



Under the Yankee Group Microscope: NTT DoCoMo's Experience with Flash Lite

Executive Summary

Flash Lite has become a de-facto standard for most large Japanese mobile internet content providers. Approximately 15 million NTT DoCoMo subscribers have Flash-enabled devices.

Since the introduction of NTT DoCoMo's i-mode service in early 1999, Japan has become the world's leading market for mobile content and mobile commerce. Today, almost 100,000 companies and organizations offer mobile content for i-mode and similar services by KDDI/au and Vodafone.

- Growing at a pace of more than 30% annually, the total mobile content and commerce market in Japan is likely to reach \$4.7 billion during 2004.
- In 2003, revenue from i-mode use (including basic subscription fees, package charges and premium site subscriptions) had reached an astonishing \$15.76 or almost 21.6% of total ARPU.
- According to NTT DoCoMo statistics, in addition to spending significantly more on their overall mobile phone use, i-mode users also spend more on voice traffic than non-i-mode users.

Sophisticated information services using Flash Lite have characterized the first wave of innovation using Flash Lite. But Flash Lite extends readily to the critical task of developing dynamic, highly customizable user interfaces. The animated graphical user interface simplifies complex search operations, eliminating the need to navigate through a series of hierarchical text menus (see Exhibit 1).

- We estimate that at least 15 million DoCoMo subscribers (approximately 35% of total i-mode subscribers) will have Flash-Lite-enabled phones by year-end 2004.
- More than 60% of the 4,400 official i-mode sites are based on Flash Lite.
- Approximately 20% of the unofficial commercial i-mode sites are Flash-enabled.

(Note: All monetary figures in this report are expressed in U.S. dollars unless otherwise indicated.)

Sponsored by Macromedia

Macromedia commissioned the Yankee Group to provide an objective assessment of Flash Lite's impact in the mobile Japanese market. We devote our attention to NTT DoCoMo because this carrier has more than a year of experience with the technology.

Research Methodology

The Yankee Group obtained data from nine major content providers in Japan, responsible for more than 1,000 sites. In addition, we surveyed another dozen smaller, unofficial i-mode content providers. Based on this research—and information from Macromedia, KDDI/au and NTT DoCoMo—we have estimated the penetration of Flash within the i-mode ecosystem.

Exhibit 1

Flash Lite and the Wireless Graphical User Interface

Source: Japanese Content Providers and NTT DoCoMo

Flash Lite enables rich, graphic applications that deliver great usability.



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I. Introduction

The simplicity and low cost of text-based services—especially standard IP mail messaging—was an initial driver for i-mode adoption. Indeed, the shift to billing by traffic from a time-based format was nearly revolutionary at that time. Since then, the cost of data transmission continually has declined. The shift to 3G services with FOMA enabled DoCoMo to reduce its tariffs per packet. NTT DoCoMo recently introduced flat-rate pricing plans. This decline in transmission cost has driven traffic and i-mode mobile content is now advancing toward more sophisticated, increasingly graphics-based services.

The next mobile revolution will see wireless phones used as music players, cameras and payment instruments. The user interface must make each application seem natural. Flash Lite can play a crucial role in this transformation of mobile phones into multifunctional handheld terminals.

To obtain a clear overview of the status of Flash Lite and its impact on the mobile content market in Japan, the Yankee Group has undertaken a series of interviews with Japanese carriers and content providers.

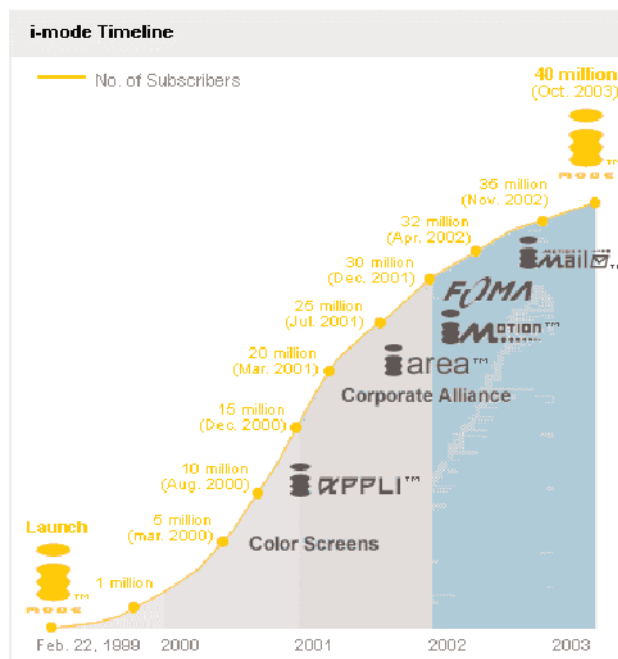
In the following sections of this report, we provide an overview of the mobile content market in Japan, focusing especially on i-mode. We then detail the use of Flash Lite by NTT DoCoMo and KDDI/au. We review the leading Flash Lite applications, paying particular attention to the use of Flash to improve graphical user interfaces.

II. The Mobile Content Experience: Enter i-mode

When NTT DoCoMo launched its i-mode mobile internet service in early 1999, Japan was a traditional, voice-centric mobile market with no track record in data services. Today, i-mode is a mobile internet business ecosystem with more than 40 million users and thousands of participating companies that perform a great variety of mobile business transactions, from e-mail and games to booking rail and airline tickets.

NTT DoCoMo has steadily enhanced the value proposition of i-mode through a variety of additional and complementary services, such as the Java-based i-Appli and—more recently—mobile phones enabled for Sony's smart card system FeliCa (see Exhibit 2).

Exhibit 2
The i-mode Timeline
Source: NTT DoCoMo, 2004



i-mode Critical Success Factors

The principal reasons for the success of i-mode include:

- **Low internet penetration:** At the time of service launch, the penetration of personal computers in Japan was relatively low compared to the United States and Scandinavian countries. Internet access was limited and prices for high-speed connections were among the highest worldwide. In this environment, i-mode emerged as an important and viable alternative to traditional PC-based internet access.
- **Unique, effective pricing model:** DoCoMo's innovative billing model charged customers for data transferred (rather than access time). In Japan, this model is transparent and equitable compared to the access time model used by providers of WAP services.
- **No "walled garden" approach:** Perhaps most importantly, NTT DoCoMo didn't attempt to control the market for mobile internet content but rather provided open access to the internet for mobile users while offering content providers the option to register their site for a set percentage of their revenue in the official i-Menu.
- **Focus on usability:** Although the Japanese market is known for rapid adoption of new technologies, DoCoMo has not taken its tech-savvy base for granted. The carrier has continuously improved the user experience (with technologies such as Flash), making its services accessible and attractive to the mass market.

Almost 60% of total mobile internet users subscribe to NTT DoCoMo's i-mode service. DoCoMo's success with i-mode has been imitated fairly well by KDDI/au and Vodafone. Because these factors were successfully executed across all three networks, the number of subscribers to mobile internet services in Japan is well above 70 million or roughly 86% of the country's total internet users.

The Mobile Content Industry in Japan

The open access approach taken by NTT DoCoMo has seen the number of companies that provided i-mode content at launch increase to tens of thousands of companies and organizations. Companies include startups by young entrepreneurs, subsidiaries of large companies in the entertainment and publishing industries, and spinoff companies from large trading firms.

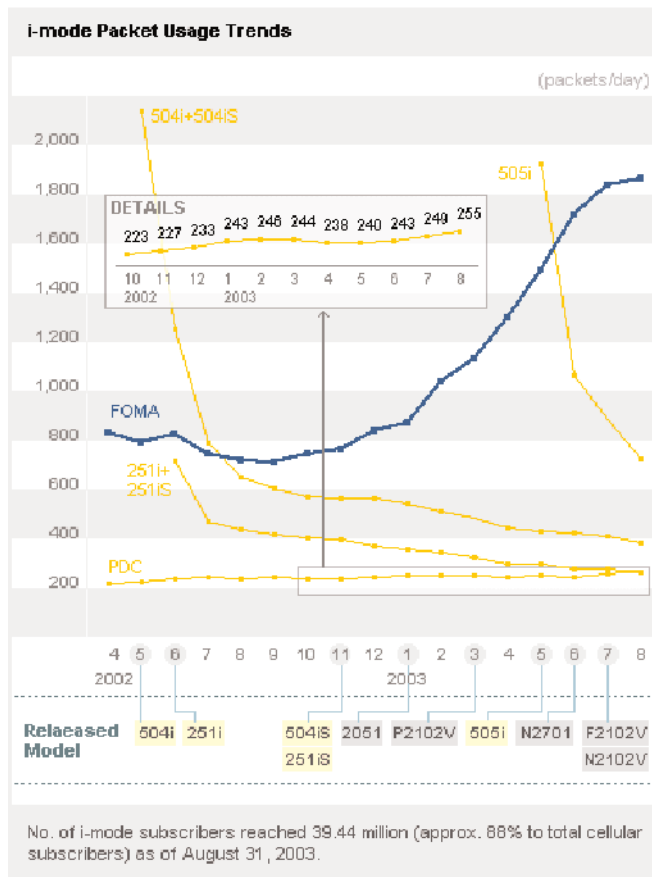
According to the Mobile Content Forum (MCF), an industry organization with 200 member companies, the total mobile content and commerce market in Japan generated by i-mode (as well as similar services by KDDI/au or Vodafone) reached an astonishing \$3.6 billion during 2003. Of that figure, \$2.04 billion was for mobile content while \$1.56 billion was for mobile commerce. Mobile content sales grew by approximately 11% during 2003 while the number of transactions over the mobile internet grew by more than 70% in the same period. In addition, mobile advertising has doubled from an estimated \$46 million during 2002 to more than \$92 million in 2003. Forty-five percent of mobile content is related to ringtone melodies while the remainder was mostly for visuals, games and information services. Growing at a pace of more than 30% annually, the total mobile content and commerce market in Japan is likely to reach around \$4.7 billion during 2004.

Managing ARPU: The Crucial Role of Mobile Internet Content

From the carrier's standpoint, the steady decline in voice ARPU is driving the urgent growth of mobile content businesses. It is important to note that ARPU in Japan has been much higher than in other countries, including advanced mobile societies such as Finland. To underscore the point, ARPU for i-mode services alone is now in the range of the entire ARPU of discount mobile carriers in Europe, such as Virgin Mobile.

As Japan reaches mobile saturation, the pressure on mobile carriers in Japan to maintain revenue in the face of stiff competition has been considerable. According to NTT DoCoMo, ARPU during 2003 was around \$73, down from \$98 in 1998, the year before the launch of i-mode.

Exhibit 3
i-mode Package Usage Trends
Source: NTT DoCoMo, September 2004



However, in 2003, revenue from i-mode use (including basic subscription fees, package charges and premium site subscriptions) reached an astonishing \$15.76 or almost 21.6% of total ARPU during that year. Most importantly, the mobile data ARPU contribution is still increasing more than 5% quarter-to-quarter. The decline of aggregate DoCoMo ARPU would have been much steeper if not for the contribution of i-mode services.

According to NTT DoCoMo statistics, in addition to spending significantly more on their overall mobile phone use, i-mode users also spend more on voice traffic than non-i-mode users. NTT DoCoMo benefits in multiple ways from the i-mode service and the Yankee Group estimates the actual i-mode effect on NTT DoCoMo ARPU to be in the range of a 26% to 28% boost.

According to NTT DoCoMo, package traffic spikes when new handsets with high functionality are introduced (see Exhibit 3). Consumers who purchase a new handset, such as the Flash-enabled 505i handset, tend to spend considerably on exploring the functionality and novel services offered by the phone. However, within 3 to 4 months, traffic decreases rapidly. An exception here is the FOMA service, which has had a steady increase in traffic.

III. Using Flash at NTT DoCoMo

Together with Java, Flash Lite has been part of an effort at NTT DoCoMo to increase the functionality of mobile phones. Flash Lite was first introduced in 2003 with the 505i series of NTT DoCoMo phones. Different from the web version of Flash, Flash Lite is not available for download—it must be pre-installed on handsets. Flash Lite was developed in close cooperation with NTT DoCoMo. Currently, the Flash Lite player has been installed in 28 mobile phone models sold by DoCoMo. All models released after the 505i phone—a major hit in Japan—come with a Flash Lite player integrated into the handset. We estimate that at least 15 million DoCoMo subscribers will have Flash-Lite-enabled phones by the end of 2004.

i-mode Content

As of October 2005, there were more than 4,400 official i-mode sites accessible through the i-Menu on NTT DoCoMo phones (see Exhibit 4).

The broad range of i-mode sites offer a corresponding variety of content. Distinctive ringtones or standby screens that personalize subscriber handsets are a major component of the Japanese mobile content market. Interest in more advanced services, such as games enabled by the introduction of Java and Flash Lite, is now increasing (see Exhibit 5).

Exhibit 4
Number of Official i-mode Sites

Source: NTT DoCoMo, September 2004

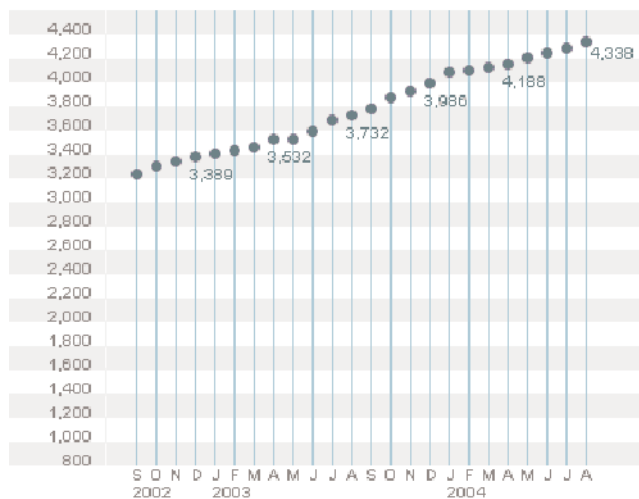
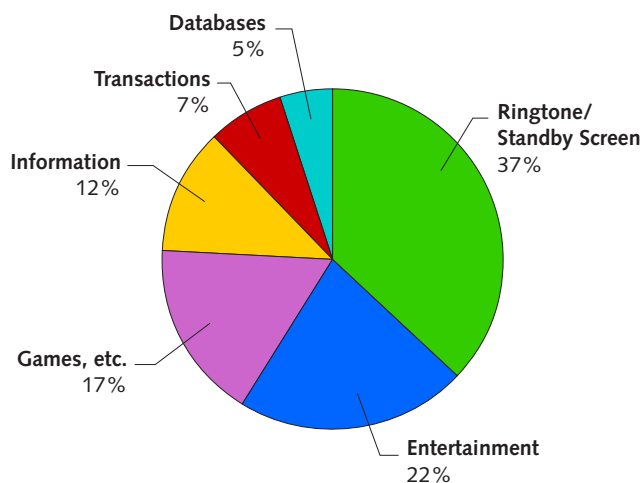


Exhibit 5
Access to i-Menu Content (October 2003)

Source: NTT DoCoMo and the Yankee Group, 2004



Flash Lite: The New Standard for i-mode Content?

Flash Lite has become a de facto standard for most of the large Japanese mobile internet content providers. We interviewed nine major content providers in Japan that are responsible for more than 1,000 sites. In addition, we surveyed another dozen smaller, unofficial i-mode content providers. Based on this research and information from Macromedia and NTT DoCoMo, we have estimated the penetration of Flash within the i-mode ecosystem:

- More than 60% of the 4,400 official i-mode sites (i-Menu) are Flash-enabled (only 20% were Flash-enabled at the end of 2003).
- Of the innumerable unofficial i-mode sites, 20% are Flash-enabled.

Bandai Networks, a spinoff company from the Bandai Corporation and a major content provider, revealed that 300 of its 600 sites use Flash. Bandai expects Flash use to increase rapidly during the next year. In fact, all content providers surveyed indicated that they plan to increase the number of Flash-enabled sites during the next year.

Bandai's dedication to Flash Lite is underscored by its commitment to develop new functionality beyond what Macromedia has provided in the Flash MX Professional authoring tool. Together with Interchannel (formerly NEC Interchannel) and two other content providers, Bandai Networks developed a content generator software tool called "Lite Work" for dynamically developing mobile content using Flash Lite. This investment has simplified the creation of more complex applications that rely upon rapidly changing data such as weather maps.

Not all content providers have been as rapid in their adoption of Flash Lite for mobile content development as Bandai Networks. For example, Index—a mobile content provider that was launched by Nissho Iwai, a large trading company—reports that only 20% of its sites are currently Flash-enabled. Nonetheless, even Index—a company that produces little animated content—expects more than 30% of its sites will be Flash-enabled within the next year.

Macromedia's Flash technology isn't the only way to deliver vector-based graphics on mobile phones. The SVG-Tiny standard (which Macromedia supports in its current 1.1 release) opens the door to competitive solutions. However, content providers appreciate the value of an established ecosystem as a major advantage to working with Flash. Companies we interviewed identified compatibility with their web-based Flash development and the large community of experienced Flash developers as major reasons for supporting Flash Lite over other graphics formats. In addition, several companies mentioned it was easy to speed development time of content using Flash Lite.

Flash Lite makes it much easier for designers to realize their concepts with high accuracy. Especially in complex projects with many partners, Flash helps to streamline the project workflow. Although we haven't attempted to quantify the impact of Flash Lite on time-to-market, content providers claim the development of complex projects such as short games using Flash typically takes only 3 to 4 months from concept to completion.

IV. KDDI's Mobile Content Initiative

NTT DoCoMo's main rival in the Japanese market, KDDI's au mobile service, released Flash-enabled phones in mid-2004—almost a year after the release of Flash Lite by NTT DoCoMo. KDDI's approach to competition with DoCoMo centers on a broad mobile internet content strategy with aggressive pricing.

Attempting to leapfrog the market leader, KDDI incorporated the updated Flash Lite 1.1 into the most advanced KDDI phones. It licensed Flash Lite 1.1 to leverage the existing Flash Lite content as well as quickly design its new, intuitive UI in Flash. The new UI can be consistently displayed across diverse handsets with varying OS, processors and screen sizes.

Two and a half years after the introduction of next-generation services, 88% of KDDI/au subscribers use next-generation phones. In addition, KDDI/au was the first company to introduce a flat-rate mobile internet service that offers customers two tariff categories, depending on the number of packets sent or received. The success of KDDI/au's mobile content initiative is best seen in the enormous popularity of the company's "chaku-uta" (or "ringtone song") service introduced in December 2002. This service enables customers to download an MP3 file together with a small video. In December 2003, KDDI/au introduced a more advanced service that uses Advanced Audio Coding (AAC) instead of MP3. The latest generation of KDDI/au files enables the download of files of up to 40 MB through KDDI/au's new service "chaku-uta Full."

Although the maximum file size used by the KDDI/au phones is the same as the NTT DoCoMo 900i FOMA handsets, KDDI's previously mentioned use of Flash Lite 1.1 differs in a number of instances from Flash 1.0 used by NTT DoCoMo:

- New features in Flash Lite 1.1 make it possible to update only a portion of the Flash content, a feature that enables effective network utilization and new application categories such as Flash-based advertising.
- Flash Lite 1.1 adds support for MP3 in addition to original audio formats: PCM, ADPCM and Yamaha's SMAF.
- Flash Lite 1.1 supports SVG-T, an industry-standard vector graphics specification.
- To seamlessly integrate Flash content with the handset, Flash Lite 1.1 enables developers to access date/time, battery level and volume.
- Flash Lite 1.1 supports text input.
- Flash Lite 1.1 also provides network access and connectivity supporting the creation of dynamic applications and user interfaces.

Although this report focuses on the NTT DoCoMo experience with Flash Lite, the KDDI deployment indicates that the Japanese market overall is increasingly embracing the technology (not just the i-mode ecosystem). KDDI is raising the technology bar with its deployment of the latest Flash Lite technology.

V. Flash Lite Applications

A phone with a 2.4-inch screen—even one with QVGA displays—struggles to entertain and inform the user. Flash technology proves invaluable on the phone because it saves clicks, provides a better visual experience and enables faster access to content.

All of the surveyed Japanese content providers indicated they are using Flash Lite to enhance hierarchical menus and to build user interfaces. Almost all large content providers list still or moving image delivery as a major application for Flash. Games and advertising were other leading application categories.

Animation, Animation, Animation

Image-related services are the main application area for Flash Lite. Image data delivered by Flash can be used for screensavers and still and moving images. Graphical applications include a broad variety of entertainment services, such as characters and comics like *Manga* (see Exhibit 6). Moreover, Flash Lite is used to enhance e-mail content in the form of electronic greeting cards.

Exhibit 6

Flash Lite Screenshots

Source: Japanese Content Providers



Developing Games Using Flash Lite

Developing complex computer games using Flash Lite has proven difficult because of an initial limitation of the file size available for Flash in DoCoMo handsets (20 KB). The most recent DoCoMo phones as well as Flash-enabled KDDI/au phones raise the limit to 100 KB, which enables complex games. However, game developers such as Hokkaido-based Hudson point out other limitations (besides the Flash memory limitation) to the success of large games developed for mobile phones. Most importantly, playing complex games takes time. The battery life of most mobile phones is not suitable for lengthy gaming activity. Although average mobile phone users in Japan seem willing to spend a few minutes on a phone computer game while waiting for a train or commuting to work, fewer users are interested in more extensive and complex games that require considerable time. For games that take only a few minutes to complete, Flash Lite is perfectly suitable.

VI. Building User Interfaces with Flash

Sophisticated information services using Flash Lite have characterized the first wave of innovation. However, Flash Lite extends readily to the critical task of developing dynamic, highly customizable user interfaces. With an animated graphic user interface, complex search operations can be simplified, eliminating the need to navigate through a series of hierarchical text menus. Animated graphics can help navigate through maps or complex graphical representations of data and information that are unwieldy on a standard 2.4-inch display.

A well-known example is the weather forecasting application that uses an animated graphical user interface to select the target area. In earlier versions of the service, users had to navigate through multiple levels of text menus. The data for the service continued to be displayed in unremarkable standard text. This stands in stark contrast to the appeal and ease of use offered by the smooth Flash animation of the improved user interface.

Both carriers are using Flash Lite for interface elements. Several NTT DoCoMo phones use Flash Lite for the i-Menu, the i-mode service homepage. Elements of the graphical user interface of the new KDDI/au phones are created using Flash Lite. In both cases, the user experience is clearly enhanced when compared to typical user interfaces on other phones. These experiences point to an increasing recognition of Flash's potential beyond content delivery. In the case of complex information services on a 2.4-inch display, animated user interfaces enhance user service quality and experience. As mobile phones morph into indispensable and ubiquitous appliances, the user interface will become an increasingly important differentiator. We expect that the work of the Open Mobile Terminal Platform alliance in Western Europe will seek standardization at the applications layer with a view toward concentrating differentiation at the user interface.

The concept of the highly utilitarian, differentiated user interface extends well beyond the mobile terminal. Flash Lite can be used in a number of devices, including digital cameras, car navigation systems and set-top boxes. Graphic and animated user interfaces with low-response latency can be used in every device that has a graphic display, including office machinery such as copy machines. In addition, providers can easily implement Flash as a GUI layer on embedded operating systems.

Flash offers two important technical advantages over the HTML/WAP browser:

- Flash Lite has response latency in the 0.1-second range, which is impossible to achieve with standard HTML/WAP browsers.
- Like Flash, Flash Lite is a unified platform and developers need not worry about different implementations, as is the case with HTML.

Equally important, Flash and Flash Lite help customers develop sophisticated GUIs for embedded applications in a much more straightforward fashion than currently available alternatives. As a technology that was originally developed for designers (rather than software engineers), Flash Lite also offers important advantages over Java virtual machine technology. Notably, using Flash or Flash Lite, designers can develop the user interface by themselves and need not rely upon engineers for the implementation. Consequently, companies will be able to streamline the development process and reduce development time for GUIs. Eventually, this will help companies develop better and more attractive products in less time.

A number of shortcomings remain even in the most recent version of Flash Lite that limit the use of Flash for user interfaces. For example, the "Load Movie" function in Flash Lite 1.1. only supports Flash files, not other video or animation formats. Although the challenges identified by the content providers are significant, Macromedia can address them in successive software iterations.

The next mobile revolution will see devices used as multifunctional terminals capable of making payments at a point of sale. As the phones are used to facilitate physical-world interactions, the user interface will have to enable a fast transaction (otherwise, the user won't see the phone as the convenient universal remote control). Flash Lite can play a crucial role in this transformation of mobile phones into multifunctional handheld terminals.

VII. Conclusion: Flash and the Future of the Wireless Industry

The last 2 years have witnessed a massive, global push to deliver branded content to the handset. The branded operator portal service environment has become a worldwide phenomenon, from Vodafone Live! and Reliance's R World to China Mobile Go Tone and Verizon Get It Now.

The recent content initiatives launched by NTT DoCoMo and KDDI show that Flash technology is a key differentiator in highly competitive, mobile-content-oriented markets. As the data experience becomes the focus of competition, we expect to see an emphasis on technologies such as Flash Lite. Late in the development of this report, Vodafone KK also announced new Flash-Lite-powered handsets. Therefore, the experience in Japan increasingly will be influenced by the ubiquity of Flash Lite.

Flash Lite's suitability to enabling a superior GUI is the most compelling capability for all players in the wireless value chain. Value in the mobile handset market is migrating and concentrating at the user-interface and applications layer. Flash Lite offers significant potential for competitive differentiation. With Flash Lite, user interfaces easily can be changed, adapted and customized. This offers compelling branding and personalization options for operators, content providers, end users and device manufacturers.

Macromedia's Flash technology is not the only way to deliver vector-based graphics on mobile phones. Yet Macromedia—with its experience in Japan and its community of developers—has a compelling proposition.

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