-HTML (Compact Hyper-Text Markup Language), a form of HTML with a reduced instruction set, thus easing the transition of content providers from their already existing HTML websites to i-mode-ready content.

DoCoMo was careful in its management of consumer expectations, never even mentioning the word "Internet" in marketing i-mode. Rather, i-mode was advertised as a new kind of wireless data service. By branding i-mode as essentially an extension of pre-existing mobile phone services, DoCoMo prevented consumers from expecting an experience akin to the World Wide Web, complete with flashy graphics, on their phone, and then feeling cheated and disappointed, a problem encountered in the U.S. and Europe

marketing of “Wireless Web” services.

Natsuno, now Executive Director of the i-mode division, has said that his model for i-mode was America Online (AOL), a user-friendly menu-based Internet portal. A great deal of effort has been put into designing the i-mode portal site, with its menu of some 600 official providers. DoCoMo assists official content providers, helping them customize their i-mode Web sites.

But i-mode provides something that AOL cannot offer, a payment structure that has been hailed as a successful model for m-commerce worldwide. The nature of i-mode’s separate data network allows DoCoMo to record billing details for its official providers. DoCoMo’s system allows them to charge small sums and have the amount show up on the user’s phone bill. Freed from credit card charges, services involving small, incremental charges, such as a few cents for a news article, become feasible. DoCoMo handles the billing, and takes a 9% commission for its trouble. This is the innovation that has caught the attention of the Internet industry worldwide.

Since the emergence of e-commerce, the challenge has been to develop a business model that actually results in profitability. Most Internet portals and other service providers have attempted to make money through advertising, or through marketing its products online. DoCoMo, on the other hand, doesn’t generate any revenues from mobile advertising or transactions executed on i-mode. Instead, it focuses on increasing network revenues like airtime fees and commissions for collecting fees for value-added services. In other words, DoCoMo has generated revenue directly out of its core competencies as a mobile telecommunications carrier: building wireless networks and growing their subscriber bases.

DoCoMo has successfully rolled out a mobile Internet service, gaining valuable technical and

business experience, all in a lowband environment. This has placed DoCoMo in excellent position to provide leadership in rolling out similar services in the coming broadband 3G networks. Moreover NTT DoCoMo will initiate the world's first 3G wireless service in May, 2001 in the Tokyo area, based on the W-CDMA standard developed by DoCoMo and already adopted by the EU, giving it first mover advantage in yet another technology. NTT DoCoMo's successes in i-mode and 3G technology are both key to DoCoMo's global strategy: building partnerships based on these standards.

DoCoMo's Global Strategy: Partnerships Based on Standards

The globalization of telecommunications has resulted in a rash of mergers and acquisitions as companies flush with high stock evaluations attempt to cash in by expanding through purchases. But as yet, NTT DoCoMo has eschewed that strategy. Rather, DoCoMo management states that it is through the power of their technology and accrued business practices that they will be able to spread their influence worldwide. DoCoMo management has made an aggressive attempt to move beyond the domestic ties it inherited from its parent company and build a series of partnerships and coalitions with various players both in the West and in Asia, most notably on the basis of its i-mode standard.

Telecommunication service providers everywhere are in search of new revenue sources, as providing basic telecom services becomes a highly competitive, low profit proposition. They find DoCoMo's success with the i-mode business model success on DoCoMo's part very attractive. In developing i-mode, DoCoMo has acquired key exportable skills in setting up and managing m-commerce platforms on wireless networks, above all i-mode's packet communications billing system and the associated structuring of content presentation in menu form on the handset.²⁰

Across the globe, DoCoMo has set up relationships with local wireless providers, handset manufacturers as well as Internet content providers with the desire to go mobile. This includes alliances with many U.S. firms, including Microsoft, AOL, Sun Microsystems and, most recently a reported tie-up with telcos SBC and BellSouth Corporation to form a joint wireless consortium to rollout i-mode service in the U.S.²¹ However, DoCoMo's present overseas strategy is focused on the area that will see the next move to high-speed, packet-switched wireless Internet services: the European Union.

Over the last year, through selective acquisitions of minority holdings in a couple of key firms, NTT DoCoMo has developed a growing presence in the European market as it prepares to roll-out 3G service in 2002. DoCoMo has bought stakes of about 20% in Britain's Hutchison Telephone, holder of a British 3G licence, and Dutch wireless operator KPN Mobile N.V., with services in Holland, Belgium, Germany and Hungary. The three companies have announced their intention to bid for 3G licences in Germany, Belgium and France.²² DoCoMo has thus signaled its intension to be part of the creation of a fourth big player in European wireless, along with Vodaphone-Mannesmann, France Telecom-Orange, and Deutsche Telecom.

However, the new alliance, powered by i-mode's success in Japan, is not going to wait for 3G in 2002. The DoCoMo-KPN-Hutchison alliance also announced their intention to introduce i-mode service in Europe early next year as the so-called 2.5G service, GPRS, which includes separate packet-switching capabilities, is initiated on existing GSM networks.²³ DoCoMo's experience in building a mass consumer base in Japan, based on effective utilization of existing technologies, is cited as key to the rapid development of an i-mode network in the European market.

One thing that is clear from these moves is DoCoMo's intention to make "i-mode" an internationally

recognized service brand, and global standard for mobile wireless. NTT DoCoMo would appear to be developing the kinds of cooperative relations required to successfully support such a move.

Conclusion: DoCoMo as Innovative Leader

Does NTT DoCoMo's i-mode success offer an example of resurgence on the part of a key Japanese firm in global high technology? This conclusion will examine how well i-mode meets the requirements for such a success outlined earlier in this paper:

- Has DoCoMo's experience with i-mode in the Japanese domestic market set the stage for global competitiveness?
- Is wireless Internet a technological space that enhances Japanese manufacturing competencies in efficient use of space and energy inputs?
- Has DoCoMo demonstrated its ability to function in a standards-based market both by producing a dynamic, universalizable standard and by beginning to forge the global alliances necessary for standards-based market leadership?

The evidence so far points to a qualified "yes" in each category, pointing to DoCoMo's ability to sustain and globalize its potent first-mover advantage in wireless Internet service.

The Japanese political economy developed a system of innovation and economic development that made an "advantage of backwardness" by not recapitulating all the stages of development of the western early developers, but rather skipping forward to the most advanced technologies. Can the same be happening here? Paradoxically, one source of NTT DoCoMo's strengths in wireless Internet is the same set of conditions that served as disadvantages in Japan's being competitive with the U.S. in the PC-based

Internet era.

I-mode's success was made possible by the potential for rolling out Internet service to masses of consumers with no previous Net experience, the result in part of the slow growth of PC use in Japan. PC penetration in Japan is only about 20%, compared to over 50% in the U.S. It is no surprise that this initial effort to provide email and other Internet services to the masses was based on AOL, who in many ways played the same role in the U.S. But in DoCoMo's case, the situation allowed a definition of the Internet experience not based on comparisons with the PC.

Another incentive for Japanese consumers to adopt i-mode is the incredibly high cost of wired Internet access in Japan. Combined telecom and ISP fees for dialup Internet access in Japan are an estimated \$67.12 per 20 hours, among the highest in the world and more than twice those in the U.S.²⁴ DoCoMo's parent company NTT continues to insist on high per minute charges for local calls and has dragged its feet in opening its lines to cheaper Internet services. This has led some to charge that the i-mode success is partially the result of a situation in wired Internet service in Japan uniquely skewed by a regulatory regime dominated by an NTT that still enjoys monopoly power in local telephony. Whatever the causes, a strong argument can be made that the Japanese domestic market for wireless Internet represents the future for much of the rest of the world. As we have seen, the explosion of mobile telephony is huge and unexpected, a global phenomenon on the level of the development of the PC. Wireless telephony rates of penetration are much higher than PC penetration in most countries, and wireless is spreading much faster. In this sense, the U.S. is the outlier, with a PC penetration rate almost double that of mobile phones. Japan, with its booming wireless market, is much more like the rest of the world, especially the developing world.

In many ways, the PC is an unsatisfactory platform for further development of the Internet. It remains user unfriendly, difficult to use and crash-prone, it is not mobile, and penetration rates in much of the world is low. As anticipated, the Internet is in the process of migrating to a new platform. In Japan, more Internet traffic will soon flow through wireless devices than through the PC, a situation that is soon to be true in most of the rest of the world (except, perhaps the U.S.), in just a few years.

From the beginning, DoCoMo refused to label i-mode as in any way a continuation of the PC Internet experience. This created a clean space in which to construct a new kind of experience of the technology. DoCoMo's position allowed it to see that a system that would allow effortless incremental billing and easy navigation--high levels of user friendliness--could be introduced successfully at 9.6 Kbps. Generally, wireless technologies are a better match for Japanese manufacturing competencies. Efficient miniaturization of components is a key concern, but, more importantly, the key inputs of battery power and radio spectrum are limited, and must be used efficiently. With the emergence of a common 3G standard for Europe and Japan (and much of the rest of the world), Japanese electronics firms expect to be positioned well in the handset market.

Both in the domestic Japanese market, and, in other ways, in the emerging global market for wireless Internet services, DoCoMo can be seen to have gained a critical first mover advantage. DoCoMo's business model is responsible for attracting a critical mass of content and users. M-commerce is quickly becoming the dominant form of business-to-consumer e-commerce in Japan; i-mode has become, in many ways, the de facto standard for Japanese e-commerce. DoCoMo's organizational innovations were a response to the unusually competitive environment of wireless telephony in Japan. Putting top priority on marketing,

DoCoMo leadership recruited mavericks to aggressively innovate business practices at the same time developing new technologies.

DoCoMo has, in i-mode, a standard with the potential to be marketed internationally in an industry with almost unlimited growth potential. It stands as an expression of the organizational/institutional interface between users and technology that is at the heart of successful innovation. The embodiment of the i-mode business model in DoCoMo's proprietary technologies raise barriers to entry by imitators, while encouraging interested firms to gain access to i-mode. Moreover, DoCoMo has taken the first step toward building a network of global partnerships and alliances to support the adoption and development of the i-mode standard as broadband wireless Internet develops.

The convergence of mobile telephony and the Internet does indeed seem to signal another shift in the balance of forces in advanced information technologies. This creates the possibility for a new trajectory, a moment when outcomes are unpredictable, but certainly will not just be an extension of existing power relationships. Mobile-Internet convergence is producing a situation where new technological appropriations and relationships will be forged. The most pressing question is whether or not NTT DoCoMo is flexible and dynamic enough as an organization to continue to play the leading role it has forged in Japan on a global scale?

At this point, DoCoMo is one of Japan's leading candidates to show the way for resurgence in global high-tech innovative competitiveness.²⁵ I-mode is a brand, a service, and a standard, not just a technology, and could serve to point the way for other Japanese firms. Time will tell if more "mainstream" Japanese firms will be able to emulate DoCoMo's innovative approach.

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¹This paper is based on interviews and other data gathered while a Visiting Research Fellow at the Institute for Social Research at the University of Tokyo from 1994 to 1996, under the sponsorship of the Fulbright Commission, and continuing up through 2000. This involved extensive interviews with officials at NTT, the

Ministry of Posts and Telecommunications, and various other Japanese firms and government organizations. The other major source of topical information is extensive perusal of the Japanese business press, especially the *Nihon Keizai Shimbun*.

²The classic exposition of this perspective Chalmers Johnson, *MITI and the Japanese Miracle: The Growth of Industrial Policy, 1925-1975* (Stanford: Stanford UP, 1982).

³See Daniel I. Okimoto and Gary R. Saxonhouse. "Technology and the Future of the Economy," in Kozo Yamamura and Yasukichi Yasuba, eds., *The Political Economy of Japan, Volume 1: The Domestic Transformation* (Stanford: Stanford UP, 1987) pp. 385-419.

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⁵Charles H. Ferguson and Charles R. Morris, *Computer Wars: The Fall of IBM and the Future of Global Technology* (New York: Times Books, 1993) and "How Architecture Wins Technology Wars," *Harvard Business Review*, March/April 1993, p. 86 ff. This analysis also has more than a passing similarity to Clayton Christensen's model of the role of "disruptive technologies" in Clayton M. Christensen, *The Innovator's Dilemma : When New Technologies Cause Great Firms to Fail* (Cambridge: Harvard Business School Press, 1997).

⁶Michael Borrus and John Zysman, "Wintelism and the Changing Terms of Global Competition: Prototype of the Future?" Berkeley Roundtable on International Economics, Working Paper 96B, February 1997, available at: <http://brie.berkeley.edu/~briewww/pubs/wp/wp96b.html>.

⁷Martin Fransman, *Visions of Innovation: The Firm and Japan* (Oxford: Oxford UP, 1999), p 74.

⁸This model is adapted from Jiro Kokuryo, "From Closed Network to Open Network: Transformation of the Japanese Economy in the Information Age," in *JIPDEC Informatization Quarterly* No. 105 (Tokyo: JIPDEC, 1996) and "The Role of Japan in the IT Revolution," Graduate School of Business Administration, Keio University, Tokyo Japan, July 2000. Available at: http://www.kbs.keio.ac.jp/kokuryolab/index_e.html.

⁹Information in this section derived from "Survey: Telecommunications, The World in Your Pocket," *Economist*, October 9, 1999 and "Wireless Wave II: the Data Wave Unplugged," Goldman Sachs Investment Research, November 10, 1999. Both reports are available online.

¹⁰United States Internet Council, *State of the Internet 2000*, Washington, USIC, 2000, p. 27.

¹¹The "i-mode" stands for information, interactive, Internet, and *ai*, which means love in Japanese."

according to Keiji Tachikawa, CEO of NTT DoCoMo.

¹²Figures from NTT DoCoMo press release, August 7, 2000. Also "Mobile communications - i-mode's modest success," *The Economist*, March 11, 2000.

¹³Daniel Scuka, "Unwired: Japan Has the Future in its Pocket," *Japaninc*, June 2000. Available at: http://www.japaninc.net/mag/comp/2000/06/print/jun00p_unwired.html.

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¹⁵"The Business Week Global 1000," *Business Week*, July 10, 2000.

¹⁶Discussion on DoCoMo management history and personalities is based on interviews and perusal of the Japanese business press, especially *Nihon Keizai Shimbun*, but a good summary of these issues in English is Kenneth Neil Cukier, "Wireless à la I-mode: Japan's NTT DoCoMo's flashy phones are connected to new wireless business models," *Red Herring*, June, 2000. Available at: <http://www.redherring.com/mag/issue79/mag-docomo-79.html>.

¹⁷All figures from Japan's Ministry of Posts and Telecommunications at <http://www.mpt.go.jp/>.

¹⁸NTT Communication actually offers a separate packet-switched service on its landlines called Open Computer Network (OCN), which provides ISDN service, primarily for business customers.

¹⁹Keiji Tachikawa, who replaced Ohboshi as CEO of DoCoMo, has an MBA from MIT's Sloan School of Business.

²⁰Yoshio Ando, "NTT DoCoMo: Global Strategy and European Operations," Goldman Sachs Japan Research, July 14, 2000.

²¹*Asian Wall Street Journal*, August 1, 2000 on AOL tie-up. For SBC-BellSouth see *Wall Street Journal*, August 18, 2000.

²²"DoCoMo, KPN Acquire Stakes In Hutchison Wireless Unit --- Partners to Bid for Europe's New Mobile Licenses," *Asian Wall Street Journal*, July 13, 2000. Also Yoshio Ando, "NTT DoCoMo: Global Strategy and European Operations," Goldman Sachs Japan Research, July 14, 2000.

²³A number of other companies are backing HTML in the wireless market. Logica PLC, a leading supplier of wireless data technology based in the U.K., also has thrown its weight behind compact HTML. Hutchison Telecom also plans to introduce i-mode to Hong Kong so it can offer games alongside its existing WAP services.

²⁴Emarketer statistics, July 1, 2000, available at: <http://www.emarketer.com/>.

²⁵The other Japanese firm that might vie for this honor is Sony, another innovative firm with maverick leadership. Sony is attempting to leverage its competencies in game consoles, notably PlayStation II, into leadership in the migration of the PC to a more user-friendly consumer appliance. See: John Nathan, *Sony: The Private Life* (New York: Houghton Mifflin, 1999).