European Multimedia Messaging Market

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Introducing the Market Engineering Consulting Report

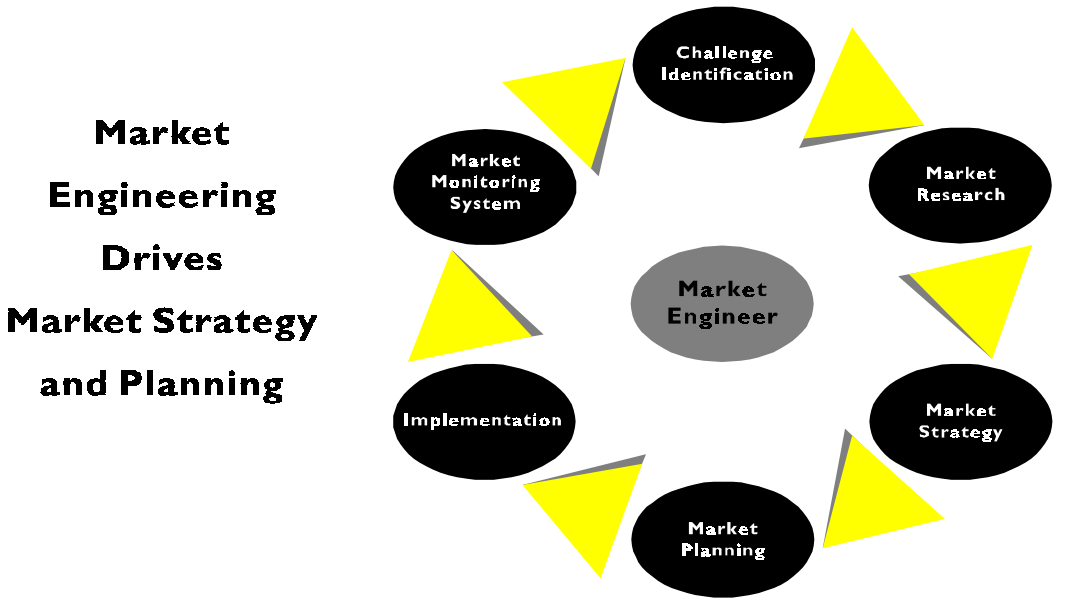
Frost & Sullivan's Market Engineering Consulting Report takes a unique approach to market research. It is based on the Market Engineering system—a market measurement system based on engineering principles, designed to lead to market success for the companies that use it.

This system is a continuous-loop improvement programme developed through years of market research and consulting experience. It has solved business problems and created strategies for Frost & Sullivan clients worldwide.

This system is based directly on the realities and challenges facing high-technology business rather than on theory derived at a university. Chart 1 illustrates the Market Engineering system.

Chart 1

The Market Engineering System



Source: Frost & Sullivan

The Market Engineering System

Frost & Sullivan's unique and proprietary marketing consulting system is a six-phase research programme:

1. Identify specific challenges
2. Measure precisely the challenges
3. Create the strategies for reaching company goals
4. Create the market plan
5. Implement the market plan and strategies
6. Monitor the market, market challenges, and company status against company goals

In Phase 1, the specific challenges to the industry are identified. These include opportunities, problems, and threats in the industry. Once the challenges are identified, they are used as the basis for designing the specific steps of the Market Engineering system and provide a common theme for the entire Market Engineering Consulting Report.

In Phase 2, the specific attributes of the challenges are measured. This disciplined market research measurement programme precisely identifies the location of the market and the attributes of the challenges. During this phase, Frost & Sullivan:

- Determines the measurements
- Selects the measurement instruments
- Designs the market research survey instruments

In Phase 3, this disciplined research process identifies, through precise market measurements, the exact market status, the market participants, and the challenges facing the market. The navigational information acquired in the market research phase is then used to identify company goals and develop strategies for attaining those goals.

In Phase 4, the client implements the strategy. Doing so entails creating a market plan that specifies the tactical steps for implementing the strategy. The marketing plan must be based on measurements, because a company can manage only what it can measure.

In Phase 5, the system is implemented. The plans and strategies are communicated to the staff and are put into practice throughout the company.

In Phase 6—a continuous improvement process—the market and its challenges are monitored, and the company's market position is observed and measured against the company's goals. Changes in status are monitored by frequent market measurements. This process

checks the accuracy and efficiency of the previous phases and allows the company to improve the system based on its experience.

Frost & Sullivan's publication entitled *Market Engineering*—a 500-page training manual based on actual case histories—provides more information on the Market Engineering consulting philosophy.

Market Engineering Report Elements

Identification of Industry Challenges

This section of the report illustrates the major challenges, opportunities, problems, and threats facing the industry. These challenges ultimately affect the choice of measurements, the market forecasts, the strategic recommendations, and the monitoring programme.

Market Engineering Measurements

These measurements are designed on the basis of the unique attributes of the market. Each market segment chapter of this report has a Market Engineering measurement chart summarising the measurements for that segment. The measurements are meant to significantly expand the client's understanding of the marketplace.

Measurement Trends

The identification of the trend for each measurement has tremendous strategic value. The data point on any measurement holds limited strategic value for a market participant. But when trends over time are determined, the measurement can be used to forecast threats and opportunities and drive strategic formulation. These trends are summarised for each market segment in the Market Engineering measurements charts.

Market Engineering Forecasting

Market Engineering is a measurement-based forecasting system that focuses on the challenges to the industry and draws on the expert opinion of analysts and on econometric variables. This unique system establishes solid credibility with industry participants. These forecasts are integrated into each market segment chapter and are supported, where appropriate, by two bullet-point tables of the market drivers and restraints.

Market Share Analysis

In this section, key companies are strategically analysed wherever possible to determine why they gained or lost market share over the preceding year. This analysis provides excellent support for competitive benchmarking programmes.

Measurement-Driven Market Engineering Strategy

Strategic recommendations, found in the Market Engineering strategy chapter, are formulated from the Market Engineering measurements using Frost & Sullivan's unique system of generating strategic recommendations. This system is an effective tool for designing strategy because market participants understand how and why the recommendations were created.

Market Engineering Monitoring

Market participants should frequently monitor the markets in which they compete. In this report, Frost & Sullivan incorporates several key elements to help each company monitor its market position more accurately.

Recommendations for Further Research

These recommendations are based on the Market Engineering system. They help customers understand other research options that might significantly improve their market understanding and position. This section is integrated into the Market Engineering monitoring chapter.

Strategic Benefits of Market Engineering for Readers of This Report

This Market Engineering report provides significant strategic benefits not available from a standard market research report that merely describes the industry. This report provides companies with a foundation for improving their position in the marketplace. This foundation is the measurement-based marketing and sales system, from which strategies and plans for action can be developed.

Integrating the Market Engineering system into this report has another major benefit—the training of the entire management team on the elements of strategic business marketing and decision making.

Frost & Sullivan has conducted management training worldwide for more than 25 years. Frost & Sullivan has seen a great need for more advanced sales and marketing training within virtually all companies. Training is necessary for many reasons:

- Markets are constantly changing, which tends to make experience and previous training obsolete.
- Key executives are being promoted into positions for which they were not trained.
- The university educational system focuses on theory, which may not be directly applicable to high-technology or industrial markets.
- Market success depends on unified teamwork. Without a thorough understanding of industry challenges, measurements, and strategy, teamwork is not possible.

Top Ten Benefits of a Market Engineering Consulting Report

This section describes the ten key benefits that Market Engineering brings to this strategic marketing consulting report (Figure 1).

Figure 1

Market Engineering Consulting Report: Top Ten Benefits (Europe), 2001

Rank	Benefits
1	Integrates all departments around market dynamics
2	Helps companies be market-oriented
3	Is a practical, reality-based system
4	Provides a navigational tool for goal attainment
5	Integrates competitive benchmarking improvement benefits
6	Stimulates ideas and action
7	Provides a foundation for strategy brainstorming sessions
8	Develops a more competitively aggressive team
9	Serves as an excellent training tool to build teamwork
10	Drives market- and customer-oriented business plans

Source: Frost & Sullivan

A Word of Caution

Readers of this Market Engineering report, particularly marketing managers with years of marketing experience, may at first think that the information is not new. The difference in this report lies in the strategic significance and benefits it offers. Companies should focus on the following points to derive maximum benefit:

- Information that may seem obvious to many may not be so to all, particularly those new to market research.
- Information in this report should be used to make the entire company aware of the market dynamics.
- Though some strategic recommendations may seem obvious, a closer look may suggest specific actions for the company to take to succeed in the market.
- All companies in the market have the same information. The winners in the market are those that interpret the information and translate it into action.
- Using the strategic recommendations in off-site strategic brainstorming sessions among management team members may lead to a unique and effective strategy for success.
- This Market Engineering report does not in itself map out the most effective strategy. Rather, it is a tool to help companies create and reach their goals.

Frost & Sullivan hopes that this report helps drive change and improvement. Readers should feel free to contact Frost & Sullivan with feedback or arrange a strategic discussion session with the analyst team.

1

Executive Summary of the European MMS Market

Executive Summary

Market Overview

As the cost of voice communications drops, mobile data services becomes a paramount revenue stream for wireless carriers. The short messaging system (SMS) achieved unexpectedly high use levels as a way of communicating amongst people, particularly pre-paid youngsters. The market success and growth of SMS in Europe show that the multimedia messaging service (MMS) can be one of the most lucrative mobile services in the near future. Mobile communications is swiftly evolving from a mainly traditional voice-oriented industry into a content and personal information-oriented one.

MMS will provide the ability to exchange not only text, but also pictures, audio, animations and video via a mobile phone. Another messaging standard called enhanced messaging service (EMS) has already arrived in Europe and brings some multimedia features such as basic images and ringtones. Nokia has been offering a similar but proprietary protocol for messaging called Smart Messaging since 1997.

Enhancements in network connection and data transfer rates are crucial requirements for the deployment of MMS. Hence, 2.5G technologies, which represent the first significant step towards third generation (3G) promising much higher processing speeds, will facilitate operators to launch MMS in the short term. However, the delivery of general packet radio systems (GPRS) in Europe has been repeatedly delayed due to mobile operators' financial problems as a result of their expensive bids for 3G licences.

Operators are relying on MMS to give them the necessary financial returns and average revenues per user (ARPU) improvements to begin a phase of continuous growth.

The main requirements for the deployment of MMS are the availability of GPRS infrastructure and MMS-enabled terminals, the implementation of MMS centres platforms on the

network and the development of multimedia content and applications. In addition, operators need to have billing systems to cater for both contract and prepay customers. Pre-pay users will continue to have a predominant role in the development of MMS, as they do in SMS. Therefore, the set up of a real-time billing system for prepay customers is a must for reaping the full rewards of MMS.

MMS will integrate with the Internet world and the interoperability between the fixed and the mobile worlds is complicated from a technical and billing perspective. Other messaging developments such as unified messaging (UM) and instant messaging (IM) are very important as they will converge, impacting and driving each other.

MMS Value Chain

The MMS value chain is formed by network operators, MMS platform vendors, handset manufacturers and application providers. The various technical and functionality aspects of MMS are being standardised by third generation global project partnerships (3GPP) and the wireless access protocol (WAP) Forum. Mobile operators will install in their networks an Internet protocol- (IP) based store-and-forward messaging centre specifically designed for MMS. An MMS user agent is also needed on the mobile station. MMS platform vendors supply operators with MMS centres (MMSC) and in some cases the user agent. There are currently 13 MMSC providers in the marketplace. Most of them also market SMS infrastructure in Europe and many unified messaging, instant messaging, mobile Internet, voicemail and e-mail solutions. These vendors include:

- Alcatel
- CMG
- Comverse
- Ericsson
- Logica
- Materna
- Motorola
- Nokia
- Openwave
- SchlumbergerSema
- Tecnomen
- Telecommunication Systems
- Unisys

Frost & Sullivan anticipates more players will join the European MMS infrastructure market, either moving from the unified messaging or e-mail messaging arena. So far, six network operators have awarded contracts to four MMS vendors for the MMSC:

- Xfera - Comverse
- Telenor (four countries) - CMG
- Telia - CMG
- Hutchison 3G - CMG
- Sonera - Nokia
- Vodafone (seven countries) - Ericsson

Frost & Sullivan believes that CMG, Logica, Comverse, Alcatel, Motorola, Nokia and Ericsson are best positioned in the MMS race. Mobile operators will be looking to buy MMS solutions from existing SMS suppliers or, due to the financial burden of the 3G awards, from their network infrastructure provider. The latter will be able to offer MMSC bundled into 3G infrastructure products and can provide an end-to-end solution including MMS-enabled handsets.

Leading network operators are planning to start offering MMS during the second half of 2002. The vast majority of the European operators are trialling MMS technology from different vendors over their GPRS networks and using either personal digital assistants (PDA) or the Ericsson T68 in the terminal side.

With regard to mobile devices, Ericsson and Nokia have both unveiled models of MMS-capable terminals. The Ericsson T68 and the Nokia 7650 will start shipping in Europe during the first quarter and the second quarter of 2002 respectively (T68 is currently available supporting EMS). They will be priced high and so will initially target the high-end of the market should the operators not subsidise heavily. Motorola and Siemens will release their MMS terminals during the second half of 2002 and Alcatel during the first quarter of 2003. Other handset manufacturers will follow, those already marketing 3G multimedia phones in Asia (Panasonic, NEC and Sanyo), magic4 customers (Philips, Sagem and Sendo) and others.

Outlook for MMS

Primarily MMS will be a person-to-person or peer-to-peer (P2P) application. At the present time, an average of 98 percent of all text messages being sent in Europe are P2P. Digital cameras integrated in handsets and multimedia albums will spur P2P communication through self-created content such as postcards, getting a second opinion when shopping and endless other possibilities. However, Frost & Sullivan believes that a much higher proportion of traffic will correspond to application-to-person communication such as information services, entertainment and music. Server-based content, as opposed to self-created, will be key in MMS.

Throughout its research, Frost & Sullivan has identified the major barriers for future uptake of MMS in Europe. Firstly, it is anticipated that there will be a substantial gap between customers' expectations and the reality in terms of both price and user experience. With regard to price, subscribers expect a similar price for sending a multimedia message as for SMS. While Frost & Sullivan believes that, generally, MMS will be priced relatively low, there will be some operators that will set high prices based on unrealistic end-user eagerness. In addition, the high cost MMS terminals can ruin operators' ambitions to create a mass-market service from day one, especially taking into account the impracticality of carriers' subsidies of handsets. As for quality of the service and end-user experience, Frost & Sullivan foresees interoperability and roaming problems being present during 2002 and several months of 2003. Furthermore, disappointing GPRS data rates and lack of MMS handsets penetration will also affect users' perception of the service.

Frost & Sullivan, wary about overestimating the importance of MMS in the next couple of years, has forecast that in 2002 only 6 percent of the total handset shipments will be MMS-enabled devices, excluding PDA. It will not be until 2005 that the penetration of MMS handsets will reach mass market levels. Subscribers will send an average of five messages per month in 2002 and by 2006 this will increase to 28. As traffic rises, so will the average size of messages exchanged.

In 2006, Frost & Sullivan expects MMS revenues for operators to reach $26 billion. One out of four messages sent in 2006 will be a multimedia message.

Conclusions

While SMS revenues are expected to go down in the coming years in Europe, MMS will inherit its success and contribute very heavily to operators' data revenues. MMS is the major business case on the way to 3G. There are various technical and commercial challenges and barriers on the way to mass market adoption, which will take more time to materialise than many have anticipated.

MMS will bridge the Internet and mobile worlds. Operators will have a central role in the MMS value chain, forging the right relationships with third-party content application providers and retaining the ownership of the applications. In addition, providing an integrated and consistent experience for the user will be key for operators, and customer education will be key.

2

Introduction: Precursors of Multimedia Messaging

Introduction

Evolution and Use of Wireless Information Services

Increased competition in the wireless market is driving network operators and service providers to introduce new, differentiated services in an effort to increase market share, reduce churn and increase revenues as they move towards third generation (3G). This has created a lot of hype and over-promotion that has exaggerated the real capabilities of new wireless information services and the timeline for their introduction. Wireless access protocol (WAP) services in Europe are a prime example where inaccurate marketing and the media exaggerated WAP's capabilities, usability, and the scheduled availability of handsets and related services. Figure 2-1 outlines the evolution of wireless information services. The types of services that can be accessed with a mobile phone and the experience this creates does not compare to accessing the fixed Internet from a PC. The same variety and quantity of services do not exist in the wireless space and even if they did, it would be impractical to view most of them from any of today's wireless phones.

The telecommunications industry has shown a propensity to over-promise and over-estimate the types of services subscribers will find valuable and be willing to pay a premium for. Wireless data services have the potential to be very valuable revenue generators, benefiting network operators, service providers, content developers, wireless advertisers and marketers, and wireless subscribers. However, the groups that are working together to develop the wireless channel will have to be careful not to assume too much about what subscribers will be willing to accept, find valuable and pay a premium for. The network operators and service providers need to educate subscribers about how wireless information services can be of value to them and fulfil their needs and interests. This will be one of the key drivers for the

uptake of wireless services. General packet radio systems (GPRS) and 3G will both suffer from over-promotion if operators and service providers do not start to market the services that are available today, and deliver them via channels that are ubiquitous amongst today's handsets and terminals.

Figure 2-1

Total Multimedia Messaging Services Market: Evolution of Wireless Information Services (Europe), 1998-2003

Year	Development
1998	First release of WAP
1999	NTT DoCoMo launches I-mode service in Japan
2000	Early WAP phones and services launched with disappointing results and low sales; leads to 'WAPlash'. By the end of 2000 I-mode has approximately 17 million subscribers
2001	Initial roll out of packet based GPRS networks in Europe is expected to help drive the uptake of wireless services and development of better handsets in Europe. Initial roll out of NTT's 3G W-CDMA network in Japan. At Q2 2001 i-mode has over 25 million subscribers and 1,500 official content sites. First EMS handsets shipped. Operators start trialling MMS platforms
2002	Broader roll out of GPRS networks in Europe and the USA. M-Services and WAP 2.0 compliant handsets released to the market in bulk. Revenue share models announced between service providers, operators and content providers to drive the creation of more compelling and valuable premium content. First MMS terminals and services launched in Europe
2003	Scheduled initial rollout of 3G networks in Europe. Mass uptake of GPRS services and handsets

Source: Frost & Sullivan

As a result of the disappointment and negative press that surrounded the launch of WAP services in Europe, many content developers, service providers and network operators have shifted their immediate focus to short message service (SMS), as a viable, practical and profitable delivery channel for both person-to-person messaging and content services. The key factors that make SMS such a popular delivery method are that it is available in virtually every handset, simple to use, inexpensive, has a critical mass of users, and is a significant revenue generator for network operators. Most of the content that is being developed today is SMS-based. SMS presents a good way to introduce subscribers to content services and migrate them towards delivery methods such as WAP and multimedia messaging service (MMS) that will support more compelling, premium content.

In 2000, mobile revenues represented 30 percent of total worldwide telecommunications revenues, at approximately $273 billion. This was generated almost entirely by voice communications. However, subscribers are being pushed to adopt more data-based services as voice average revenues per user (ARPU) are being driven down. As it is today, wireless subscribers in Europe have been slow to adopt wireless information services. Some of the key reasons for this are outlined below:

- Packet-based networks enable more efficient and rapid access to services. Europe is only now in the process of rolling out packet-based GPRS networks, making the transfer of data easier and faster. However, the majority of subscribers are still on circuit-switched global system for mobile communication (GSM) networks. SMS does not require packet based networks.
- Lack of appealing handsets capable of accessing wireless services, with an easy to use graphical user interface (GUI). SMS is fully operational on almost 100 percent of current handsets.
- Lack of good quality content that can be displayed effectively on all mobile devices. SMS is restricted to 160 characters of text and can only deliver basic content.
- The billing structure for accessing information has been very complex and expensive. Circuit-switched networks do not have an always-on connection as packet-based ones do, therefore users have been charged for slow connection times and data downloads. Most operators are currently rolling out reverse billing, which enables them to bill the subscriber for receiving SMS messages. Until these billing systems are in place, it is the sender that pays.

Wireless Internet Services versus Fixed Internet

It would be incorrect to look at fixed and wireless communications channels as direct competitors, and to assume that applications that are popular on the fixed Internet will also be over wireless. Figure 2-2 outlines the key differences between fixed and wireless Internet data services, and as is seen, the two are used for very different reasons and by different people. It is important to remember that, to date, the primary use of a mobile phone is to communicate by voice. Although data communications are starting to increase, and more data-centric and user-friendly terminals are being developed and launched, a mobile phone is all about convenience and mobility. Therefore it is important to develop content that is relevant, easy to use, inexpensive to access and can be supported on current mobile terminals. This is why SMS is so popular as a channel for messaging and content delivery.

Figure 2-2

Total Multimedia Messaging Services Market: Key Differences Between Fixed and Wireless Internet Data Services (Europe), 2002

Device	Primary Purpose	Content Preference	Willingness to Pay	Locations Used
PC	Information retrieval and browsing	General directory portals	Low	Mainly at work
Wireless	Communications–e-mail, SMS and voice	Entertainment and infotainment such as games, sports, horoscopes, ringtones	High	Anywhere, anytime

Source: Frost & Sullivan

Adoption of Wireless Information Services and Network Type

Many complementary wireless technologies, such as location-based services and Bluetooth, are still in development stages and will not become mainstream with mass market take-up until 3G. If 3G lives up to the hype, it should enable new wireless services and technologies, better phones and communicators, and quicker always-on connections. All of these will enable much more interactive, seamless multi-modal communication than is currently available. For wireless information services to succeed in Europe, they need to be more compelling and exciting. There are a number of factors that will drive the uptake of wireless services in Europe but several of these need to be resolved in order for that to happen. They include the availability of quality content, GPRS handsets, clear billing structure and tariffs, and a sustainable business model between the network operators, service providers, content providers and handset vendors.

Figure 2-3 outlines the timeline for the development of wireless services as they relate to network technologies. The take-up of wireless data services such as WAP and MMS is expected to be driven by the availability of GPRS networks and handsets that are better able to transmit and display data and good quality content.

Figure 2-3

Total Multimedia Messaging Services Market: Evolution of Mobile Data with Network Type (Europe), 2002

Functionality	Features
GSM	Associations and standards bodies formed to collaborate on formulating WAP standards
	Initial introduction of WAP services
	Launch not very successful—over promised and infrastructure not in place to support it; circuit switched network was not very good for accessing wireless services
	WAP services mired by failed launch and negative public perceptions of 'wireless internet'
	GSM Association and Openwave release M-Services initiative, aimed at setting minimum set of requirements for handset vendors so as to make handsets better able to display content in a more compelling fashion
	Trying to bring some consistency to the industry
	WAP 2.0 released: outlines set of specifications aimed at improving the quality of wireless content
	Based on best of XHTML and WML, which should make it easier for content developers to develop good quality content
GPRS	Further uptake of WAP 2.0 and M-Services
	GUI make navigation and viewing of wireless services a much richer experience, contributing to its uptake
	Packet based network means better reliability and user experience for services due to always on connection and faster data transfer speeds
	Enhanced services such as instant messaging, location based enhancement, interactive alerts and exchange
	Revenue share models introduced between content providers and wireless portals–attempting to drive creation of top quality content; make it valuable for developers
	Billing–develop clear, easy billing models so consumers understand what they are paying for, ie. the quantity of data in terms of the service, not the actual data (bps)
	Educate subscribers about what wireless services are and how they can be of value to them
	Shift away from communicating the technology towards communicating and marketing the basic services
UMTS	Enhance current services
	Faster and more reliable
	Greater ability to push information and alerts to subscribers; and more interactive, instant services
	Devices more integrated PDA/mobile phones–more multi-functional with sound, video, images, animation, etc

Source: Frost & Sullivan

SMS Definition and Benefits

SMS is available on all digital networks and enables the transmission of maximum 160 characters of text between mobile phones and PC-based e-mail, paging and voicemail systems. SMS is considered to be a smarter protocol than paging because it can notify the sender when the message is both sent and received. SMS has been called the 'lowest common denominator' bearer for inter-personal text messages. Person to person (P2P) messaging is the most popular form of SMS at present, accounting for 94 percent of total SMS traffic. SMS content services are in development and will account for just 6 percent of SMS traffic in 2002. However, this is forecast to grow to 15 percent in 2006.

There are two types of SMS. MO-SMS is mobile originated, meaning it is sent from a handset to the destination handset or fixed Internet, via the short messaging service centre (SMSC). MT-SMS is mobile terminated. This means the SMS originates with the network operator or voicemail system and is sent to the mobile handset, via the SMSC. Network operators and service providers want to encourage MO-SMS because these generate revenues, whereas it costs the operators and service providers to send MT-SMS to subscribers. Figure 2-4 shows the key functionality and features of SMS.

Figure 2-4

Total Multimedia Messaging Services Market: Key Functionality and Features of SMS (Europe), 2002

Functionality	Features
Basic Functionality	Delivery of notification and alerts
	Guaranteed message delivery
	Reliable, simple and low cost
Enhanced Features	Forward and delivery to multiple recipient groups
	User groups
	Integration with other data services and applications
Value Add	Increase network traffic
	New revenue streams from new VAS
	Over the air service provisioning
	CRM/marketing/promotions
	ROI

Source: Frost & Sullivan

SMS first appeared in Europe in 1992 when it was written into the GSM Phase 1 standard. Its initial application was for voicemail notification. SMS was not actually marketed as a P2P messaging tool until early 2000 as a result of the youth market who are predominantly prepay subscribers, adopting it as their own generational technology. Operators were not able to bill prepay subscribers for SMS, hence it was free to send SMS whereas voice calls were more costly. This contributed to the initial rapid growth in use. Operators were unable to bill prepay subscribers for SMS because links between the prepay platform, billing systems, and SMSC were not in place. When prepay billing for SMS was implemented, traffic levels fell off slightly, however it soon increased again and reached pre-charging levels. The cost of sending an SMS was still less than a voice call. SMS pricing has been shown to be price inelastic in some markets where SMS traffic continued to increase despite increases in the cost of sending SMS. In 2000 SMS was launched on non-GSM networks and is now supported by most network technologies.

Some of the key drivers for SMS use are:

- Almost every handset supports SMS, thus eliminating the need for a separate messaging device.
- Easy to use and inexpensive.
- User pays; reverse billing will enable operators and service providers to bill the recipient for premium SMS content, which will drive use of SMS content and entertainment services.
- Full interoperability across devices on GSM networks.

The SMS market will continue to evolve and develop, reaching maturity in 2004. After this time it will remain a popular messaging channel, however growth will level and start to decline slowly as new technologies such as MMS and WAP are launched to the mass market. As with other wireless content delivery channels, value chain partnerships and business models are negotiated on a case by case basis. This is one of the obstacles in getting mass market adoption of SMS content services. Like WAP services, there is very little content actually being developed for SMS because the data services market has been slow to take off in western Europe, and there is a lack of comprehensive business models. There is a clear trend towards favourable revenue share for revenues generated by subscriptions to premium-value added services (VAS) and increased network traffic.

Benefits

Messaging in general is the killer application for wireless. The main reason for owning a mobile phone is to communicate. Text-based messaging is just an extension of voice communications. The easiest and most convenient way to send messages today is with SMS. SMS represents the first step on the evolutionary path of wireless data. Additional information and entertainment based content can be delivered with SMS, adding incremental value and introducing new revenues and CRM opportunities for network operators and service providers. SMS can provide up to a 95 percent margin for operators.

SMS penetration is higher than any other mobile data application, and is highly intuitive. It is here and now, easy and simple to use, operates with minimum bandwidth, still has strong growth potential, is presence-enabled with confirmation of message delivery, and it is supported by all GSM networks with full interoperability between carriers and handsets. SMS services can be easily migrated to next generation networks, meaning content and services will not need to be adapted for GPRS and UMTS network technologies. This means that operators have infrastructure investment protection because demand will continue over 2G, 2.5G and 3G.

SMS is a key revenue source for network operators. Initially, SMS was not marketed as a P2P messaging service. Therefore when it started to grow in popularity, generating massive volumes of network traffic and hence revenues, it took the operators by surprise. They have since undertaken to market SMS services and are working with content developers and aggregators to launch premium rate SMS content services. The perceived value of SMS is high compared to the investment cost required to implement SMS infrastructure. In many cases, the ROI can be calculated in months, and for some operators in weeks.

SMS Content

The marketing of WAP services has fallen off since WAP's failed launch and subsequent "WAPlash". Although development of WAP-enabled handsets and WAP-based services is still very much part of network operators' and service providers' next generation strategies, there has been a noticeable shift to SMS as the more viable delivery channel for the short to medium term. Commercial focus is on SMS, whereas Research and Development is focused on WAP, 2.5G and 3G. SMS will continue to supplement and complement next generation networks and devices, where its importance and utility will not be diminished. It will continue to be used for spontaneous, simple P2P messages, however content will start to take advantage of more interactive and richer technologies, such as MMS and WAP.

SMS can fulfil basic information requests over any network, whereas next generation technology is used for more enhanced services, such as getting a picture map with your location and co-ordinates, instead of a basic text description. SMS complements the services and applications that can be sent and received over GPRS networks. Always-on, higher band-

width GPRS networks will enable users to request and receive links to push-based content, and access it via a faster, more reliable WAP connection. For example, a subscriber might receive a SMS message with a WAP link they can select. They would then be taken to the WAP page where they will find more detailed information. WAP is not very well suited to "surfing", or searching for information. However, WAP applications can be useful when used in combination with SMS alerts because the subscriber can receive information they have requested, and either view it through the SMS or store it for later. Subsequently SMS migrates subscribers to premium content and drives the uptake of WAP services.

Enhanced Messaging Service

EMS Definition and Standards

Overview

The enhanced messaging service (EMS) is a mobile messaging standard recently developed by the third generation partnership project (3GPP). It is considered the next step in the development path of mobile messaging in which users are able to send not only text but also basic pictures, sound, animation and text formatting enhancements. Thus, as the market develops, enhanced messaging is positioned as an interim standard or an evolutionary step between plain text and towards multimedia messaging.

Currently, there are three types of enhanced messaging standards: Smart Messaging, magic4 and EMS. For the purpose of this report, Frost & Sullivan has differentiated between EMS and enhanced messaging, the latter encompassing all the different types of messaging schemas alluded to before. The evolution of these standards is discussed later. EMS allows the inclusion of binary objects in SMS messages. Multimedia content such as melodies and images can be inserted into one or more messages. The specifications for EMS allow for mobile phones to be preloaded with certain images and sounds that can then be referenced by an incoming message. EMS-enabled handsets can also include image and sound editors.

EMS places additional requirements on the handset, which needs to be installed with specific software. However, all enhanced messaging standards (Smart Messaging, magic4 clients and EMS) use existing SMS infrastructure. Virtually there is no need for technology investment by the operator. Nevertheless, as an EMS message carries more data than a normal SMS message, the delivery of EMS services has an impact on the network capacity. Already some network operators are concerned with the capacity issue due to the unexpected escalation of SMS communications and further efforts might be needed to ensure quality of service.

Timeline and Key Features of EMS Standards

Initially, it was Ericsson that submitted the concept to the standard setting bodies ETSI and 3GPP. The three companies looked for support by the rest of the leading handset manufacturers to decide whether it was worthwhile to embrace and commit full resources to the EMS standardisation. Since all major vendors, except Nokia, eventually backed EMS, 3GPP incorporated, developed and finalised the standard. These handset vendors were Motorola, Siemens, and Alcatel although many other companies contributed to the development of the EMS specifications.

The first release approved within the standard bodies was release 99 in 2000, but this was very limited in terms of functionality and the lack of support by Nokia and client software developer magic4 (partly owned by Phillips). In June 2001, 3GPP publicised the release 4 of the EMS technical specification described in the TS 23.040 specification. Release 4 defined the first version of EMS based on simpler pictures and ringtones than the most recent version outlined in release 5. Release 5 is expected to be completely finalised and approved by the beginning of 2002.

While the version 4 of the specification did not add significant features to plain-text messaging, the current EMS release 5 proposal includes support for:

- Various text justification, style and size settings, new image and data formats
- Vector-based image formats
- Pre-defined user-defined monophonic sound based on iMelody standard
- Polyphonic sound formats
- Variable size black and white, 4-colour grey-scale and 64-colour images and animations.
- Use of concatenated SMS
- Media library
- Mobile-originated EMS messages
- Advanced sound formats
- Object distribution control bit
- Extended objects: EMS forms and menus as well as sessions ID
- Compression

Figure 2-5 outlines the key features and formats that the EMS release 5 standard will support.

Figure 2-5

Total Multimedia Messaging Services Market: Key Features and Media of EMS Release 5 (Europe), 2002

Media	Features	Formats
Text	Plain Text	GSM 7-bit alphabet text
	Text Formatting	16bit plain text
		Text style, alignment and size
Images	User-defined basic B&W, greyscale and colour graphics	1-bit Small: black and white 16x16 pix
		1bit Medium: black and white 32x32 pix
		Extended 2-bit: greyscale bitmap up to 255x255
		Extended 6-bit: 64-colour bitmap up to 255x255
		No Max but 96x64 recommended
Sound	Predefined and user-defined sounds and tunes	Predefined sounds
		Polyphonic tunes
		User-defined through iMelody standard
Animation	Predefined and user-defined moving pictures	Small (8x8 pix)
		Large (16x16 pix)
		Extended 1-bit: B&W frames up to 255x255
		Extended 2-bit: greyscale frames up to 255x255
		Extended 6-bit: 64-colour frames up to 255x255

Source: Frost & Sullivan

Extended Objects

It is important to underline the support for the extended objects feature within release 5, provided by the incorporation of magic4 to the standard. This allows handset manufacturers to differentiate within the standard and allows for richer data services and business and m-commerce applications. EMS Forms plug-ins are the most important element of extended objects. These are user-defined templates and menus sent over-the-air offering check boxes, radio buttons, text and numeric input boxes and hidden fields so recipients can select, interact and submit the form data.

The potential applications for EMS forms are:

- Subscriber registration and preferences making data input easy and uncomplicated.
- Gaming: combining pictures, sounds and forms, the game experience is enhanced.

- Forms can be used to retrieve location data such as network code and cell ID. Variable-sized images can be used to provide maps.
- CRM and marketing: powerful branding and good campaign follow-up mechanism.
- M-ticketing.
- M-couponing.
- Non-specific binary data: delivery mechanism for plug-in data, such as new game levels.

EMS Handset Development

Interoperability

Compatibility between handsets is considered essential for EMS success and mass-market uptake, as it was for SMS. Currently, the EMS standard is being pushed by all the major handset manufacturers except Nokia, which has decided to forgo EMS completely and chosen to stay with its own Smart Messaging technology, incompatible with EMS.

The standards and the interoperability situation has changed over time. In 2000 and most of the first half of 2001, different companies were pushing three different enhanced solutions for messaging:

- Nokia and Smart Messaging. Nokia developed this standard and implemented it into its phones in 1998.
- Magic4 and the magic4 client. The company originally developed its own proprietary software client, which was embedded into devices like Motorola's and Phillips's GSM phones. In 2000, the magic4 messaging software comprised proprietary text information encoding technology (bar coding) and media types.
- Ericsson and its new EMS concept.

In May 2001, Alcatel, Ericsson, Siemens and Motorola announced they would support the implementation of EMS and would collaborate towards interoperability between their mobile phones. They joined 3GPP to contribute to EMS development. In turn, Magic4 submitted a change request and gave away elements of its work to 3GPP. The company owned intellectual property rights covering the use of bar coding in the wireless environment, but now this is licence-free to any company that wants to adopt it. Thus, the standard committees were able to extend the EMS scope by including magic4 client's features. The company is now committed to developing an EMS standard-based product. In fact it has had an active role to extend EMS to release 5 and is the first to offer EMS release client.

Nokia continues to avoid committing to support the concept of EMS. The company not only refuses to open standards but has also raised objections at standard bodies discussions. Nokia was one of the first companies to push MMS over GPRS, so MMS would gain market share quickly, making EMS a short-lived temporary technology. Had MMS been postponed until 3G is rolled out, the gap between Nokia's Smart Messaging and the next messaging phase would have been too wide. Additionally, it has been argued that this might be a strategy to increase sales. Namely, the likelihood that a user without a Nokia handset would not be able to send to or receive enhanced messages from friends is high due to Nokia's strong share of the mobile phone market and consequently, this may induce those users to buy a Nokia terminal.

Having said that, Nokia's position has somewhat changed. Firstly, it announced enhanced messages interoperability between its mobile devices and Ericsson's. Frost & Sullivan believes Nokia will end up supporting EMS in the same fashion as magic4, which saw its customers' list enlarge since embracing the standard. More importantly, Nokia supports the GSM Association's M-Services initiative for which MMS is a key focus. Magic4 has developed an enhanced version of its technology, magic4 SMC, that converts Smart Messaging content into magic4 content, allowing Nokia and magic4 handsets to interoperate.

As a result, at the present time, two competing standards are dividing the European mobile phone market: Nokia's Smart Messaging and EMS. However, to some extent, the lack of interoperability between these can be overcome by new components added to SMSC. This new function enables content conversion between different enhanced messaging formats: old magic4 client, Smart Messaging and EMS. In some cases, depending on the platform supplier, the centre would verify the capabilities of the receiving handset. When this is an SMS handset, the conversion function would take off the portions of the message that the handset cannot receive.

Magic4 has signed deals with companies to provide SMS-based software platforms that translate Smart Messaging into a format that EMS users can read. The problem is that it only works one way so Nokia users will not be able to receive EMS messages. In the long term when people have MMS phones, this compatibility problem will disappear.

Availability of EMS Handsets

From the four major handset manufacturers that had initially driven the EMS standard, Alcatel, Siemens and Ericsson have already shipped EMS (release 4) compliant handsets in Europe. These are:

- Ericsson: T29 (GPRS), T20e, T65, T68, T39, R520
- Siemens: ME45, 3618
- Alcatel: One Touch 511 and 311
- Motorola: V Series
- Telepong: The Telepong Boomerang (to be available during the second quarter of 2002)

Other handset manufacturers that are also introducing EMS devices into the market include Samsung, Sony, Trium, Phillips (which owns magic4), Sagem, Sendo and Panasonic. Virtually all the GSM handset manufacturers are implementing or plan to implement EMS clients. By the end of 2002, most of the handset manufacturers will have shipped EMS-capable handsets. In 2003 all mobile phone shipments, except those of Nokia, will have EMS capability. The level of EMS deployment (EMS terminals being actually acquired by users) will depend on the handset churn rate, that is the pace at which mobile users change handsets. Assuming that the length of the average subscription contract is 12 months, we can see high deployment of EMS in one or two years time in Europe.

Certainly, we have to take into account other factors such as how business models are changing. Handset subsidies are disappearing thus discouraging the user from churning from device to device. And maybe more important than the penetration of EMS-capable phones in the European market is the amount of those that will be used for EMS communication in the future.

EMS Applications and Services

EMS implies enhancements to services offered to the subscriber thanks to the ability of adding a visual feel to them.

A new range of content providers emerged to cater for the need of the EMS market in 2000 and 2001. Network operators' portals have been updated to contain EMS pictures and ringtones. However, most of the portals and content providers concentrate on offering content based on the Smart Messaging standard. During 2002, more EMS content is expected to be available as providers accommodate the new EMS characteristics.

The following are some of the main mobile messaging applications and how EMS improves them:

Person to Person

It gives users the ability to communicate feelings in a different and more effective way. Picture postcards are expected to be most successful and the exchange of ringtones. Set format fixes cost, simplifying billing for the operator and service provider.

Content Services

EMS will provide support for new media enhancing content services:

- Mobile device customisation becomes more engaging.
- New services can be marketed: cartoon or comic strips.
- Download of ringtones.
- Operator replacement logos.
- Graphics and sound.
- Embedded forms.
- Downloadable menus.
- Remote diagnostics.
- Advertising and sponsorship: more realistic and more effective visual branding.

Advertising and Sponsorship

- More realistic with enhanced media.
- More effective visual branding.
- Combined with cell broadcasting for more accuracy.
- Possibility of adding corporate ringtone.
- Can start driving subsidised services model for subscribers.

Mobile Ticketing Using Barcode Technology: Retail Commerce

- Send and store barcode as SMS.
- Enables m-ticketing solution.
- Together with location services, allows for m-coupon while shopping.
- Affinity card.

Entertainment

Interactive trivia games could be offered based on EMS forms.

Future of EMS

There are various factors that need to be looked into to be able to determine the potential level of success and uptake of EMS.

Handset Development

Virtually all mobile phone manufacturers are supporting EMS. Shipments of EMS terminals will reach 100 percent of total mobile phone shipments in Europe by the end of 2002. However, "virtually" implies the exception of the leading European handset manufacturer, with more than a third of the market share.

Pricing

Another critical success factor for EMS is the way it is priced. Users will be charged more for each EMS than SMS since, as previously mentioned, an enhanced message carries several SMS messages. However, the perceived added value by users is not much greater than a SMS message, thus EMS should be tabbed a similar price to SMS to achieve significant success.

Displacement by MMS: Window of Opportunity

As mentioned, EMS is regarded as an interim phase until full multimedia messaging is introduced in the market. This is true even if there are plans for EMS encapsulation within MMS-enabled handsets, that is, devices with so-called "backward capability". These terminals will contain EMS and SMS capabilities but obviously the use of enhanced messaging will drop drastically with MMS. This is due to the fact that both messaging technologies are complementary. The likelihood that subscribers will send an EMS image when they are able to send a MMS image instead is very low, although price will hinder the latter.

Hence, the lifetime of EMS, or its "window of opportunity", is determined by the time of introduction of MMS in the marketplace. The advent of MMS will restrict the chances that EMS has to reach mass market or even a really significant number of users. Thus, the imminent implementation of MMS infrastructure across networks and the introduction of MMS-enabled handsets indicate that EMS does have a limited window of opportunity. Although this study discusses MMS timescales in further detail in later sections, Frost & Sullivan does not see any significant level of mass-market uptake of MMS services until the last quarter of 2003. Therefore, EMS life span is restricted to about 25 to 30 months, although this will vary between European regions. Undoubtedly, EMS momentum will benefit from current delays in the set up of next generation networks across Europe and from possible setbacks that MMS rollout could face. Consequently, the window of opportunity may broaden. However, the opportunity is there and handset manufacturers and content providers seem to be thrusting the standard.

Through its research, Frost & Sullivan has ascertained that several European operators have taken the decision, based on the availability of handsets, of focusing on MMS as their strategy going forward, overlooking EMS services. Furthermore, various leading applications and content providers will also turn a blind eye to EMS. They do not see enough window of opportunity for EMS. From the operators' point of view, MMS offers much more than EMS, virtually in the same timeframe, so from a resource perspective they are investing in MMS as the core messaging project rather than in EMS. Having said this, there may be cases where the operator needs to have an EMS offering to remain competitive in a particular local market, such as the German market.

Some operators are also concerned about the marketing message to their customers. Currently the majority of people are comfortable using text messaging, so to really excite them and move them into MMS, the fact of having two steps can steal a lot of the fun from MMS. Operators that have upsold subscribers from SMS to EMS may have more trouble to move them from EMS to MMS when they can jump directly to MMS and really wow people.

As mentioned, EMS signifies an improvement across numerous applications from information and content services and marketing to person-to-person messaging. However wide the window of opportunity will be for EMS, Frost & Sullivan anticipates revenues will increase across different service types, due to these enhanced features. Operators will see an increase in the number of SMS messages sent in a concatenated form by the users. One of the main success factors is that MMS will be harder to compose and subscribers need a high cost terminal. As MMS device prices come down and capabilities go up, EMS will grow more slowly.

Summary of Key Drivers

- Minimal technology investment required by network operators.
- Support by leading mobile companies: Ericsson, Motorola, Siemens, Alcatel, Phillips and others.
- Few requirements for EMS handsets in terms of memory, processing power and display.
- Standardisation work by 3GPP with richer features than just icons and ringtones (release 5).
- EMS will advertise to the end-users towards MMS, so they get some multimedia experience.
- Higher price through differentiated billing will increase ARPU.
- Cheap version of MMS: users who cannot afford to have an MMS phone will buy an EMS phone.

Summary of Key Restraints

- Lack of a universal standard: Nokia's Smart Messaging dominates the market.
- Imminent arrival of full-blown MMS.
- Enhanced messaging is not separated enough from SMS: it is only with MMS that compelling content-rich media messaging and a new environment will be really enabled.
- The confusion that multiple messaging formats creates.
- No need to adopt EMS when Smart Messaging is freely available to manufacturers.
- EMS seems to be pushed by handset manufacturers and not to receive much endorsement from operators, which are starting to concentrate on investing their scarce resources in MMS.

3

MMS Technology and Functionality

MMS Technology

Overview of Service

The introduction of short messaging service (SMS) into the mobile market proved to be a major success, becoming a crucial revenue source for all players in the value chain. However, the technology had a major limitation, the inability of sending a large amount of content. This is due to the restricted capability of the different elements involved in the mobile messaging process: the messaging platform, the mobile devices and network type.

Third Generation Global Project Partnership (3GPP) has been studying the way to develop the platform and the terminals to create a service to one which is not restricted to a fixed maximum 160 character plain-text, eventually coming up with the new multimedia messaging service (MMS). The service is designed for next generation cellular networks, be it general packet radio system (GPRS) or 3G.

MMS will benefit the current SMS success across the world by migrating existing users towards a richer similar experience. The MMS platform architecture is similar in concept to the SMS platform but it uses different technology. MMS service will take advantage of the new MMS architecture and Internet protocol- (IP) based connectivity protocols (as opposed to signalling transport mechanism), allowing for collaboration between different types of networks which take part in the messaging chain: the Internet, the intranet, public switched telephone network (PSTN), circuit-switched, and next generation networks. Thus, the world of Internet and wireless messaging can converge. There are other major differences between the SMS and MMS systems characteristics, which are fully analysed in the MMS Positioning section of the report.

MMS Standard Bodies

The standard-setting bodies play a crucial role in the successful deployment of MMS services worldwide. The unification of the standards is an absolute must for success and growth in MMS, as it is in most of the areas in the wireless industry. Figure 3-1 describes how various organisations are involved in developing MMS standards. The main goals for all bodies involved:

- Compatibility and interoperability
- Faster market acceptance and penetration
- Reduced operator and manufacturer risk
- Bring all industry players together to ensure industry-wide compliance, comprehensive specifications and fast implementation

Figure 3-1

Total Multimedia Messaging Service Market: Standard Bodies (Europe), 2002

Body	Specification	Area of Responsibility	Defined Elements
3GPP	3G TS 22.140 (Rel 4) 3G TS 23.140 (Rel 4)	MMSE	MMSC Platform (Servers and Relay) User Databases Message Storage MMS VAS Applications IP Networks Link to Mobile and IP Networks
WAP Forum	WAP 205, 206 and 209 WAP PAP	WAP implementation of MMS WAP application presentation	Transmission between UA/base stations and MMSE (Push Access Protocol). WML application presentation
W3C		Presentation Format	Synchronised Multimedia Integration Language

Note: The GSM Association, although not a standard body, provides recommendations, guidelines and framework related to standards. 3GPP2 is the new standard body for CDMA specifications.

Source: Frost & Sullivan

3GPP has defined the different elements contained in the MMS Environment (MMSE) and how they should interact and be combined in an homogeneous way across operators' networks. The key focus of 3GPP is to assure interoperability of the service. There is a standard specification for the service definition, T2 22.140, and another for the functional definition, T2 23.140. The Release 99 of the MMS standard was frozen on 14 March 2000, that is, since that date revisions have only been allowed in the case where a correction is needed. The Release 4 is currently the latest complete set of 3GPP specifications, frozen in March 2001, and aims at defining things like the connection between MMS centres. Finally, release 5 of the standards will be frozen and publicised in March 2002, with a more advanced and harmonised characterisation of MMS .

The wireless access protocol (WAP) Forum, through its Multimedia Drafting Committee has typified the communication protocols between the MMSEs and the user agents, that is, the WAP implementation at application level of MMS. In addition, the WAP Forum has defined a specification for the WAP multimedia message encapsulation. Finally, the World Wide Web Consortium (W3C) has been working on releasing the synchronised multimedia integration language (SMIL) standard for the presentation of the message on the terminal.

Standard Requirements for MMS

High Level Requirements

There are high level requirements for MMS defined by 3GPP:

- Forward compatible multimedia messaging: MMS mechanisms shall provide the capability to support current and evolving messaging by re-using existing standards or extensions of these.
- Consistent messaging: regardless of the message type or format, MMS shall be capable of supporting integration of all types of messaging such as SMS, fax, voicemail, multimedia or e-mail, in a consistent manner.
- Universal messaging access: the user shall be able to consistently access the multimedia message through a number of different access points, such as 2G and 3G networks, fixed networks and the Internet.
- Interoperability: the MMS shall support a minimum set of functionality and message formats to ensure interoperability between terminals, such as deletion of messages, standardised message notification, message media types and message content formats.

General Requirements

3GPP recognised the need to further standardise the general functionality and format requirements for MMS as operators would configure and support MMS differently based on their own network and commercial requisites. This standardisation would try to ensure interoperability across networks and terminals. However, 3GPP also admitted flexibility in the way operators configure their MMS systems and services as long as interoperability is maintained.

3GPP also identifies service requirements that have to be supported by MMS but does not require standardisation. These non-specified requirements are those that fall into the application level functionality. This is the case of interaction and/or command between the terminal and the network applications of the same operator. So if a recipient requests certain functions for his messaging application, all these would be out of the scope of the specification.

The following is a list of the general requirements that shall be supported, just as described by 3GPP.

Multimedia Message Management

- Terminal-sensitive message management: the MMS shall be able to support the capability for the terminal and network allowing for delivery compatible with this capability.
- User status-sensitive message management: the MMS shall be able to support the capability for the terminal and network to take account of the availability and so things like storing messages if the recipient is not available can be done.
- MMS control by the operator: the MMS shall be able to support a request from the operator to enable or disable message delivery and submission.
- MMS control by the user: the MMS shall be able to support a request from the user to enable/disable message delivery and submission.

The following are requirements that will be supported at the application layer in the terminal or at the network and, as mentioned earlier, will not be further elaborated by 3GPP.

- MMS personalisation: the MMS shall be able to support a request by the user to manage the service preferences of his user service profile (USP), depending on roaming and operators' conditions. The service preferences refer to things like filtering of incoming messages and message delivery policies.
- Multimedia message creation: the MMS shall be able to support the request to create a message by the user or an application. This requirement shall be supported at the application layer in the terminal, and will not be further elaborated.

- Multimedia message recall: the MMS shall be able to support the request by the sender to delete a message once submitted as long as it has not yet been delivered to the recipient.
- Multiple media: multimedia messages may be composed of either a single medium or multimedia. The MMS shall be able to support a request for media synchronisation or sequencing.
- Media type and media format conversion: the MMS shall be able to support a request to convert between media types and formats.
- Message forwarding: the MMS shall be able to support a request to forward multimedia messages or multimedia message elements without having to first download the message to the terminal.
- Storage of multimedia messages: the MMS shall be able to support a request for multimedia messages or message elements to be stored until delivered to the recipient's terminal, until they expire, or until they are deleted by the user. The MMS shall be able to support a request to store and manage all multimedia messages in a network-based repository rather than on the handset.
- Prioritisation of messages: the MMS shall be able to support a request for message prioritisation, subject to the capabilities of the network.
- Screening of messages: the MMS shall be able to support a request for screening, subject to the capabilities of the network such as automatically delete "junk mail" without delivery to the recipient's terminal.
- Validity period: the MMS shall be able to support a request to define validity periods for message delivery.

Multimedia Message Delivery and Submission

- Submission mechanism: the MMS shall support multimedia messages or message elements to be submitted to the recipient's terminal.
- Push mechanism: the MMS shall be able to support a request for multimedia messages or message elements to be automatically delivered to the recipient's terminal.
- Pull mechanism: the MMS shall be able to support a request for multimedia messages or message elements to be delivered to the recipient's terminal on request by the recipient.

Notifications and Acknowledgements

The MMS shall be able to support a request to send generic notification and acknowledgement capability to inform the user in an appropriate manner of MMS events, such as:

- Notify the recipient about received messages, including a description of the message.
- Notify the recipient about actions taken by the MMS, such as those due to profile settings.
- Acknowledge the sender about successful or failed message storage, submission, delivery to the recipient terminal and deletion.
- Acknowledge the sender, upon request, about the status of a submitted message (that is, delivered/not delivered).

Core MMS Features and Services

Following, there is a more in-depth description of some of the MMS features that Frost & Sullivan regards as the most valuable of the MMS.

Legacy Devices Support

This is a crucial feature that allows mobile users without a MMS-capable terminal to receive multimedia messages and maybe to be able to send them. The notification support will also be important for MMS devices because next generation networks will not be ubiquitous and multiple network types are going to be in existence. Subscribers leaving the 2.5 or 3G coverage area or roaming in a network without GPRS/3G or MMS support need to receive the message somehow.

Legacy devices support will create additional revenues from legacy and non-legacy subscribers and will induce non-subscribers to become subscribers due to the exposure to MMS. The main difference between a 2G handset and a MMS terminal is that the multimedia content sits in the network instead of on the terminal. The support solution differs depending on the type of terminal.

Legacy Device with Browser

If the legacy device supports WAP push, the MMS centre sends a push notification containing an address that allows the recipient to render the message over a WAP session through a WAP browser. PDAs or PCs will use a hyper text mark-up language (HTML) browser instead. Initially, this is only feasible for pictures. Content transcoding ensures the images are formatted into wireless bitmap (WBMP) format to be viewed optimally in WAP phones. Of course, it is up to the recipient to decide from what device to view the message. Instead of viewing it on a black and white low-resolution WBMP format on a WAP terminal he may prefer to wait and view it on a PC.

MMS also can allow owners of legacy devices with an HTML or WAP browser to respond, composing and submitting multimedia messages. The user would access a WAP page in the operators' network, select a media type from a media album and send it off.

Legacy Device without a Browser

The MMSC sends an informative SMS note, the content of which depends on the operator and user configuration. Typically the SMS message will contain a unified resource locator (URL) attached so the user can then access the Web using a PC to view the message. In addition, the text part can be stripped out from the multimedia message and sent as a short message. These users can also create multimedia messages to reply over the Web.

Depending on how both the operator designs the service and the subscribers set up their service preferences, the message can be forwarded to a permanent store such as an e-mail or a unified messaging (UM) mailbox, to be accessed and revisited (regardless of the device in the case of UM). With regard to audio, this would not be sent to a WAP phone or SMS phone. The audio element would be removed from the message and, depending on the user configuration, forwarded to a destination e-mail address, whether that is an operator central e-mail store or an individual store. Depending on the operator's configuration, there is also the option to put in a bracket saying that the audio element was part of the message but was removed, or similar.

Transcoding or Content Adaptation

During a message retrieval, the MMSC determines the necessity of any content transcoding and then carries out this conversion to suit the device capabilities.

There are two types of content conversion that can be carried out by the MMSC:

- Media format conversion. The MMSC converts messages to different formats of the same media type. For example, in the case of handsets that only support the JPEG format, the MMSC will convert images sent as GIF or bmp into that format.
- Media type conversion. The MMSC will be able to convert, for instance, a video message to an audio message. That is, MPEG4 to WAV. Additionally, multimedia messages can be converted into e-mails or to voicemails and vice versa. Thus, conversion is carried out, both of those messages arriving at the recipient MMS relay/server from legacy messaging systems and those leaving the originator relay/server to these legacy systems.

For some of this transcoding to take place, the MMS centre obviously needs to know the terminal hardware and software characteristics and the network to which it is connected. This can be achieved in two ways. The most efficient one is through capability negotiation, in which an exchange of information between the MMSC and the user agent profile at the terminal. The MMSC will use the user agent profile information received via WAP to match the message content to the destination terminal. For WAP 1.1 handsets and hyper text

transfer protocol (HTTP) clients, wireless session protocol (WSP) and HTTP GET reports are respectively used,

The other option is for the operator to populate a database with information about the terminals if it already knows the type that is possessed by its subscribers. But this approach implies storage, maintenance and update costs. In addition, it would be difficult to cater for prepay customers without the automatic receipt of terminal information by the MMS centre.

Additionally, the MMS centre takes into account the roaming network for the delivery of the message. Should the users roam on a low bandwidth network, those messages or applications with high data transmission rate requirements will not be sent to the terminal. Some MMS platforms offer URL notifications in roaming scenarios.

Permanent Store and Multimedia Album

These store capabilities are new elements not present in the SMS centres that add great value to MMS. The permanent store allows for network storage of messages, instead of just on the store-and-forward temporary store or the MMS terminal. The multimedia album provides a directory of media files to facilitate the composition of multimedia messages. More information can be found in the section dedicated to the MMS architecture.

Multimedia Message Structure and Presentation

A multimedia message is composed of one or more message elements, which are those parts of a multimedia message consisting of only a media type. A multimedia message contains MMS headers and the message body. The headers contain information on how to transfer the message from the originating terminal to the recipient terminal. The message body contains the multiple multimedia objects in separate parts. The way these multiple media elements will be combined to create a multimedia message is by using multipurpose internet mail extensions (MIME) multipart format. The MIME multipart is a standard Internet technique to combine the e-mail body and the attachments. There are several media and file formats that should at least be supported in order to guarantee a minimum compatibility between MMS capable handsets. Additional support for other accepted formats is also suggested, as shown in Figure 3-2.

In a multimedia message, multimedia content and presentation information are encapsulated to a single message. The presentation part describes how the content should be rendered on the device. If the presentation part does not exist in the message body, the rendering will depend on the terminal capabilities. In most cases, the terminal will employ the XML-based SMIL, a W3C standard, and WAP's wireless markup language (WML) as the presentation languages. SMIL 2.0 protocol reached the level of a W3C recommendation in August 2001 and is backed by Microsoft, Macromedia, Real Networks, Intel, Philips, and others. Those

MMS devices equipped with SMIL will allow the user to compose and present a combination of types of content integrated as part of the body of the message. Hence, MMS can offer a slide show that encompasses styled text, audio and colour images in multipage messages.

Figure 3-2

Total Multimedia Messaging Service Market: Media Formats for MMS (Europe), 2002

Media Type	Mandatory	Optional
Text	All plain text: Unicode, ASCII, UTF, Shift_JIS...	---
Audio	Adaptive Multi Rate (AMR)	MP3, MIDI, AAC, WAV
Still Image	JPEG	GIF 89a, WBMP
Video	ITU-T H263	MPEG-4 (Visual Simple Profile) H.263 profile 3 Quicktime
Dynamic Media	MPEG-4	---

Source: Frost & Sullivan

WML provides the same multimedia options as it does in a WAP browser: hyperlinks, images, and some support for styles. SMIL goes well beyond that with support for layout, timing and synchronisation as well as animation. An MMS message will contain both the presentation language and the multimedia objects. The multimedia objects are referenced from the presentation language with URLs.

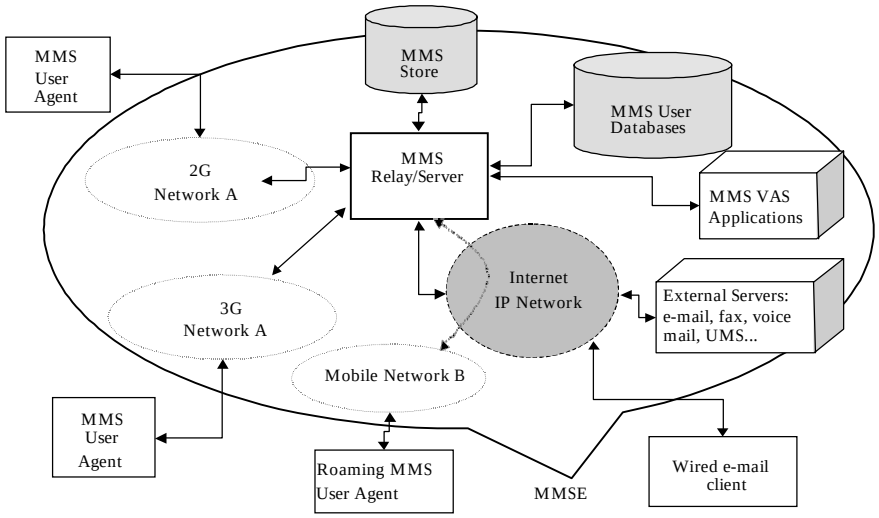
MMS Architecture

This section describes the combination of different elements that form a representative MMS system architecture. Chart 3.1 shows a diagram of the MMS architecture. The various components involved in MMS system are:

- MMS environment
- User agent
- Other networks in roaming
- Wired clients (e-mail)

Chart 3.1

Total Multimedia Messaging Services Market: MMS Architecture (Europe), 2002



Source :Frost & Sullivan

MMS Environment

The MMS environment (MMSE) can be defined as the group of elements related to the multimedia messaging service under the control of a single administration and that provides all the necessary messaging service elements. It can combine different types of network and existing messaging systems. The different components of the MMSE are connected by Internet protocols. The following elements form the basis of the MMSE.

MMS Centre

Part of the MMSE is the MMS centre (MMSC), which is the core element of the MMSE. The number of elements included in the MMSC is dependent on the platform offering of vendors. Typically, the MMSC contains three distinct elements:

MMS Relay/Server

This entity can be found as unified or split into relay and server. It is mainly responsible for:

- Receiving, sending and forwarding multimedia messages.
- Checking terminal availability.

- Storage and handling of incoming and outgoing messages. The MMS relay has the capability of storing a message as it is received and forwarding it to the recipient's user agent. The user can configure the way the MMSC stores the messages: until delivered, until it expires or until it is deleted by the user. For delivery the relay creates MSISDN (Mobile Station Integrated Services Digital Network) and can translate between e-mail addresses and phone numbers. It also has the capability of hiding the sender's address from the recipient.
- Transfer of messages between different messaging systems.
- Media type and media format conversion.
- Terminal availability and capabilities negotiation.
- Generating charging data, the so-called call data records (CDRs).
- Generation of notifications and acknowledgements to the handset (or user agent).
- Implementation of delivery preferences set by the sender.
- Screening of messages. The MMS deletes automatically anonymous messages without the need to deliver them to the recipient.

MMS User Databases

The MMS relay/server has access to user-related databases such as the following:

- Subscription databases with details such as addresses.
- User profile database with configuration information about delivery and screening rules as well as current terminal capabilities. The user databases must provide information for the control of access to the MMS.
- Home location register (HLR), which is often separated from the MMS user database and is the main database component of permanent subscriber information for a mobile network.

External Server(s)

As mentioned earlier, there are various message store servers that are linked to and integrated by the MMS relay/server. The way this is done is subject to the particular design of the service provision of each network operator. The external servers are usually included within the MMSE, but in some cases they are external and connected to it. Examples of these servers are voice, fax, e-mail, SMS servers and unified messaging systems.

Message Store

The message store is primarily used for temporary storage of multimedia messages using the store-and-forward mechanism. The MMSC stores the message until the receiving terminal is available, and then sends a push notification and the message. All MMS platform vendors offer a permanent message store as an option for operators to include in their MMSC, as part of the MMS user database. It is optional because the operator may prefer to use the e-mail or unified messaging system (UMS) already in its network for persistent storage functions. Subscribers can retrieve the messages from a desktop and/or from a mobile device via WAP or HTTP. The vast majority of operators have UMS capabilities or are implementing it. Those who do not have will integrate this permanent store component with the MMS platform for the following reasons:

- The handset has limited memory for storage.
- Users with poor display capability terminals will be able to see their messages from a PC later on.
- Users without a permanent store who are deprived from or mislay their phones will lose valuable data.
- The possibility of creating new revenue streams by offering the permanent message store as a subscription-based service.
- 3GPP has agreed on standardising this network mailbox as part of the Release 5.

Multimedia Library or Album

This is a Web-based media storage element that can be offered as two differentiated services. One would be a commercial service (depending on the case), by which users composing a message and needing a piece of clipart, an image or a audio or video clip can access a public multimedia library and select and buy a template to incorporate in their messages. The public library will be populated with content from third party providers and links to other multi-media albums. On the other hand, the multimedia library provides the user with the ability to store his/her own personal media to be retrieved to compose multimedia messages.

Value Added Services Applications

MMS will be an enabling platform for a number of different application. The MMSC needs to be able to communicate with these value added service (VAS) applications that third party providers will be willing to offer to MMS subscribers. Again, Frost & Sullivan has considered these applications as part of the MMSE, but they could sit outside and connected to it. VAS applications will carry out administration, authentication and accounting management together with the MMSC and depending on the case these VAS will be able to generate charging records.

User Agent

The MMS user agent (UA) is a software or application layer that mainly provides the ability to view, compose and manage the messages being able to interpret WML, WML Script or similar. Generally, the UA resides on the user equipment but it can also be present at the mobile station. The functionality was defined by both the WAP Forum and the 3GPP. The elemental UA functions are the following:

- The presentation of the MMS as well as acknowledgements and notifications.
- Retrieval of MMS (at least to initiate the delivery of the message to the UA).

In addition to the functions listed, the UA can undertake optional tasks such as:

- Composition of multimedia messages.
- Submission of multimedia messages.
- Streaming (with a streaming media player).
- Message encryption and decryption.
- Multimedia message storage in the terminal.
- Request for reports. The UA delivers status information about the life of the message on read, expiration, rejection by recipient or if it is forwarded. Some of these acknowledgements would not be available if there is no agreement between both the originator and the recipient.
- Setting of the earliest desired time of delivery of a message as well as the desired time of expiry.
- Setting of message qualifications such as priority, message class and subject.
- Handling of external devices.
- User profile management.

The sender UA submits the multimedia message providing the recipient address and the content type (MIME) of the message. The originator may add attributes to the message such as priority, message class or validity period. Perhaps the sender requests address hiding or read-reply report. The message is then routed through both the sender's and the recipient's MMSE. The recipient UA will retrieve the message based on the kind of notification that it has received from the MMS relay.

Handset Requirements

The following are the essential functions that a handset must support to be able to be considered an MMS terminal, as agreed by 3GPP and the WAP Forum:

- View an MMS
- Receive notifications
- Retrieve the message

There are other optional requirements for MMS terminals. Although being non-compulsory, no terminal should be considered an MMS device without fulfilling these.

- Compose MMS
- Submit MMS
- Store MMS
- Encryption and decryption
- Handling of messages from external devices (such as digital cameras)
- User profile management (where the user preference and configurations are set)

As opposed to the MMS network elements, the standards do not define in great detail the specifications related to the handset. This is partly due to the comprehensiveness and the breadth of functionality defined for the MMSC. The standards organisations outlined the basic mandatory functionality for all MMS terminals to have 3GPP does not set any requirement for the MMS to be responsible for the processing and presentation of the message after it has been delivered to the terminal. Since the requirements are few, the device manufacturers have flexibility when it comes to designing the terminal and the embedded applications. Based on the specifications, even a basic text terminal can be considered an MMS device as long as it uses the wireless application or Internet protocol and is able to communicate with the MMSC.

Ingredients of an MMS Terminal

The main ingredients of an MMS-enabled device, for which technology development is still on progress, are:

- MMS client. This is a special software that needs to be able to work with the WAP stack. Of course, most of the phones currently available are WAP phones so already have the WAP stack. However, the MMS client must support at least the version 1.2 of WAP to be able to interpret the push notification to the terminal and display MMS messages (which are MIME multipart messages).

- Since these messages are resident in the terminal, there is new memory capacity requirements in the terminals to be able to store large sized messages. Today's terminal data storage capacity ranges from 2 Mb to 64 Mb of flash memory (PDA). Most handsets can store only 2 Mb of data. For rich MMS applications, more memory will be required. As device memory will never be enough for rich MMS applications, operators offer network-based storage and streaming will become crucial.

- Large screen and high resolution colour display. Currently, mobile phones in Europe have low quality, backlit and monochrome screens. The latest PDAs and PDA-phones made available on the market have high-density colour displays. Colour is not considered an indispensable feature for MMS but crucially improves the usability experience of MMS. Display technologies are developing fast and already two are emerging that signify an improvement over the current liquid crystal displays: organic light emitting diodes and electronic ink.

- Additional processing power for service execution. The processing capability and power consumption dictate the kind of applications that can be supported by the device.

- Longer battery life to cope with higher processing power and power-hungry displays. The pace of battery technology development is not keeping up with the progress of chip processing power. It takes semiconductors manufacturers 18 months to increase the power of silicon chips whereas it takes a battery maker 5 to 10 years to achieve comparable improvement. A number of chip manufacturers are improving the chip technology to reduce the battery power consumption. In addition, battery technology is an active area of research, so significant improvement is expected in the future. Fuel cells is a technology that is currently under development and that would remove the need for recharging.

- Built-in or add-on digital camera (or video cam). This is an additional capability to enable the user to create his/her own content for MMS. In addition, camera-handset integration to transmit pictures from one to the other will also be an important feature. Bluetooth or infrared technology will be used for this purpose.

- Microphone to originate AMR (Audio/Modem Riser specification) speech audio files.

Due to the vast amount of mobile services and applications, Frost & Sullivan anticipates the availability of a wide range of terminal types in the coming years. Already a multitude of data communication devices has been developed, varying in form factor, functionality, usability and cost, thus catering for the needs of every market segment. The handset market will be composed of the following to name but a few:

- Legacy 2G phones

- EMS devices

- Smart phones

- PDAs

- GPRS devices

- Enhanced data for GSM evolution (EDGE) devices
- UMTS devices
- Speech-only terminals
- Videophones
- Data terminals
- Wideband data terminals
- Fax terminals
- Multi-band/multi-mode terminals
- Various combinations

Each type of handset will support various and different features like processing power, display characteristics, memory capacity, communication protocols, codecs and so on.

Java

Java 2 Platform, Micro Edition is a technology especially oriented to devices with significant restrictions in terms of memory, storage and processing capacity, such as wireless terminals. The technology allows programmers to use Java language to develop programmes to run in mobile devices.

Leading handset manufacturers present in the European market plan to launch Java technology-enabled wireless devices in the future. There is a huge community of Java compatible programme developers that will create appealing multimedia applications. Due to the advantageous characteristics of Java, multimedia applications can be downloaded and run on any type of operating environment.

Streaming Multimedia

The basic requirements for terminals to be able to support streaming multimedia services are support for audio and video compression/decompression (codec) and a data transfer rate of 32 kbs minimum (approx.). A codec is an algorithm, or specialised computer program, that reduces the number of bytes consumed by large files and programs. Codecs are used to minimise the amount of storage space through compression so that the transfer of data can be executed in a reasonable length of time.

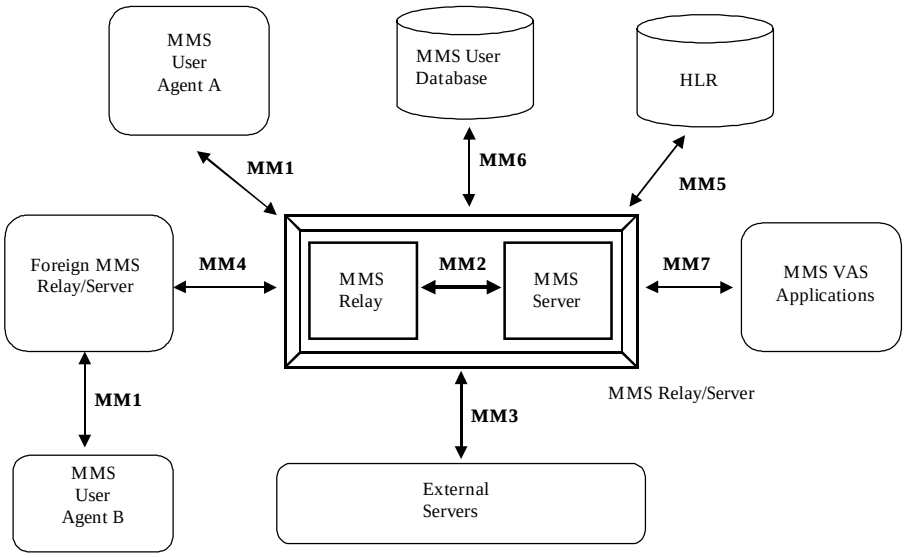
Interfaces and Protocols

MMS Interfaces

The MMS relay/server communicates with the rest of the elements of the MMSE through interfaces based on the Internet protocol and associated IP-based messaging protocols as defined by the standard bodies. Thanks to the use of these, wireless networks can be compatible with Internet messaging systems. Chart 3.2 shows the involved interface in MMS. The interfaces are described below.

Chart 3.2

Total Multimedia Messaging Services Market: Interfaces Involved in MMS (Europe), 2002



Source: Frost & Sullivan

- MMS Relay/Server and User Agents: MM1

This interface allows the UA to submit messages to the relay/server or to receive them either via push or pull, including notifications and reports. The MMSC transmits the message using IP (HTTP) to the WAP Gateway, which in turn transfers the message to the handset using WAP or a MExE compliant protocol such as Java or Transmission Control Protocol or Internet Protocol (TCP/IP). This is one of those points where work in standard bodies is still in progress, but it seems that WAP will typically be the transmission protocol between the handset and the network.

- MMS Relay and MMS Server: MM2

Because these two elements can be combined, it is up to the MMSC supplier to define the type of interface. Generally, technology providers integrate the relay and the server into one single physical entity.

- MMS Relay/Server and External Servers: MM3

The MM3 has been defined for the communication between the MMS relay/server and the messaging servers that are within or connected to the MMSE. The MMS relay/server hands over messages to and retrieves messages from e-mail servers (be it UM, mobile e-mail or dedicated permanent store) using simple mail transfer protocol (SMTP), IMAP4 or MIME. The content of the message of the external server has to be mapped to an appropriate MIME type and attached to the multimedia message.

- Interworking of MMSEs: MM4

MM4 is the interface between MMSCs from different MMSEs. All the elements of the message will be included in a SMTP message organised as a MIME content type application.

- MMS Relay/Server and Home Location Register: MM5

MM5 is used to link the MMS relay/server with the database HLR to get subscription information. If the operator is using SMS for notifications, this interface is unnecessary as the SMSC is already connected to the HLR.

- MMS Relay/Server and User Databases: MM6

This is the protocol used to link the MMS relay to the MMS user database. Although it has not been specified by 3GPP, a convenient protocol would be lightweight directory access protocol (LDAP).

- MMS Relay/Server and VAS Applications: MM7

MM7 lets third party providers integrate their content and applications with the MMSC. This interface is still under standardisation work. The protocols for this will be SMTP, XML or HTTP.

- Other Interfaces

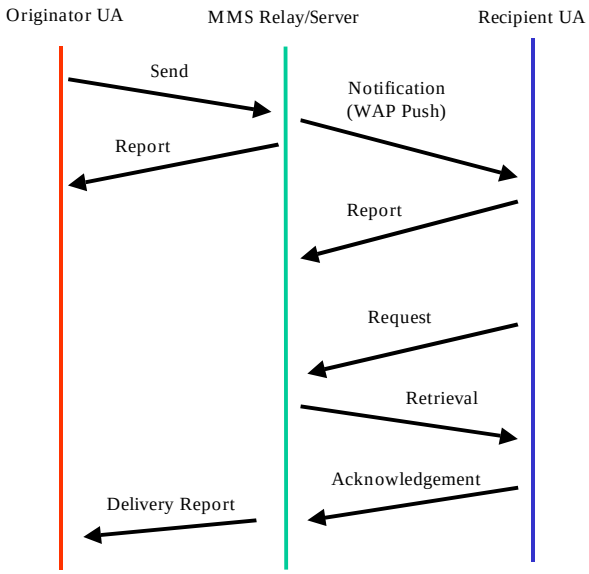
The MMS relay/server interfaces with other network elements such as Push Proxy Gateway (PPG), SMSC, WAP Gateway and, depending on the implementation, with the multimedia album. To communicate with the SMSC, push access protocol is employed to link the MMSC with the Push Proxy Gateway, which in turn will use the push over-the-air protocol to convey the SMS push message to the mobile device. The MMS relays interface with the multimedia album via XML or HTTP. The latter protocol will also be employed to reach PDAs and PCs. Finally, different implementations of the transmission method to the MMS terminal are under discussion: WAP and IP (or MExE, such as Java and TCP/IP).

WAP Implementation of MMS

As mentioned earlier, the WAP Forum has been working to create MMS specifications to include MMS as part of WAP. The WAP Forum specified WAP Push as the transmission method. With WAP Push, the originator server sends response to the client on its own "over the air" without the client requesting for this response. Chart 3.3 describes how WAP will be used for end-to-end transactions between the UA and the MMS relay/server elements.

Chart 3.3

Total Mulitmedia Messaging Services Market: WAP Transactions Flows of MMS (Europe), 2002



Source : Frost & Sullivan

There is a debate around the role that different protocols will play in the data transmission and application presentation of MMS. Even if MExE and Java are expected to become very popular in the near future, it seems WAP will remain as the protocol of choice for data transmission in wireless communication. That is, WAP will typically be the bearer technology for mobile connectivity or the air-interface protocol. Nevertheless, Java will likely take over WAP as an application presentation platform.

WAP, as well as MExE, is bearer-agnostic. This implies that MMS will have backward and forward capability, meaning that it will still be possible to use SMS and EMS. Summarising, a WAP Push undertakes the following tasks:

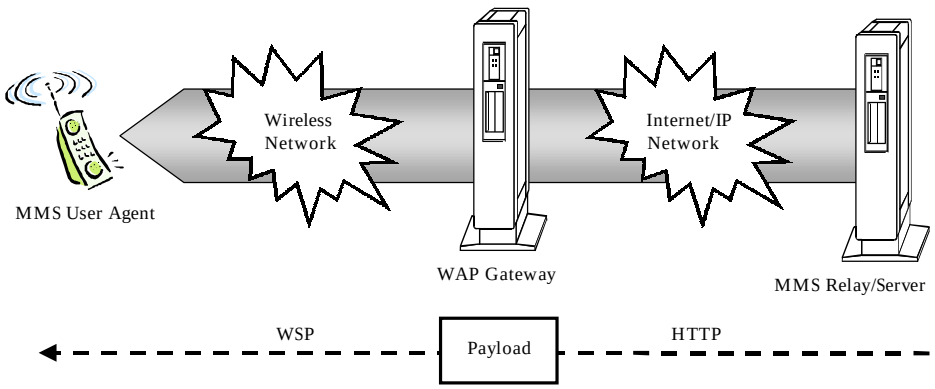
- Service loading. The UA loads and executes a service identified by the uniform resource identifier without the need for any user intervention. There are three types of actions that can be taken: interruption of the user activities if it is using another type of service; no interruption of user activities; and introduction of the content into the terminal's cache if there is space available.
- Service indication. This is the SMS notification service with text and an URL link mentioned earlier.

As seen in Chart 3.4, which shows the scope of WAP support for MMS, the communication between the UA and the WAP gateway uses the WAP stack, which is network independent. The WAP session protocol layer is the method used to communicate the "payload" to the UA, using push over-the-air protocol. The payload includes the message and several standardised fields as defined in the MMS message encapsulation specification.

The transfer of data between the WAP Gateway and the MMS relay/server is done over an IP network using HTTP. The WAP Gateway provides access to standard WAP resources such as push services, over-the-air security (especially at the wireless transport layer security) and capability negotiations.

Chart 3.4

Total Multimedia Messaging Services Market: The Scope of WAP Support of MMS (Europe), 2002



Source : Frost & Sullivan

IP-based Implementation of MMS

3GPP has described how MMS would function using Internet and e-mail protocols only, within the 3G frame. These standard protocols are defined by the Internet Engineering Task Force (IEFT). Full IP implementation of MMS will not be realised until all standard bodies, including the IEFT, agree on the standardisation of all aspects of MMS. This will happen in release 5 or more of 3GPP.

In UMTS networks, packet switched sessions will be handled via IETF's session initiation protocol (SIP) which can also be used for messaging and asynchronous notifications. SIP user agents will be available in all UMTS terminals integrating all the content types of multimedia messaging and offering possibilities for real-time sessions like streaming and voice over IP.

Instead of a WAP Gateway, an IP-based gateway would be used and a modified version of standard TCP called wireless profiled TCP would be used as transmission control protocol (transport layer). While in the WAP implementation WSP was used as a transfer protocol between the UA and the gateway, in the IP implementation SMTP, IMAP4, Post Office protocol 3 (POP3), HTTP and similar will be used on wireless profiled TCP. As for the link between the gateway and the MMS server/relay, the wireless profiled TCP will be translated to normal TCP in the IP gateway, and again IP-based protocols will be used.

MMS over GPRS and 3G

2.5G and 3G Forecasts

Currently global system for mobile communication (GSM), circuit-switched or 2G cellular networks are deployed across all European countries. Licences to set up 3G networks and offer 3G services have been sold but the economic and industry downturn is altering timescales delaying its launch. While the mobile community waits for 3G to emerge, another technology has come forward to provide a prelude of the capabilities that 3G promises to bring: GPRS.

There are two basic ways of accessing data over a wireless network: circuit-switched and packet switched:

- Circuit-switched

The user dials the phone number of the ISP or network access point and the data is carried through a dedicated connection. The user is billed the same way as for a voice call, by the time of use.

- Packet-switched

The data streams are broken into packets. Each packet is then quickly routed to its destination over a shared medium. Each user time-shares channels with other users, allowing the operator to sell the same channel to different users. An additional benefit of a packet-switched service is that it is an "always-on" service and allows for per-packet pricing or fixed price service.

From 2G to 3G

Digital 2G cellular networks such as GSM would seem to have a natural advantage in transmitting data due to their digital nature. However, these networks were originally developed to provide increased capacity and features for voice traffic. They were not designed for data services as they were not a high priority. Now, however, fast access to the Internet and rich content messaging has become necessary.

Figure 3-3 shows the data rates differences between 2G, 2.5G and 3G. The existing GSM network provides data access at speeds of up to 14.4 kilobits per second (kbps), although typical GSM data rate is 9,600 bps. This was considered a reasonable speed when the system was developed, but users are now accustomed to at least 56 kbps dial-up speeds and many are now using asymmetric digital subscriber lines (ADSL) or cable modem connections to get even higher rates. The evolution of the wireless network to provide data rates in the same range is being accomplished in two stages: 2.5G and 3G.

Figure 3-3

Total Multimedia Messaging Service Market: GSM, GPRS and UMTS Data Transmission Rates (Europe), 2002

Application	GSM	GPRS	UMTS
Voice switched	14.4 kbs	14.4 kbs	14.4 kbs
Dial up data circuit	9,600 bps	9,600 bps	9,600 bps
Dial up fax	9,600 bps	9,600 bps	9,600 bps
Packet Data	No	Up to 171 kbs	144-384 kbs High Mobility 2Mbs Low Mobility

Source: Frost & Sullivan

3G services promises to offer data speed rates up to 2 Mbps, depending on the users' distance from a base station and whether they are physically in motion while connected. The regulatory bodies have been struggling to gain consensus on the 3G system for several years, with an agreement on the air interface only reached in late 1999. Disputes and disagreement over the best technology and intellectual property ownership have considerably slowed the

process. Even now, the compromise agreement on the radio standards shows several different and incompatible air interfaces. It remains for the network operators and infrastructure manufacturers to make choices and begin developing plans for true 3G rollout.

3G networks will provide the following:

- Wider spectrum
- More efficient use of the spectrum
- Larger capacity
- Enhanced capability: simultaneous voice and data communications
- Advanced quality of service
- Richer user experience through faster and more compelling applications and services

2.5G systems represent an intermediate upgrade in data rates available to mobile users. With GPRS, for instance, operators do not have to build completely new mobile networks in order to offer it, as the system can be accommodated over sizeable chunks of existing GSM networks. It is therefore the ideal stepping stone for what will eventually evolve into 3G. There is no clear consensus of what really constitutes a 2.5G network, but the most important ones as far as Europe is concerned are:

- Enhanced Data for GSM Evolution

This technology, combined with GPRS, allows data rates up to 384 kbps by switching to a different modulation scheme GSM currently uses to get a higher number of bits per transmitted symbol. EDGE will be deployed by network operators in some GSM countries but as yet there is no specific date set for the deployment.

- General Packet Radio Service

GPRS is an extension of the GSM system, using the same channels and modulation and network backbone as the existing GSM. This makes deployment relatively simple compared with the installation of a completely new infrastructure. Data transmission rates that GPRS will allow will depend on the type of channel coding scheme (CS) and the number of channels (or timeslots) supported in the terminal (up to eight). The choice of coding scheme depends on the condition of the channel provided by the cellular network (quality of the radio link between cell phone and base station). If the channel is very noisy, the network may use a CS with a lower data transfer rate to ensure higher reliability. If the channel is providing a good condition, the network could use other coding schemes to obtain optimum speed. The highest rate that can be obtained is 171.2 Kbps.

■ High-speed Circuit-switched Data (HSCSD)

HSCSD can potentially achieve a maximum data rate of 57.6 kbs over the GSM network by also using multiple timeslots (up to four). As opposed to GPRS, it uses the GSM network and it only requires software upgrades so it is relatively cheap and simple for operators to implement. Unfortunately, this throughput is only available in areas of good GSM coverage.

Forecasts

Figure 3-4 and Chart 3.5 show the forecast growth of mobile subscribers between 1999 and 2006 in Europe.

Figure 3-4

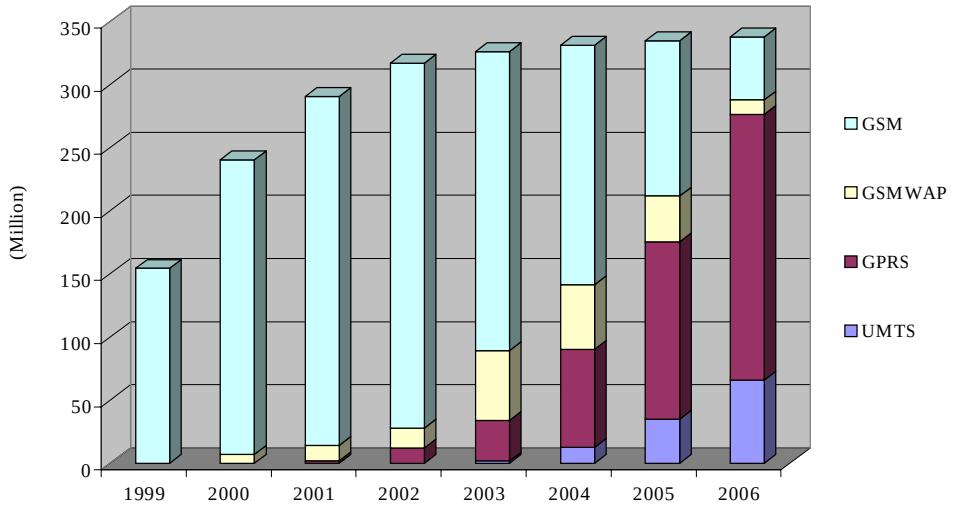
Total Multimedia Messaging Service Market: Mobile Subscribers Forecasts (Europe), 2000-2006

	2000	2001	2002	2003	2004	2005	2006
UMTS (**Million)**	0	0	0	1.8	12.8	35	65.9
GPRS (**Million)**	0	2.1	12.1	32.3	77.5	140.5	210.3
GSM WAP (**Million)**	7.26	12.3	15.87	55.15	51.07	36.2	11.57
GSM (**Million)**	233.14	276.19	288.74	236.62	189.54	122.98	49.82
Total (**Million)**	240.4	290.59	316.71	325.87	330.91	334.68	337.59

Note: All figures are rounded. Source: Frost & Sullivan

Chart 3.5

Total Multimedia Messaging Service Market: Mobile Subscribers Growth (Europe), 1999-2006



Source : Frost & Sullivan

MMS and Type of Mobile Network

MMS is a network independent service. As long as the handset supports some kind of data communication such as WAP it can take part in MMS services. The MMS bearer could be either circuit-switched data over GSM or packet-switched GPRS and in the future UMTS. Nevertheless, as the MMS network infrastructure is based on the Internet protocol, IP-based mobile networks shall be the bearers for the service. As importantly, the larger average size of multimedia messages content also demand high-speed networks that provide a faster connection to data services than traditional cellular networks, like 2.5G and 3G. Circuit-switched networks can only work to standard speeds of around 9.6 kbps, the same speed as voice on a fixed phone. This speed is fine when users are just talking but it is a different story when it comes to mobile data. The bearer-independence enables messages to be exchanged between different mobile network generations and types.

In order to assess the appropriateness of an application or message type in relation to the network bearer, various factors have to be taken into account. The transmission rate and latency requirements, that is, the delay experienced between the originating terminal and the receiving terminal, is indicative of the feasibility of each service type. The rate of the application and the rate of the network have to parallel each other. It is sometimes argued that in those cases where the MMS platform allows for message download to the terminal before notification, users are not aware of the transmission delay. However, there are certain scenarios where the time to deliver the message becomes apparent to the end-user and so data transmission rates impact the user experience:

- In situations where users establish a more fluid MMS dialogue, such as an instant messaging or chatting scenario. Then the time to upload a picture to include as part of the chat session matters.
- "Pull" or retrieval of multimedia messages by the recipient to the handset, either from the Internet, the MMS permanent store, the unified messaging system and so on.
- Streaming .

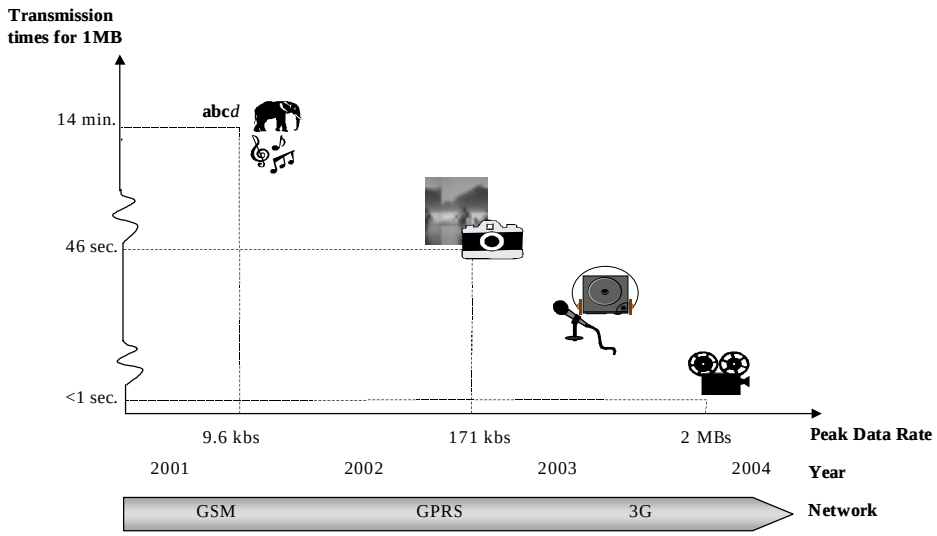
Hence, packet delays will not be tolerated as they can be perceived by the recipient and so demean the user experience. As multimedia message size and volumes increase, high-speed networks and high-performance MMSC will become increasingly important. Therefore, applications such as video messaging can create network congestion unless these networks can deliver speeds close to fixed-lines. MMS will likely be introduced in several phases, each adding successively more functionality and richer applications. Initially it will be the ability to send maybe a GIF file, a picture image, and maybe a small video or audio clip. Then it will expand to streaming video and audio capabilities. Streaming lets the subscriber play media stored on the Web without having to completely download it before playing. Streaming is an attractive option for handset owners since their phones would not need to store large files.

Instead they would receive bits of an application in a real-time continuous stream. Data rates of 2 Mbps are sufficient to allow streaming video feeds with modest resolution.

A thousand words, which occupies approximately 6 Ks of digital data space, would take around five seconds to transmit over a 2G 9,600 bps dial-up connection. It would take around 13 minutes to transmit a simple 640x480 picture (VGA), which corresponds to 900 Kb. A 5 Mb video clip would take one hour and 20 minutes to be transmitted over GSM. Chart 3.6 represents how the data transmission times are expected to decrease as next generation networks are deployed and how this allows for richer messaging content exchange. Frost & Sullivan expects in 2002 and 2003 the average message size would be around 20 to 30 Kb, still images being exchanged via imaging terminals. In 2003 traffic of audio files will start picking up, and the average message size can increase to 50 to 60 Kb. At the beginning of 2004, subscribers will be able to send short video files and again the average message size will increase substantially.

Chart 3.6

Total Multimedia Messaging Services Market: Theoretical Transmission Times (Europe), 2001-2004



Source: Frost & Sullivan

So probably one of the upsell messages of moving from GPRS to 3G will be video. Video messaging is feasible with GPRS but since it is so bandwith-dependent it will not be until 3G that industry players will get their act together to design a compelling service around it. Let alone video and audio streaming. Furthermore, struggling European operators are building lower quality 3G networks and so lower data transmission rates than originally planned. The fact that these networks will be initially rolled out in main urban areas only and that they

will not provide top bit rates unless the subscriber is close to the base stations will also hamper the development of bulky message communications.

If the message is downloaded to the terminal before the notification, operators charging GPRS subscribers by the amount of data received in mobile terminated charging scenarios need to offer an opportunity to reject or screen messages. Users automatically downloading every message that is sent to them will be accumulating considerable costs. For example, a user is sent a video clip of a megabyte in size. If the subscriber cannot reject the message it may use up their monthly data allowance.

As mentioned earlier in this chapter, the terminal awareness and negotiation capabilities of the MMSC can allow for detection of the type of roaming network to then take it into consideration for message delivery. Hence, subscribers on low-bandwidth networks would not be able to enjoy bandwidth-hungry services, and so the MMSC can store for retrieval at another time.

Acronyms

ARPU:	Average Revenues Per User
bps:	bits per second
CDR:	Call Data Records
CS:	Channel Coding Scheme
DRM:	Digital Rights Management
EDGE:	Enhanced Data for GSM Evolution
EMS:	Enhanced Messaging Service
GIF:	Graphic Interchange Format
GPRS:	General Packet Radio System
GSM:	Global System for Mobile Communication
GUI:	Graphical User Interface
HLR:	Home Location Register
HSCSD:	High-speed Circuit-switched Data
HTTP:	Hyper-text Transfer Protocol
HTML:	Hyper-text Markup Language
IMAP:	Internet Messaging Access Protocol

IP:	Internet Protocol
ISP:	Internet Service Provider
Kb:	kilobyte
kbps:	kilobits per second
LDAP:	Lightweight Directory Access Protocol
Mb:	Megabyte
MIME:	Multipurpose Internet Mail Extensions
MMS:	Multimedia Messaging Service
MMSC:	Multimedia Messaging Service Centre
MMSE:	Multimedia Messaging Service Environment
MPEG:	Moving Picture Experts Group
OEM:	Original Equipment Manufacturer
P2P:	Person-to-Person/Peer-to-Peer
PDA:	Personal Digital Assistant
POP3:	Post Office Protocol 3
PSTN:	Public Switched Telephone Network
SIP:	Session Initiation Protocol
SMIL:	Synchronised Multimedia Integration Language
SMS:	Short Messaging Service
SMSC:	Short Messaging Service Centre
SMTP:	Simple Mail Transfer Protocol
STP:	Signal Transfer Point
UA:	User Agent
UM:	Unified Messaging
UMS:	Unified Messaging System
URL:	Unified Resource Locator
USP:	User Service Profile
USSD:	Unstructured Supplementary Services Data

VAS:	Value Added Services
WAP:	Wireless Access Protocol
WAV:	Wave File
WBMP:	Wireless Bitmap
W3C:	World Wide Web Consortium
WML:	Wireless Markup Language
WSP:	Wireless Session Protocol

4

MMS Positioning

MMS versus Other Messaging Solutions

MMS versus EMS and SMS

A concern for network operators is not to confuse customers and when the user has so many ways of communicating with someone, such as phoning, using short messaging service (SMS), using multimedia messaging service (MMS), sending IM or sending an e-mail, it can get pretty confusing. Network operators' marketing people will duplicate efforts to convey with clarity the value for all various methods of mobile communication.

Figure 4-1 shows the main differences between SMS, Smart Messaging, enhanced messaging service (EMS), and MMS. The success of SMS led to the creation of EMS and MMS. Obviously, the main difference between the three messaging services is the media types that each are able to support. SMS messages can contain plain-text with a simple format, EMS messages include melodies and basic images, while an MMS message can enclose any type of media as multipurpose Internet mail extensions (MIME) format.

Figure 4-1

Total Multimedia Messaging Service Market: Main Differences Between SMS, Smart Messaging, EMS and MMS (Europe), 2002

Technology	Media Types	Channel	Key Application	Full Interoperability
SMS	Plain text	Signalling	P2P Business Content Services Voting	Yes
Smart Messaging	Plain text, and simple images and ringtones	Signalling	P2P Icon/Ringtone download	No
EMS	Plain-text, text formatting, picture sound and animations (concatenated SMS)	Signalling	P2P Content services Marketing m-Ticketing Gaming	No
MMS	Text, pictures, audio, video streaming and combination	Data (IP)	Unlimited	Expected

Source: Frost & Sullivan

Figure 4-2 illustrates how different SMS and MMS are. From a technology point of view, SMS and EMS communications make use of SMS centres (SMSCs). However, as each enhanced message comprises several short messages, EMS requires SMSCs to be upgraded to support concatenated SMS. Both SMS and EMS use the signal transfer point (STP) to transport the messages. STP is a network routing element that takes a message in, checks the routing information and sends the message towards its destination. STP uses the Signalling System 7 (SS7) protocol. In a SS7 signalling channel, voice calls (or modem data) travel through circuit-switched voice switches, while control signals travel over a separate packet-switched signalling network. The signalling channel was not designed for bandwidth-thirsty data.

Operators wishing to roll out MMS need to install brand new Internet protocol- (IP) based MMS centres (MMSCs), the complexity of which fully exceeds that of SMSCs. Messages are carried over IP data channels and wireless access protocol (WAP) is used to connect the terminal to the MMSC and IP is a possible alternative. Regarding terminal technology, both EMS and MMS require a new software client on the handset. However, the EMS software is easier to develop and integrate to the handset than MMS software. Needless to say, EMS is

designed to be implemented in current terminals with current form factors, so new hardware is not a requirement as in MMS.

Figure 4-2

Total Multimedia Messaging Service Market: Comparison Between SMS and MMS (Europe), 2002

Function	SMS	MMS
Delivery Protocol	Control Channel (SS7)	Internet protocols
	Mobile Application Part (MAP)	WAP
Message type	160 characters plain-text	Multimedia MIME format messages
Message delivery	Push	Push and retrieval
	Sender's SMSC handles delivery	Sender's and recipient's MMSCs handle delivery
	No content format conversion	Content format conversion
External Applications Protocols	Short Message Peer to Peer Protocol (SMPP)	Internet protocols
	(CMD)	
	UCP	
Scalability	SS7 makes load balancing difficult	SMTP facilitates load balancing and sharing
Data rate	Low	High
Storage	Temporary–store and forward	Temporary and permanent store
		Multimedia library
		External messaging servers–UM, e-mail…
Streaming	No	Yes

Source: Frost & Sullivan

Although MMS, EMS and SMS are in many respects alike, there are various things that can only be done in the MMS environment, thanks to a completely new IP-based infrastructure and functionality. Some of these new features are not available in SMS because they are just not relevant in a service where only plain-text is transmitted:

- Retrieval or download only a part of the message.
- Access to public and private media libraries or albums.
- Notifications describing the content of the message.

Conversely, other new MMS features are improvements over SMS, giving users a much better control over what messages they want to receive, when and where:

- Ability to forward the message to another device or to an e-mail mailbox.
- Ability to send messages to multiple addresses.
- Permanent storage besides the temporary.
- Multimedia message recall function.
- Status information on how the message is handled.

Finally, SMS and EMS are a "push" only service, whereas multimedia messages are received either via automatic "push" or by a planned retrieval by the user.

MMS versus E-mail

Handset manufacturers and infrastructure providers have tried to ensure that carriers and end-users are aware of the differences between MMS and messaging services based on the Internet, such as e-mail. Based on a Barclays Bank's report, e-mail use has dropped 5 percent due to the popularity of SMS. While Frost & Sullivan does not necessarily agree with this estimation, it sees clear how e-mail can be considered as the main competing messaging technology of SMS and especially of MMS. E-mail is still the most popular way of communication and use of Internet technology. Businesses have demonstrated the value of e-mail for direct marketing, customer relationship management and advertising purposes.

MMS will bring the richness of content of e-mail with the instantaneous delivery of SMS. However, initially, the number of available MMS media types will be limited when compared with e-mail, as have been defined by the standards. This is an effort to ensure interoperability between handsets so that all MMS terminals can display all multimedia messages received.

Frost & Sullivan believes that e-mail will compete with MMS in the corporate space, where various companies have developed mobility solutions that allow employees to access or retrieve their corporate e-mail mailboxes on wireless devices, typically PDAs. Mobile e-mail is said to be the killer corporate application as it enables employees to read and respond to messages while travelling. The Canada-based company Research in Motion has developed a solution that emulates the MMS user experience by using WAP push as the corporate e-mail delivery mechanism. The major drawback of some of these PDA-based e-mail solutions is their difficulty or inability to display the file attachments. But taking terminals such as the mmO2's xda or the Nokia Communicator as examples, these remove the need for MMS software.

On the other hand, there is still not a valid e-mail messaging proposition available to the mobile consumer in Europe. E-mail can be regarded more as a business application whereas MMS would be more a mass market application. Having said that, in Japan, NTT DoCoMo's i-mode's most successful application among consumers is mobile e-mail. Most of the new general packet radio system (GPRS) handsets launched in Europe are e-mail clients. There are even some hardware vendors developing devices that are capable of displaying attachments. Companies such as Dialogue Communications and Bitfone offer wireless e-mail solutions allowing common e-mail attachments and image formats to be displayed in the WAP phone. Bitfone considers MMS to be the evolution from mobile e-mail, available now, rather than from SMS. Should mobile e-mail gain acceptance in the consumer space, MMS traffic can be lower than expected.

Figure 4-3 shows the major differences between e-mail and MMS. A principal difference between the two messaging solutions is related to delivery method and the quality of service. MMS is a store and forward service, whereas e-mail is a store-and-retrieve service. E-mail is stored on a server and only the headers can be pushed to the device. When users see a header they are interested in, they need to select that message for download from the server. With MMS, the message is pushed to the device and sometimes only when the download is complete is the user notified of receipt so there is no perceived delay between notification and viewing.

Figure 4-3

Total Multimedia Messaging Service Market: Main Differences Between MMS and E-mail (Europe), 2002

Function	**E-mail**	**MMS**
Delivery	Pull: store-and-retrieve	Push: store-and-forward
Content adaptation	No	Yes
Presentation	No synchronised (text with attachments)	Synchronised (no attachments)
Network	Internet oriented	Mobile oriented
Storage	Permanent	Temporary and Permanent
Quality of Service	Not important	Essential
Editor Location (sending, deleting...)	E-mail server	Integrated into terminal
Time of Editing	Online	Offline
Billing	Subscription and/or access time	Per-message
Key application	Business wireless data	Consumer messaging

Source: Frost & Sullivan

The different nature and functionality of the two types of messaging imply different quality of service exigencies. Data services delivered over packet-based networks have different requirements in parameters such as throughput (data transmission speed), delay and latency. The term latency refers to the message handover time between access points in IP-based networks. Packet delay is equal to transmission time plus latency. Thus, voice communication demands low latency whereas data communication is tolerant to varying degrees of latency. Accordingly, while e-mail can be delayed with no major impact to the subscriber, this is not so for most cases for MMS. As mentioned, since the MMS can be pushed to the receiver as soon as the terminal is on, the instantaneous delivery removes the latency.

Frost & Sullivan expects e-mail to be to some extent substituted by multimedia messaging as the content that both carry can be basically the same, although not so the presentations of that content. A multimedia message shows all multimedia elements as one single body and on those terminals that support synchronised multimedia activity, the multimedia presentation can be "choreographed" combining video, text and graphics in real-time. E-mail includes multimedia content primarily in the form of attachments rather than as an integrated message. In the future, assuming that the media type is supported by MMS, operators will be able to move away from just notifications of e-mail towards the delivery of the entire e-mail.

The form factor is definitely another reason why MMS is more suitable than e-mail in the mobile environment. MMS has been standardised to fit the mobile terminal, taking into account its limitations and capabilities. Additionally, MMS makes available better and more services to the end-user than e-mail, thanks to the MMS infrastructure features, such as reports retrieval, informative notification and so on, as well as being able to prepay.

MMS versus Unified Messaging

Unified messaging (UM) or unified messaging system (UMS) is the handling of voice, fax and text messages as objects in a single mailbox that a user can access either by an e-mail client, the Web, a fixed phone and a wireless device. In this case the user accesses the mailbox over the phone, text is converted into audio files so they can be played back.

The difference between MMS and UM seems clear, as shown in Figure 4-4. Unified messaging allows the storage of messages which users can then access and retrieve through their UM mailbox. Conversely, MMS systems only store the message as long as the subscriber's device is not active on the network. When it becomes present, the messages are pushed out to it by the MMSC. It is therefore impossible for the MMS user to retrieve messages from the MMS buffer in the same way as UM users. As clear as the functionality differences are, from a user perspective UM and MMS may be perceived as the same thing.

Figure 4-4

Total Multimedia Messaging Service Market: Main Differences between MMS and Unified Messaging (Europe), 2002

Function	UM	MMS
Delivery terminal	Any device	Mobile device
Delivery method	Pull	Push
Storage	Permanent	Temporary
Media types	Cross-media	Multimedia

Source: Frost & Sullivan

This is the reason why MMS infrastructure providers, as contemplated in the standards, are developing permanent storage to equip MMSCs with UM capabilities. MMS is also compatible with sending out multimedia messages as e-mail. Most operators already have a UMS or a central e-mail server installed within their networks. Ultimately, the multimedia permanent store and the UM mailbox may be the same, as the MMS is delivered to the same location where the rest of the messages are delivered, that is, voicemail, SMS, faxes and e-mail messages. At any rate, over time, UM and MMS will become integrated in terms of how people handle day-to-day messages.

Based on the user profile, multimedia messages can be automatically sent to the UM inbox so subscribers can "pull" them after being notified of their existence. Or users can configure the UMS to deliver the e-mails or the voicemails as MMS. UM allows subscribers to have an overview of all their messages. This is a good value proposition especially for corporate users, who have stricter requirements in terms of accessing messages anytime from any device while mobile.

Hence, Frost & Sullivan sees MMS as a driver of UM and vice versa. Both services are complementary and each will benefit from and stimulate the development of the other. MMS will enable the UMS to be accessed from any MMS-capable terminal and, in turn, the proliferation of multimedia content will drive the demand for storing it in a simple way in a place users can access from any device, be it an MMS terminal or a hyper-text mark-up language (HTML) client on a PC. UMS will use MMS as their wireless access user agents (UA).

The Third Generation Global Project Partnership (3GPP) describes in its release 4 how MMS and legacy systems, the likes of UMS, voicemail and e-mail systems, could coexist and interoperate. The connection between those could be by linking the MMS relay/server to a UMS, which in turn connects to SMS, voicemail, fax and e-mail systems. Streaming of voice from the voicemail system is also contemplated by 3GPP.

Several UM technology providers operating in the carrier market have already moved into the MMS market and those that do not have a UM background are forming associations with those that do in order to be able to provide this network-based storage.

MMS versus Instant Messaging

Fixed-line instant messaging (IM) technology has been used for several years over the Web. North America and western Europe are the global regions with the highest penetration of IM. It has gone from 0 to 174 million users in the four years since its inception. Mobile IM will build on the success of fixed-line IM, poised to become a key application for the wireless industry to grow. Already the leading players in the fixed market have entered the mobile market: MSN, ICQ, AOL and Yahoo!.

IM is platform-agnostic and operates at a server level. Combined with presence and location technology, IM allows mobile subscribers to have a list of selected people, to get real-time information about whether they are available or willing to communicate and finally to send messages instantaneously based on availability and location. For carriers, the first revenue opportunity comes from an increase in the calls volume as a result of presence technology. Also, complex IM application can be created and generate premium revenues.

Figure 4-5 shows the differences between IM and MMS.

Figure 4-5

Total Multimedia Messaging Service Market: Main Differences Between MMS and Instant Messaging (Europe), 2002

Function	IM	MMS
Message delivery	Real-time	Store-and-forward ('near time')
New client	Yes	Yes
Price expectations	Free	Per-message charging
Importance of QoS	High	Medium
Interoperability	Under development-Wireless village	Under development-3GPP and WAP Forum
Network	Internet oriented	Mobile oriented

Note: QoS: Quality of Service

Source: Frost & Sullivan

As opposed to e-mail, IM is not a messaging technology that can replace or be replaced by MMS. IM will complement or make use of other technologies, be it WAP or fixed-line or other messaging technologies such as SMS or MMS. During an IM session, SMS is used for presence, buddy lists and location notifications and commands. The actual instant messages are either SMS over GPRS (initially) or over a WAP session (or an IM client). So typically IM will drive SMS traffic but the revenues derived from this type of communication will be lower. In the case of WAP being used, IM will replace SMS.

Frost & Sullivan foresees strong synergies between IM and MMS. Both services will enhance the other, presence technology being one of the most important drivers of MMS. This tech-

nology has a strong potential to improve messaging applications, making MMS more efficient and profitable. Currently, it is not possible for fixed IM users to communicate with SMS users and vice versa but in the future this will change. The same convergence is expected between IM and MMS, letting users exchange rich multimedia-based instant messages using presence and location. Companies such as Openwave, Motorola and Wiral have developed the software to allow for this integration.

The different scenarios for delivery of MMS to IM terminals are:

- A fixed IM client would receive the whole MMS.
- A mobile IM client with WAP would receive part of the text and part of the multimedia content.
- A mobile IM MMS client would receive the whole MMS.
- A mobile IM SMS-only phone would only see the text with a unified resource locator (URL) link.

Conversely, people on a PC can see who of their friends are online with an MMS terminal, who with a WAP phone, who with another PC and so on and send a multimedia message.

With regard to pricing, the user expectations are very different. Mobile IM is expected by the user to be a free service, as the fixed-line service whereas SMS and MMS are expected to be paid services. With IM over GPRS WAP the network operator mostly charges per Kb and the data volumes for IM are very low, and so it can be difficult for the operator to get a return from the IM platform. An IM SMS implementation, on the other hand, would be a better revenue model but this would be no different from sending SMS in the first place.

Both MMS and IM require a specific client and a GPRS connection. The main difference between the two is that IM happens in real-time. Using IM, thoughts are instantly created, transmitted and received, processed and sent back to the user. Hence, factors like latency and the speed and ease of entering words are far more crucial than in a person-to-person MMS scenario. Currently, mobile phones are used as text-entry devices, which obviously is too cumbersome for true wireless IM, although not so much for MMS.

The main barrier for carrier adoption of IM is the lack of industry standards. MMS standards are also under development, but IM is far behind MMS. Initiatives such as the Wireless Village, launched by Ericsson, Motorola and Nokia, aims to promote IM software to be put into handsets and used instead of WAP browsers. In September 2001, Wireless Village successfully demonstrated the world's first interoperable mobile instant messaging and presence service.

5

MMS Value Chain

Introduction and Business Models

Overview of the MMS Value Chain

As shown in Chart 5.1, the multimedia messaging service (MMS) value chain encompasses the following participants:

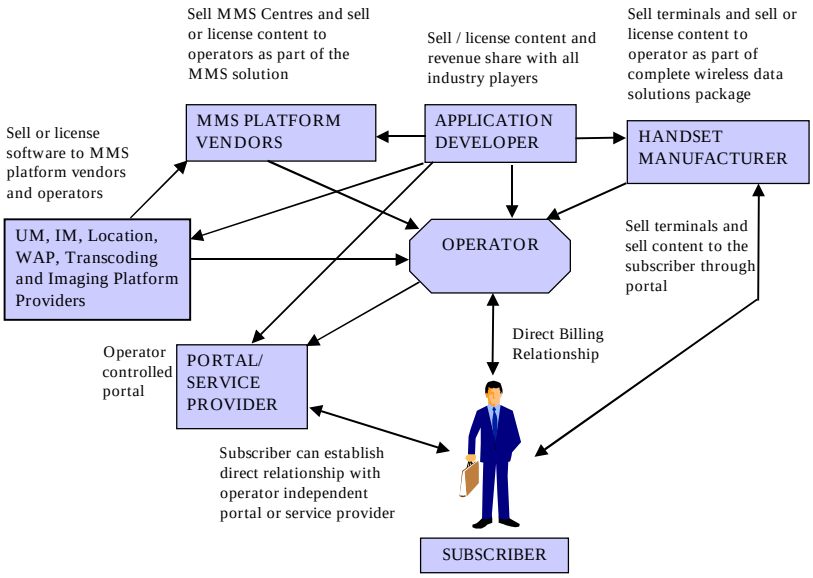
- Network operators
- Handset manufacturers
- MMS platform vendors
- Portals and/or service providers
- Application developers
- Subscribers

In general terms, the operator selects an MMS platform provider to install all the network elements required for the offering of MMS. Sometimes the operator may buy an MMS centre (MMSC) from more than one supplier. The handset manufacturer ships mobile devices to the operator and directly to retail stores. The application developer can sell or license MMS content and applications to carriers in three different ways:

- Directly to the operator.
- Acting as a service provider by setting up an operator-independent portal to channel the content to and establishing a direct billing relationship with the subscriber.
- Joining developers' communities or programmes formed by either handset manufacturers or by MMS platform vendors, which then would sell or license the developed content to carriers on behalf of the application developer.

Chart 5.1

Total Multimedia Messaging Services Market: MMS Value Chain (Europe), 2002



Source: Frost & Sullivan

At the present time, the network operator remains the central entity around which all the rest of the industry players target their offerings and base their business models. Operators possess, besides the mobile network itself, a big customer base, subscribers' location data, an established brand and the billing infrastructure. Also operators have new revenue sources compared to some years ago:

- Providing mobile access to the Internet
- Offering their own value added services
- Providing access to third party services and taking commissions for it
- Maximising return on network investment by sharing capacity with mobile virtual network operators
- Billing for voice

Generally, the operator continues to retain control over the subscribers, marketing their own services and charging them accordingly. The operator-centric approach in MMS would bring clear customer retention benefits to operators:

- Subscriptions and messaging traffic revenues would increase the average revenues per user (ARPU)
- Owning the customer information allows for the development of added-value services
- Protection and enhancement of branding identity
- Visibility for competitive advantage

Network operators can lose this direct relationship with customers to service providers. In this case, users subscribe for services offered by independent service providers, registering through Internet or wireless access protocol (WAP) portals. The operator then becomes a mere "bit pipe", providing connectivity between customers and content providers. There are several factors that will always put the operator in a better situation to retain control of the customer. Operators manage the network traffic, they have existing billing relationships with subscribers and are far more popular than service providers. Additionally, carriers can offer additional services on top of MMS, such as location, presence or m-commerce.

Revenue Sharing

Operator-Application Provider

The success of NTT DoCoMo's Mobile Internet model i-mode, gathered enormous interest from European operators. The Japanese model has proved to be extremely more lucrative for all constituents of the value chain. The primary reason and main difference with the European approach is the revenue sharing system between network operators and content and application providers. NTT DoCoMo's network is open to around 45,000 content providers with which it shares approximately 91 percent of its revenues, motivating them to develop more and better content and applications, in turn stimulating the number of subscriptions to the service.

In contrast, Frost and Sullivan has confirmed that European operators are very reluctant to pay content providers. In most cases, the usual percentage of operators' data revenues in favour of third parties is much lower than 35 percent. Nevertheless, through research Frost & Sullivan has noted a shift in the approach of the leading European operators, especially affected by the failure of WAP. In the area of MMS, some of these operators have plans for incremental steps towards a share of more than 50 percent of their revenues. Again, operators want to become service providers of choice for the user for the reasons previously mentioned (see the "Application Developer" for further information).

In general, there are several revenue sharing scenarios between carriers and application providers:

- The operator can buy or license the content from an individual or a company (application developers) and offer that as part of a service. In this case the operator has the rights to provide and charge for that content as an MMS service and takes all the risk of not selling it.
- The operator offers the information services of a content provider to subscribers at a certain price and then pays the provider a percentage of that price when sold.
- The operator buys a fixed amount of data from a content provider for a certain price. When that allocated volume has been consumed by the customer the operator will buy more at a higher price. In this case, the end-user obviously will pay less than the operator pays the content provider.

Operator-MMS Vendor

The operator pays the MMSC vendor licence fees for the use of its infrastructure. The charging model will vary between vendors. Typically, operators will be charged based on the capacity of the MMSC, that is, by the traffic handled by the MMS relay. When the traffic is low, the operator will pay a cheaper price. As traffic picks up the operator will need to upgrade and scale the MMS system, and so the price would increase.

In addition, as the market matures, enhancements through increased storage and unified messaging (UM) mailbox will be required. MMS infrastructure vendors also get revenue streams from customer support services and training.

Operator-Operator: Interconnection Fees

Normally, in the case of the short messaging service (SMS), only the operator that sends the message gets revenues from the user. The operator that delivers it to the recipient does not get any money from it. Usually there are no interconnection fees being paid between operators, that is, a fee an operator bills another for the use of its network to complete and transit calls. However, the introduction of bulk SMS services by some operators is changing this situation. Third parties can send inexpensive messages to a large number of users, using network capacity of operators that do not receive any revenues for that. In some countries, such as the Netherlands, interconnection fees are being implemented, pushing up the SMS price.

The same can happen for MMS services, spurred by the larger size of the messages, diversification of services and the increase in players and traffic. It seems likely that every operator will want to receive revenues from roaming in MMS, and cover all possible costs associated with it. The large variety of services complicate the interconnection tariff rating. For MMS, Internet protocol (IP) interconnect agreements will be set up. In addition, complex settlement will be required where partial payment will be distributed to all the parties involved: operators, mobile virtual network operators, content providers, portals, advertising. Interconnect billing systems have to cope with the change of revenue sharing agreements.

MMS Platform Vendors

Differentiators and Selection Criteria

At the present time, there are 14 MMS centre vendors in the European market. While the number of MMS platform competitors may not seem extraordinarily high, the competition is very intensive as the target market is relatively reduced due to consolidation and the reward to dominate the market is too important to ignore.

Figure 5-1 lists the different platform providers, their focus areas and clients. Most of them are players in the SMS centre arena, excepting unified messaging service (UMS) vendors Tecnomen, Teligent and Unisys, which are new entrants to the store-and-forward market. Six of the vendors provide all four messaging solutions (MMS, SMS, IM and UM): Comverse, Motorola, Nokia, Ericsson, Openwave and Sema. With regard to unified messaging, all vendors have developed their own system except for Logica and TeleCommunications Systems.

Since every element of the MMS infrastructure is becoming standardised, industry players can find themselves pressed with little room to differentiate their offerings based on functionality in order to impress clients and investors. Yet vendors have different approaches to and visions for MMS. The key selection criteria of an MMS centre supplier by an operator are:

- MMS centre performance: throughput, scalability, availability, reliability and integration
- Pricing
- Vendor's expertise in mobile messaging
- Vendor's application developers programme
- Existing commercial relationship with vendor
- Completeness of the solution package
- MMS centre functionality

Figure 5-1

Total Multimedia Messaging Service Market: MMS Centre Vendors (Europe), 2002

Name	Main Background	SMS	UM	IM	MMS Customers and Prospects (P)
Alcatel	Network infrastructure and handsets	Yes	Yes	No	
CMG	SMS and E-mail	Yes	Yes	No	Telenor, Telia
Comverse	Voice Mail	Yes	Yes	Yes	Xfera
Ericsson	Network infrastructure and handsets	Yes	Yes	Yes	Vodafone, Hutchison 3G
Logica	SMS	Yes	No	No	Orange (P)
Materna	VAS and Middleware	No	Yes	No	
Motorola	Network infrastructure	Yes	Yes	Yes	
Nokia	Network infrastructure and handsets	Yes	Yes	Yes	
Openwave	WAP and E-mail	Yes	Yes	Yes	mmO_2 (P)
SchlumbergerSema	UM and SMS	Yes	Yes	Yes	
Tecnomen	UM	No	Yes	No	
Telecommunication Systems	SMS and Location	Yes	No	No	
Teligent	UM	No	Yes	No	
Unisys	UM and Services	Yes	Yes	No	

Source: Frost & Sullivan

MMS platform vendors tend to focus on a better technical performance as a discriminating factor or competitive advantage of their MMS centre. Certainly, the throughput requirements that MMS places on the MMSC are far stricter than SMS. An MMSC featuring the same throughput rate as an SMSC (for example, 4 Mb per second) will only be able to send 1 percent of the messages. Frost & Sullivan believes that, while this and all the above are crucial, existing commercial relationships and the comprehensiveness of the offering will determine success. Platform vendors can take advantage of their existing customer bases to upsell their MMS offerings. So most likely, the winners in the MMS space are expected to be those vendors with the longest list of customer references.

It is not so easy to tell whether network operators would prefer to install an MMSC from either their SMS infrastructure supplier, UMS provider, or rather from their network infrastructure and handset supplier (or other services provision). So far, more operators seem to show preference for the first segment, but network vendors are leading, based on the addressable subscriber base. Also, this is related to the completeness of their solution offering. Telecom equipment vendors can bundle their MMS system into the sales of next generation networks, gateways, billing systems and handsets. Hence, the major differentiator for the largest mobile companies, such as Ericsson, Nokia and Motorola, is their capacity to develop

and provide an end-to-end solution to the carrier. They are also able to carry out quality of service, performance and interoperability testing to ensure everything works properly sooner than competitors.

Furthermore, operators will be in favour of those vendors that can offer services and technology complementary to MMS. Thus, vendors capable of presenting a portfolio of messaging solutions are in a better situation. As mentioned, there are only six vendors offering IM and UM in addition to MMS. The ability to understand roaming, prepay and billing issues by the MMS vendor are other critical elements.

As for new entrants to the mobile messaging market such as Teligent, the horizon may look even duller. Although operators are also looking at companies with no SMS footprint, Frost & Sullivan believes a store-and-forward messaging expertise and background will be a definite plus. Having said that, due to the close correlation between and probably future convergence of MMS and e-mail and UM mailboxes, new entrants with UM background may prove successful. The environment of MMS is a blend of the mobile messaging and the Internet worlds, understanding of IP-based technology and e-mail is heavily required. E-mail and mobile messaging is merging ever closer so companies with a strong expertise on e-mail, such as Openwave, are well positioned in the MMS market. Frost & Sullivan anticipates Critical Path will expand its messaging product portfolio to MMS.

Telecom Equipment and Handset Providers

When SMS was born years ago, by no means did the wireless industry leaders think it would become such an important revenue stream for participants years later. They then entered the SMS infrastructure market too late, when it was primarily dominated by CMG, Logica and Sema. It was too late for them as critical mass was already achieved when they entered the market, so they missed out on the SMS success and nowadays the market is still dominated by the same group as years ago, as Figure 5-2 shows. However, MMS will not take the network providers by surprise this time and so they will not make the same mistake again.

Mobile network infrastructure providers are Ericsson, Nokia and Motorola. The first two were the first to publicly demonstrate a real MMS service (February 2001 at the Global System for Mobile Communication (GSM) World Congress, Cannes). Ericsson demonstrated MMS over the general packet radio system (GPRS), whereas Nokia demonstrated MMS over circuit-switched networks. It appears these had the lead, at least at the beginning, in terms of developing and testing the functionality.

Frost & Sullivan believes Nokia, Ericsson, Comverse, Logica and CMG are best positioned to monetise the MMS opportunity. They have a strong footprint in the SMS infrastructure market and an international presence.

Figure 5-2

Total Multimedia Messaging Service Market: Leading SMS Centre Vendors Ranking (Europe), 2002

Vendor	Ranking
CMG	1
Logica	2
Nokia	3
SchlumbergerSema	4
ADC NewNet (now SS8 Networks)	5
Comverse	6
Ericsson	7
Openwave	8

Source: Frost & Sullivan

Nokia

Nokia was, if not the first, one of the first companies to introduce and start developing the concept of mobile MMS. Probably one of the competitors that is pushing harder for an early deployment of MMS, and related to this is the fact that it does not support intermediary multimedia messaging standards like the enhanced messaging service (EMS) (Nokia provides its proprietary Smart Messaging). Nokia has developed a range of different MMS products: the Artuse MMS Centre, the Artuse Profile Directory and the Nokia Multimedia Terminal Gateway. The Artuse Profile Directory will enable operators to manage both the subscriber base and the service access of WAP and MMS services from a single point. The Nokia Multimedia Terminal Gateway is the legacy devices support solution of Nokia, allowing users to participate in MMS regardless of their type of device. The company also offers billing systems, a digital rights management solution and MMS handsets.

Nokia and the Internet portal company Lycos have signed an alliance to develop MMS-based services. Through Lycos Mobile Channel, Nokia will reach Lycos community members, who can request ready-made Lycos content to have it delivered to the handset via MMS. A similar agreement was reached with eurosport.com, by which MMS subscribers will be able to receive sports headlines in real time with colour images and audio clips in their terminal. Both services are expected to be available in the middle of 2002.

Nokia shares the same strategy as most of its competitors, which is to get operators to have their MMS infrastructure up and running before the MMS-enabled terminals arrive on the market. Nokia has been one of the first MMS vendors to win clients. It will supply Sonera with the Artuse products and has received trial endorsements from Deutsche Telekom AG,

Orange and Telefonica. Sonera is also a client for the network infrastructure and just eight days before the MMS deal, an agreement to increase Sonera's capacity network was signed.

Ericsson

Ericsson's MMS solution comprises an MMSC, multimedia library, a WAP gateway and MMS handsets. The legacy phone support is incorporated as an integral feature within the MMSC. Ericsson demonstrated how legacy phones could receive a multimedia message using its infrastructure in November 2001. Soon after that, the company announced its prepaid system will support MMS. Currently, Ericsson only offers a hot billing system but has plans to have a real-time system ready for the launch of MMS services.

Ericsson boasts it has achieved the largest number of operators' trials to date, around 25 with operators and service providers and 25 internally. Its "MMS-to-be" T68 handset has received positive feedback from pilot customers and the analyst community and is central to Ericsson's success. The first company to award a global contract for its MMS infrastructure to Ericsson was Vodafone, in January 2002. The deal with the largest European operator is an impressive achievement for Ericsson, which will see Vodafone installing its MMS solution across the operator's main European regional markets. Nevertheless, there will be some midsize operators owned by Vodafone which will likely buy from another supplier. Its global partnership with Finnish positioning and personalisation company, Reach U Solutions, will enable Ericsson to offer operators the ability to launch location-based MMS services by using the Context Engine solution.

Motorola

Motorola's MMSC is based on Solaris and is part of a broader platform called Motorola Messenger. Motorola is more inclined towards partnering than most of the rest of the MMS platform suppliers. Motorola has made an equity investment in and worked together with Personity to deliver the Motorola messaging system. The platform is capable of presence-based communication amongst subscribers encompassing hardware, software and applications to enable carriers to offer IM, presence-based voice calls and MMS. Combining presence and MMS technology Motorola seeks to differentiate from the competition soon. Frost & Sullivan expects most of the vendors will add presence technology to their MMS suites.

In addition, AOL Time Warner and Motorola have formed a partnership that will bring AOL IM application to Motorola's phones. Motorola will be able to license Warner Bros. content for ringtones and wireless games in Europe. With regard to the transcoding capability of its MMS solution, Motorola has partnered with LightSurf Technologies. LightSurf's MediaExchange Server optimises digital images for MMS delivery and is integrated into the MMSC. The two companies claim that, by focusing on digital picture transcoding, LightSurf can enable Motorola with a better transcoding tool than the competition. The MediaExchange

Server recognises hundreds of different picture formats, resolutions and devices around the world.

Partnering with companies such as Ztango, Motorola plans to offer wireless content and entertainment for EMS and MMS. Finally, Motorola announced last November it had developed a real-time prepaid solution for MMS. It will be deployed during the second half of 2002. Motorola was the first to market with a GPRS-capable handset and powers mm02 and T-Mobile network systems. The list of companies trialling Motorola's infrastructure is shorter than that of Ericsson and Nokia.

Alcatel

Alcatel is one of France's largest industrial companies in France, manufacturing telecommunication equipment and mobile devices for companies around the world.

Unlike its network equipment rivals, the company has not adopted a "first mover" strategy with regards to MMS. Alcatel has opted to enter the MMS market late to avoid frustration experienced in the past when entering the mobile handset marketplace too early. The company still remembers the disappointing sales volumes of Alcatel's One Touch Com PDA-phone, which was attributed to the lack of market acceptance. Hence, Alcatel will start testing its MMS-enabled devices at the end of 2002 and ship them during the first quarter of 2003. On the other hand, Alcatel's MMSC will be available in the second half of 2002

Non-telecom Equipment Vendors

The companies included under this title are those that do not participate in the network equipment arena, but instead specialise in enhanced wireless services or messaging technology. As players in the SMS market (most of them), the rising use of mobile text messages has boosted the profit and revenues of the vendors included in this segment, in the past couple of years. Their good commercial relationships with European operators in the messaging area is starting to reap its benefits and they are current winners in the MMS race so far, with the highest number of contracts.

The other side of the coin is that these companies are also smaller and with less resources and cash than the vendors previously described. The challenge for the SMSC leaders is to replicate their success with SMS in the multimedia market. The extremely high level of competition at this second wave of messaging platforms will demand much greater development, marketing and pricing efforts than the SMS era.

CMG Wireless Data Solutions

Alglo-Dutch CMG Wireless Data Solutions is part of CMG, a provider of system integration and management consulting services employing 12,000 staff. CMG WDS division focuses on delivering UM, SMS, mobile Internet, cell broadcast, mobile e-mail and customer care and billing infrastructure for operators. The UM technology was acquired from Cisco. CMG and Sony Ericsson have already carried out interoperability tests between CMG's MMSC and Ericsson's T68 phone and are currently establishing compatibility with a Nokia handset. In addition, CMG has taken its SMS partnership with Compaq further by jointly offering an end-to-end MMS solution for iPaq on a global basis.

The vendor's principal marketing message is based around the MMSC's quality of performance. Although claiming one client is handling 80 million short messages per day using two of its SMSCs, perhaps is not the most adequate of the messages, for reasons already mentioned. Thus, CMG may rather rely on its ability to combine its consulting and integration services arm with its data solutions. The fact that it has also developed and been the first vendor to actually launch a prepaid billing solution (Prepaid mCharger) is also a plus.

CMG has done good work taking advantage of its leadership in the European SMS market, being the first vendor to sell a MMSC and at the time of writing is leading the MMS race together with Ericsson. The customer, Norwegian Telenor, already was a customer for CMG's SMSC. Telia Group became CMG's second MMS customer. CMG products will be delivered to four operators of Telia Group. Finally, CMG will enable Hutchison 3G group of companies worldwide. The 3G license-holder is present in the UK, Italy, Denmark and Austria. CMG hopes to leverage its good relationships with Telefonica (which granted a 3G deal with the vendor), T-Mobil, France Telecom, SFR, One2One, Virgin and KPN.

Logica

Logica is an international telecom, software and services company based in London. The company pioneered the multimedia messaging concept and it claims its messaging software processes are about 60 percent of the world's SMS traffic. Its position is stronger in Asia, however, where NTT DoCoMo is the main customer. Logica has big plans for Asia, where multimedia content is already popular.

Logica has partnered with US-based Mediagate, a unified messaging gateway, to be able to offer unified mailbox and MMS persistent storage technology to customers. Logica, together with PDA and smart phones client developer EZOS, demonstrated its MMSC at the UMTS Forum 2001. In October 2001, the vendor launched a new programme for MMS application developers.

Logica has joined forces with Orange to begin live trials of its MMS technology over Orange's UK unit GPRS network. Orange UK will most likely be Logica's first MMS customer in Europe. The deal would be of great value to Logica as it seems reasonable that

Orange would extend the arrangement to the rest of its units across Europe. The company's shares dropped after the Vodafone account was lost, something that has affected most of the MMS infrastructure suppliers. Nevertheless, the company is confident in gaining existing customers such as Proximus Belgacom Mobile. It has been shortlisted for all the major MMS competitive tenders in play in Europe and is well positioned with expertise in complementary messaging technologies such as SMS, unstructured supplementary services data (USSD), cell broadcasting system, WAP gateways and prepaid billing systems (real-time).

SchlumbergerSema

SchlumbergerSema was formed by the combination of Schlumberger and Sema, the latter being acquired by Schlumberger in the first quarter of 2001. The US-based company provides wired and wireless communications solutions, ranging from consulting, systems integration, customer support, billing and network management to smart cards, mobile applications, messaging software and various mobile gateways.

With regard to messaging in particular, SchlumbergerSema markets SMSC, unified communications, IM platforms, location services, mobile e-mail, USSD, cell broadcasting systems and messaging gateways to more than 150 customers worldwide. SchlumbergerSema claims the world's first commercial SMS was sent by its SMSC. At the beginning of 2001, the company's SMSC served around 15 percent of global users. Major SchlumbergerSema's European customers include Vodafone in the UK, EIRCELL in the Republic of Ireland and Bouygues Telecoms in France.

Openwave

Openwave Systems is a US-based company, which was formed by the merger of Phone.com and Software.com, that delivers IP-based mobile Internet and messaging software and services. The company was one of the main contributors in the development of WAP. Companies such as Motorola, Ericsson and Samsung license its WAP browser and around 82 carriers have deployed its Internet and intranet mobile access gateways.

Due to the failure of WAP, Openwave expanded its product line, developing SMS, e-mail, mobile e-mail, UM and recently IM software. Other offerings include a suite of m-services (mobile Internet applications), compliant with the GSM Association's m-services guidelines. The company will release its MMS solution shortly. Frost & Sullivan believes Openwave's involvement in the m-services initiative and the WAP market is a competitive advantage the company should exploit. More importantly, multimedia content and services developed for m-services devices with Openwave Download Software Fun software can be a good source for MMS content. It is logical for the company to enter the market, as MMS, together with colour GPRS devices, will spur the demand for WAP services, Openwave's core market.

The vendor will attempt to leverage its large installed carrier customer base to upsell additional wireless systems. Openwave signed a large UM contract with BT in the second quarter

of 2001 and could be the company's first MMS customer. J-Phone has been using mobile multimedia solutions, having extensive expertise in e-mail messaging technology.

TeleCommunication Systems

TeleCommunication Systems (TCS) is a US-based wireless messaging and location technology provider. The company develops and markets SMS centres, Internet gateways, messaging distribution centres (inter-carrier messaging) location platforms and prepaid billing systems.

TCS has developed an MMSC that can be integrated into its location platform, Xypoint, the same way other suppliers merge their MMSC with their UM or IM systems. In fact, Xypoint includes IM enabling technology, such as presence. The enhancements that location technology can create in mobile messaging and other applications have been explained in the "MMS-based Applications" section of this study.

TCS is one of the latest entrant to the European MMS market. Frost & Sullivan thinks it will not be the last, as the market is still nascent and in any case it will be likely that operators will install MMSCs from more than one supplier. While it is not too late for vendors with a different approach to MMS from the competition (strong integration with location system), TCS faces stiff competition and lacks brand awareness in Europe. TCS will concentrate on its location and presence platforms of its MMSC. The company will apply for membership to the ETSI and open an office in London shortly to expand presence in Europe and will rely on strategic partnerships with Lucent and Nortel.

Comverse

Israel-based Comverse is the largest of the companies covered, with around 375 customers (some of the largest in the world) in more than 100 countries. Comverse's products cover multiple markets aided by the acquisition of Boston Technologies: MMS, SMS, IM, UM, intelligent networks, mobile e-mail, mobile Internet and voice services. The company's traditional product is voicemail, to which is attributable the majority of Comverse's revenues.

The key go-to-market strategy of Comverse is based around its open platform architecture. The company can bring together all the different components of all the areas mentioned together to create an end-to-end solution. Backed by its ability to provide this single foundation for operators' infrastructure, Comverse probably focuses on a "Unified MMS" approach more than any other vendor. Operators have the option of buying Comverse's UM solution together with its MMSC. Both systems can reside on the same platform and share common resources and infrastructure components, such as access, billing, security and management. Comverse is even working to enable convergence between messaging platforms and TV through its TVGate product for cable TV and broadcast satellite services providers. This product would enable subscribers to access messaging, Internet and commerce services also from the TV set.

The Spanish UMTS operator Xfera, bought the IM and the MMS solution from Comverse. Swedish operator Europolitan Vodafone, which deployed Comverse's UMS, is in advanced commercial trials of Comverse MMSC at the time of writing this report. The same way it upsold its SMS, prepaid, UM and Internet gateways to voicemail customers, Frost & Sullivan is confident it will have the same good progress with its MMS solution. Existing European customers include Deutsche Telekom and Mannesman in Germany, Telecom Italia in Italy, SFR in France.

Unisys

Unisys generates most of its revenue from system integration, consulting, outsourcing and technical support services (around 70 percent). The company is well known for its computing hardware but is now shifting its focus to higher-margin businesses. In the mobile communication industry, Unisys seeks to be a one-stop shop, where clients can get value added services such as SMS, UM, MMS, text to speech, speech recognition, natural language understanding, voice portals as well as m-commerce solutions, broadband systems, billing, customer care solutions and network management services.

Unisys used the UMTS World Congress in 2001 to unveil its multimedia messaging solution. The company has made messaging a cornerstone of its strategy, with the capability to integrate all its messaging solutions in one single platform. Due to the fact that the core of the vendor's MMS solution is its UM system, it has received heavy criticism from competitors, which have described it as a shallow solution for MMS. Another major differentiator is that Unisys will be hosting the MMS platform using its outsourcing competences.

Unisys will provide picture messaging, video messaging for person-to-person (P2P) and person to machine communication. The company stands out from other MMS solution providers on its video and music streaming services.

Tecnomen

In the 1980s, Irish company Tecnomen delivered one of the first voice messaging platforms for analogue mobile networks. The company gradually moved forward to develop fax and mail systems for GSM networks and then UM and wireless Internet solutions for WAP 1.1 devices. In addition, the company delivers a prepaid billing solution.

In October 2001, Tecnomen launched its MMS solution after more than one year's development. Like most of its competitors, Tecnomen offers carriers two models for deploying MMS, either stand-alone and P2P-centric or integrated with its UMS and wireless Internet applications. Tecnomen eZONER is the name of the complete platform of wireless messaging and Internet solutions, including besides MMS and UM: voice services, mobile e-mail as well as content and instant messaging services.

Although more modest than most of its competitors, Tecnomen can grasp some significant market share if it succeeds to upsell its growing UM customer base to MMS. Early in 2002,

Tecnomen supplied its eZONER UM platform to German operator NetCologne. Targeting midsize and small carriers can be a way to put a foot in the market.

Teligent

Teligent AB is a Swedish company specialising in developing value-added and intelligent network services and systems. The company's product portfolio is based on its P90/E intelligent network middleware platform and among others includes: virtual private networks, network access validation, personal numbers, virtual call centres, mobile office (virtual Public Branch Exchange), unified messaging, prepaid solutions, automatic collect calling and 3G multimedia messaging.

The new offerings of Teligent in the MMS space are an MMSC and a WAP gateway. The MMSC has been jointly developed by Teligent with mi4e and is the result of combining Teligent's P90/E value added services modular platform and mi4e's Internet protocols and services technology. In addition to the MMSC, Teligent will be looking to supply UM and IM as part of the package.

In Europe Teligent has BT, Telefonica, Telia and Mannesman as customers. It highlights the partnership between Teligent and the French technology integrator and consultancy Atos Origin. The Atos Origin-Teligent alliance has a great potential to expand in the French market, where it will be an extraordinary competitor.

Materna

Materna's primary business is to provide value-added services (VAS) to mobile operators. The company develops SMS-based (in the future EMS and MMS) content, information and entertainment, as well as "SMS-to-anything" conversion services. Anny Way is the company's brand for mobile communications services, which sit on top of the company's middleware platform Anyway Information Centre. Materna licenses the middleware and the VAS to carriers and hosts them in a managed services model. The company also provides a mobility service to the enterprise by which employees can access corporate messaging systems. Other key products include WAP gateway, SMS middleware platform, UM, MExE application server and MMSC.

Certainly, Materna's MMS offerings differ from any other competitor in the industry. Not only will the company market an MMSC tied with relevant applications (Anny Way Multimedia Information Centre), but also an MMS client to be installed initially in PDA terminals. Materna has in Siemens its most powerful ally to grow in the multimedia messaging market. Both companies signed a co-operation agreement for a joint sales initiative in which Siemens would distribute Materna's products, acting as an original equipment manufacturer (OEM). Hence, Siemens will combine Materna's MMSC with its own platforms, such as base stations, UM and billing systems, and sell them to operators.

Materna is present in various tender situations for MMS implementations. Again, it is key for the company to enhance conversation with existing customers. Materna's VAS customers include: Viag Interkom, e-plus, Deutsche Telekom in Germany, Vodafone in the UK, Proximus in Belgium, Libertus in the Netherlands and Telesel in Portugal. Customers for the WAP Gateway are MobileCom and A1 in Austria and Viag Interkom.

Complementary Technology Vendors

MMS Infrastructure

Wiral

Wiral is one of the few players in the MMS infrastructure space that comes exclusively from an IM software background (US-based Ecrio also provides multimedia IM). In 2001, the company launched software extensions to its IM platform to allow carriers to offer IM subscribers an MMS solution. The product, called the MMS Extender, belongs to Wiral's core platform: Wiral Matrix Product Suite.

The company, while not an MMSC vendor, offers a product that can operate independently from and similar to MMS centres. The MMS extender can work stand alone to connect an MMS terminal with an IM client, but it was especially designed to connect to the operator's existing MMSCs. However, it is still a store-and-forward platform and carries out content adaptation.

First Hop

First Hop specialises in messaging management middleware platforms. Recently, it launched a modular offering for MMS containing upgraded versions of its First Hop Message Router, Content Push and WAP Gateway. The router is a gateway between different messaging applications and messaging centres. Content Push is a push proxy gateway product that supports WAP push capability to be able to send content to mobile phones, such as notification for MMS. The WAP gateway provides access to WAP services. In addition, it will market the First Hop Terminal Manager, which allows users to configure the settings of their handsets regardless of the type via the Web or by sending an SMS.

mi4e

Sweden-based, mi4e has developed the embedded mobilisation (EM) technology. Its EM WirelessSuite enables companies to transform their Web servers into mobile services platforms, namely mobilising (distributing over mobile networks) existing Internet applications and content. The package comprises: EM PKI Certificate Server, the EM Wireless Server, and the EM Push Server. The EM Push Server allows companies to route and push various types of data to terminals, from SMS text, ringtones and graphics, to WAP pages and EMS and

MMS messages. Mi4e has teamed with Teligent to jointly develop an MMS platform for operators.

Bitfone

Bitfone, headquartered in the United States and funded by Nokia Venture Partners, provides software that enhances the carriers' WAP gateways and MMSCs. The company provides an application layer on top of these to allow subscribers to access and grab rich media content from their PCs, the network storage (which they provide) and the Web and send these files as multimedia messages. The iBroker products (iBroker Server and IBroker Share) allow users to render attachments using WAP handsets following a link as well as to store and send. In addition, the company can convert formats in synchronised multimedia integration language (SMIL) format into multipurpose Internet mail extensions (MIME) format messages, for MMS to e-mail conversion. Its sales strategy relies heavily on global partners such as Logica, Comverse, Psion and Cap Gemini that would resell Bitfone's products as part of their messaging and data infrastructure. Bitfone hopes carriers will use its solution for mobile e-mail (WAP mail) and then support MMS when it arrives.

Transcoding Companies

- LightSurf Technologies. Please see above for company description. Current partners and customers include One2One (T-Mobil), Motorola and Kodak
- UCnGo is a small Israeli start-up company specialising in the provision of a transcoding platform to optimise multimedia messages to the device capabilities and media format. The product is called Media Application Server and also serves as a digital right management system
- PictureIQ. This US-based company develops image content production and delivery server appliances
- IBM's WebSphere Suite also includes a transcoding publisher
- ConVisual. This German start-up, is in fact a wireless ASP for visual and multimedia messaging services. Operators can outsource the transcoding function to conVISUAL
- NewsTakes. Backed by Orange, this company provides software and services for content optimisation in wired and wireless environments
- Mobixell Networks
- mEncode
- Alter Ego Networks
- OpenTV (through the acquisition of Spyglass)
- Pumatech (through the acquisition of Proxinet)

- Intel's QuickWeb
- Hewlett Packard
- Other popular content adaptation development environments are: Online Anywhere, Transend, Digestor, Mobiware, Smartclient and Odyssey

Streaming Platform and Media Player Vendors

Wireless multimedia streaming is contemplated in the MMS standards and is still under development. Wireless multimedia technology providers are forging licensing agreements with devices manufacturers to integrate their multimedia delivery, management and viewing software into mobile terminals. They also sell to mobile operators and content providers. Streaming is not really messaging, since the file is stored in a network server to be retrieved by the mobile recipient following a link included in the message.

- PacketVideo. The company has a strong presence in the 3G Asian market. Sharp has licensed PacketVideo's MPEG-4 technology to integrate into its PDAs. Other customers in Europe include Sendo and Siemens. Operators such as Spanish Airtel and Telefonica have trialled PacketVideo's service. Comverse, Motorola, Siemens, Phillips, Sony and Kyocera have invested in PacketVideo
- Emblaze Systems. This company has also attracted a lot of attention and demonstrated streaming with its partner Samsung
- Thin Multimedia
- Luxxon (acquired by Hutchison Telecom)
- Liquid Audio
- Phillips
- ActiveSky
- RealNetworks
- Apple's QuickTime
- Windows Media Technologies

MMS Handset Manufacturers

MMS Handset Availability

The technological and functionality requirements that MMS places on the handsets have been explained. These requirements imply intensive Research and Development and huge technical challenges for handset manufacturers. MMS software has to be developed. Larger screens with higher and colour resolution consumes battery power much quicker. More processing capability is needed for enhanced services. Integrated digital cameras are also being manufactured. All these requirements have pushed availability timescales forward and price upwards.

Currently there are no MMS-enabled handsets in the European market. The first MMS-enabled handsets that will be shipped in 2002 will be those able to support text, pictures (either still or animated) and voice recording and sending. At the beginning, real audio file messaging is not expected to be included in the first MMS phones, such as MP3 or MPEG. Certainly, the first MMS terminals will not be targeted at the low end of the market, but the high or middle end. There is a great debate around the positioning of the MMS terminals in the next couple of years. There are initial indications that the first MMS devices will be expensive, conditioning the market growth.

Nokia and Ericsson have already developed and presented MMS models of their mobile phones. Ericsson's T68 is not yet fully MMS-enabled. It currently supports EMS but will be upgradable to MMS around the second quarter of 2002. Volume shipments of the Nokia 7650 are expected for mid-year of 2002 and no earlier than June. Nokia anticipates that half of the handsets shipped by the end of year 2002 will have MMS capability and 100 percent of terminals will be MMS-enabled by 2003.

Handset Churn and Subsidies Vicious Circle

Europe started to see a high level of saturation in terms of handset penetration two years ago. Progress in technology permitted manufacturers to improve device functionality, improving replacement rates in Europe.

Network operators contributed to this increase. Seeking to expand their customer base, carriers helped to stimulate replacements by augmenting churn through the widespread use of terminal subsidy. This led to a situation where it was more beneficial for subscribers to swap networks and gain a new terminal than to stay with their operator. Recently, following the stock market decline and the debt overhead of the operators, these subsidies are now being reduced and operators are apparently seeking to reduce churn and move their customer base away from a prepay to a contract mentality. Therefore, at the time of writing, handset churn has reduced since the cost of terminals has generally increased, creating a barrier to adoption

of new handset technology. The average user replaces his/her handset on a timescale of between one and two years.

All leading handset manufacturers are enabling their terminals with MMS in the hope of inciting subscribers to upgrade to new phones and increase declining sales. A variety of terminals spanning from low end to high end will appear in the European market in the coming years. However, the high cost of terminals will hinder the mass market embracing of MMS. There is a strong need for operators to subsidise MMS terminals in order to attract subscribers and boost their ARPU, justifying the cost of investing in 3G, but for reasons alluded to earlier, carriers are reluctant to do so.

MMS Handsets Launched

Ericsson T68

Features

- Size: 101x 48 x 19 mm
- Weight: 85 g
- Display: 256 colours 101 x 80, 60 x 80 pixels
- Wireless connectivity: infrared and Bluetooth
- Operating frequency: triple band, 900, 1800 and 1900 MHZ
- GPRS and high-speed circuit-switched data (HSCSD)
- WAP 1.2.1
- Messaging: e-mail, EMS and MMS
- Joystick

The Ericsson T68 has an icon desktop and a four directional joystick, which enhances the phone's usability. During 2001 the T68 has been offered and employed as a prototype across the world in small numbers as part of Ericsson's trial systems that are underway. Currently, it supports EMS, but it is expected to be shipped with MMS capabilities in the first quarter of 2002.

As opposed to Nokia, Ericsson decided not to manufacture an MMS phone with a built-in camera. However, the company developed the Communicam MCA-10, a digital camera accessory that is clipped on to the bottom of the phone and which is already available to connect to those phones equipped with a modem. The Commmunicam was designed to work with GSM WAP mobile phones R320, R520, T39, T20e and T29. The image resolution is 352 x 288 pixel (common intermediate format) and the colour depth is 24 bit, supporting

16 million colours. When the Communicam is attached to the phone, an additional entry appears in the menu and the user is prompted to enter his/her ISP details. This is because the pictures are sent via the user's Internet account to the recipient's e-mail account (in the case of a non-MMS phone). The problem is that users cannot preview the pictures taken and the quality of the photographs is low. A single picture takes around one minute to send over GSM.

Frost & Sullivan anticipates that the Sony-Ericsson joint venture will develop a terminal with an integrated digital camera in 2002, in addition to the clip-on version. One of the motivations behind Ericsson's alignment with Sony was the latter's expertise on audio, video and game technology products.

Price

The EMS Ericsson T68 was priced at around $500 for prepay purchase, positioning it at the top end of the market, although the price has gone down slightly. The Ericsson T68 is available at around $210 with a Vodafone contract, which is a decent price. On the other hand, the Communicam has a price tag of $380. This is far too expensive, there are good digital cameras for that price or cheaper in the market. Frost & Sullivan expects the price for the Communicam will decrease when the T68 is shipped with MMS capability

Nokia 7650

Features

- Size: 114 x 56 x 26 mm
- Weight: 154 g
- Display resolution: VGA, 640 x 680 pixels, colour display, 176 x 208 pixels
- Memory: 4 Mb
- Integrated digital camera
- Operating frequency: dual band 900 and 1800 MHZ GSM
- Wireless connectivity: infrared and Bluetooth
- Operating system: Symbian
- WAP 1.2.1
- PIM suite (personal information management)
- GSM, HSCSD and GPRS
- Messaging: e-mail, picture messaging and MMS

Nokia's first imaging phone, as the company likes to call it, shares many of the features with Ericsson's T68. Both have a navigation joystick, a large colour display, WAP, infrared and Bluetooth connectivity and support GPRS and HSCSD.

However, there are also major differences. The Nokia 7650 is an MMS-enabled terminal. It includes an integrated digital camera as opposed to an accessory. When the camera is unveiled at the back, the screen turns into a live "viewfinder", like a real digital camera. The keypad rests underneath the cover of the phone and slides out when needed. The memory capacity is bigger than the Ericsson T68, so more files can be stored in the phone album. Frost & Sullivan expects Ericsson will improve the memory when the phone is upgraded. The Nokia terminal is also a full PDA with a PIM suite. Finally, the Nokia phone will not initially be triple band as is the Ericsson terminal.

Price

The price for the Nokia 7650 in Europe has not yet been disclosed. Nokia will confirm prices nearer the launch dates. Some prices have been put about, such as $500, a similar price to the Nokia 9210. Frost & Sullivan believes this terminal will suffer from an identity problem since it looks like a consumer proposition offering but it will not be priced accordingly.

Future Releases

Motorola and Siemens are planning to launch their MMS-enabled terminals during the second and third quarter of 2002. Alcatel claims it will ship MMS phones in 2003. The rest of the European handset manufacturers, such as Sagem, Phillips, Trium and Sendo, will develop terminals with MMS but launch dates have not been disclosed. Already, virtually all companies offer a handset model with some kind of enhanced messaging capability.

Frost & Sullivan expects 3G handset manufacturers to move to the European market, although stiff competition may stop them from doing so. Japanese 3G service Foma handset vendors include Panasonic, NEC and Sanyo. Other possible future entrants to the MMS terminal market include Samsung, Sharp, Suunto, NeoPoint, Mitsubishi, Toshiba, Ellipso, Benefon, Bosch, Sagem, Telital, Lucent, Nortel, Hitachi, Cybird and Fujitsu.

Personal Digital Assistants

PDAs, connected to wireless networks through radio interface add-ons (in the future integrated), meet several of the requirements to be MMS-enabled, such as large and colour screen and enhanced memory. Most of them can stream video and exchange e-mail. However and with some exceptions, they are not yet MMS-enabled, their capabilities do not fit with 3GPP and WAP Forum specifications for MMS. PDAs can easily become MMS embedding new software.

The only case that Frost & Sullivan has come across is Compaq, which has extended its relationship with CMG to offer operators an end-to-end MMS solution. This solution will integrate CMG's MMSC and Compaq servers on the network side and Compaq iPaq PDA and CMG's user agent on the terminals side.

Certainly, PDAs can be touted as the ideal device for MMS, with a much better colour video and graphics display. However, the PDA has been mostly a business device, whereas MMS is aimed at consumers. Compaq hopes consumers will be attracted by the more robust multimedia capabilities of PDAs in the short term. Furthermore, and the Nokia 7650 illustrates it, a convergence between PDAs and mobile phones is already happening. Other examples of PDA-phones include the mmO2's xda, Ericsson Communicator and R380, Trium Mondo, Cybird, Handspring Treo, Samsung SPH-I300, Motorola Accompli, Nokia Communicator and 7650, LG Electronics LGI-3000W/TP3000, Sendo Z100, Kyocera QCP-6035 and Toshiba, which will unveil a PDA-phone during the second quarter of 2002.

Other Non-MMS Multimedia Handsets

Multimedia devices have been designed and introduced by manufacturers for some time now in markets such as Asia. In October, NTT DoCoMo launched FOMA, the first commercial 3G wireless service in the world. FOMA brings multimedia to mobile devices, which have colour displays and built-in video cameras. Among FOMA's features, subscribers can exchange video e-mail messages with attachments of images, music and video files. Videophone devices allow live video conversations. NEC is one of the manufacturers for the FOMA services. However, while multimedia, these are not MMS terminals as defined by 3GPP since they are not based around an MMS centre but around the mobile Internet.

Samsung has developed a series of multimedia mobile phones equipped with thin film transistor-liquid crystal display (TFT-LCD), which are marketed in Asia: the SCH-M220 and the SCH-V200. The Samsung SCH-M220, or the so-called TV phone, combines the features of a TV and a mobile phone into a single device. Samsung has integrated a digital camera into a CDMA mobile phone with its Samsung SCH-V200, available in Korea since 2000. The unit can take up to 20 pictures at 640 x 480 (350,000 pixel resolution) and has a colour display for seeing the pictures. Finally, the Samsung VOD Phone can reproduce motion picture images and supports video on demand and audio on demand.

Swedish company Spectronic has developed and patented a unique system for mobile phones: SideTouch. A prototype of a sidetouch phone, called Spectronics Multimedia Telephone, was displayed at CeBit 2001. The phone can send e-mail with attached files via the current networks. The other functions of the smartphone are a fax, a built-in digital camera, WWW and WAP browsers, loud speaker and a microphone. However, the key feature is a sensor screen and an operating system developed for thumb touches. This device can also be used as a dictaphone.

Casio, in conjunction with Vodafone UK, shipped a small amount of a device called the Message-Cam in 2000. This device includes a colour, touch-sensitive screen, sound and photo archives, a voice recorder, a WAP browser and allows the user to send e-mail with picture attachments.

Phillips Ficio 820: GPRS colour, people can exchange messages with attachments.

Network Operators

MMS Rollout Plans

All network operators in Europe are working towards offering MMS to customers during years 2002 and 2003. The largest operators, 3G licence holders, intend to offer MMS as soon as possible to stimulate ARPU growth and so be able to pay back debt. However, timescales will really depend on whether there are enough MMS-enabled devices in their customers bases and an early indication of this is the penetration of WAP devices. The precise date launch of MMS services is not confirmed as yet. Operators are challenged to take the right decision, either to launch early before penetration of devices to capitalise on leadership and early entrant position or wait and make sure that a commercial success is obtained out of it.

There are other benefits that MMS will bring to operators, besides ARPU improvement. Subscribers who have the multimedia messages stored in the operator's network, as well as their notification profile set up, are less inclined to churn. In addition, operators have the opportunity of controlling, building and extending services. As in the Japanese model, by defining the services and pushing handset manufacturers to develop the suitable devices, the European operators may achieve success rapidly. In contrast, the mobile Internet is outside the operators' control.

Operators see MMS as the progression from SMS and to make that a reality they obviously consider that adhesion to the standards is essential. They need to make sure that their customers will not have worries about what device, what manufacturer and what network the recipient is actually using. This is why all operators are testing compatibility between different vendors' MMS centres, between different networks and compatibility between different devices. The Mobile Data Association did good work promoting SMS across all the different networks and is expected to try to bring in all industry players, but especially operators, to ensure that MMS is a global success.

MMS Contracts

There are only a few operators in Europe that have signed contracts with MMS infrastructure vendors. Figure 5-3 shows a list of those operators with their corresponding supplier, date of contract and the countries affected by the contract. It is clear that there is a predominance of Scandinavian operators, which are already at the forefront in the SMS space in Europe.

Figure 5-3

Total Multimedia Messaging Service Market: MMS Contracts Awarded (Europe), 2002

Operator	MMS Platform Supplier	Date	Region
Xfera	Comverse	May 2001	Spain
Telenor	CMG	July 2001	Norway
Telia	CMG	September 2001	Sweden, Norway, Finland and Denmark
Sonera	Nokia	December 2001	Finland
Vodafone	Ericsson	January 2002	Germany, Greece, Ireland, Italy, The Netherlands, Portugal, Spain, Sweden and United Kingdom
Hutchison UK	CMG	February 2002	United Kingdom

Source: Frost & Sullivan

It has been highlighted in a previous section the importance of the commercial relationships that messaging technology suppliers have forged in the past. These suppliers will have the chance to leverage their customer base to upsell to the new multimedia messaging platform. The competition from providers of next generation networks will be stiff as they will be able to bundle these with their messaging solution. Figure 5-3 shows a list of all the major European wireless carriers and their SMS centre suppliers.

Xfera, the UMTS licence holder and consortium of companies such as ACS, Vivendi, Sonera, Mercapital, Alba, ACESA, was the first operator (to-be) to buy an MMS solution. The platform was sold by Comverse together with IM solution. Unfortunately, Xfera will have to wait until 3G networks are rolled out to offer MMS, unless the government offers the company spectrum to operate commercially over GPRS or GSM.

Telia has awarded an MMS contract to CMG Wireless Data Solutions for the four countries in which it operates: Sweden, Norway, Finland and Denmark. Telia is a user of the CMG SMS solution.

Norwegian operator Telenor also bought its MMS solution from CMG, being already an SMSC client. The operator claims the highest number of short messages per subscriber in Europe. Telenor, amongst others, has developed technology for transferring MPEG-4 video over the Internet and mobile networks, establishing a major international licence programme for commercialising MPEG-4 video patents to future suppliers of video on demand. In addition Telenor is working with Egmor for multimedia cartoons services.

Sonera selected Nokia as its MMS provider in December 2001. The operator aims at offering MMS to the European market first in the world during the first half of 2002.

Vodafone, the largest mobile telecommunications operator in the world, is trying to bring MMS to the European market by mid 2002, and Ericsson's platform will be used. The

company will initially roll out MMS in Germany, Greece, the Republic of Ireland, Italy, the Netherlands, Portugal, Spain, Sweden and the UK. Vodafone-owned SFR in France and Belgacom in Belgium have not yet selected a supplier, in addition to other countries where the company has a presence: Romania, Hungary, Poland, Albania and Malta.

The last company to award an MMS contract was Hutchison 3G UK. The 3G licence-holder will implement CMG's UM and MMS solutions across all Hutchison Group companies globally. In Europe, Hutchison group is present in UK, Italy, Sweden, Austria and Denmark. In addition to UM and MMS, it will also deploy Wireless Broker, voicemail and SMS solutions from CMG.

Trials of MMS Solutions

In Sweden, Europolitan Vodafone was trialling Comverse's MMS solution and the operator stated the likelihood of closing the contract for commercial delivery. Surprisingly Ericsson eventually won the deal. Frost & Sullivan believes this is partly due to the fact that Ericsson will supply the T68 handset and 3G network infrastructure to Vodafone.

Several European operators are testing MMS solutions over their usually GPRS networks. France Telecom's subsidiary Orange UK is looking to be one of the first UK operators to deploy MMS. The operator has established a partnership with Logica and begun MMS field trials to evaluate market interest in MMS services, with a view to developing its own range of services. Orange SA carried a demonstration of a voice, data and video communication on Orange's UMTS pilot infrastructure from Alcatel in December 2001.

Initially, German operator and KPN Mobile-owned E-Plus announced that it would launch MMS when its UMTS service was operational, but as with most of its competitors, decided to offer it on its GPRS network. KPN Mobile is in close co-operation with Japanese operator NTT DoCoMo, which owns 15 percent of the Dutch operator. Together with DoCoMo, KPN claims it will be able to introduce i-mode in Europe during the second quarter of 2002. In August 2001, both carriers introduced the Snapcam, a digital camera that allows images to be e-mailed via mobile phones, manufactured by Toshiba and in use in Japan since 2000. The camera takes pictures that are stored in JPEG format and sends them using infrared to the phone. So far the success has been less than expected and the operator had to postpone its GPRS service Internet Everywhere, making the service expensive and cumbersome.

mmO2 (formerly BT Cellnet) has a presence in the UK, Republic of Ireland, the Netherlands and Germany. Under the new name, the operator is taking a group-wide approach to the delivery of large infrastructure or service projects. Hence, within mmO2, a multimedia messaging project team has been formed, which will lead and stir the delivery of MMS across all its networks in Europe. Consolidating the multi-network provision of MMS into a single vendor and moving away from having local solutions units, the carrier seeks to capitalise on cost savings and ease the support processes.

mmO2 will start MMSC, network and device interoperability tests at the beginning of 2002. After that, the operator will carry out a request for quotes process with six vendors to select the commercial partner, to offer services in the last quarter of 2002. Due to the relationship between the company and Openwave, it is quite likely this will eventually be the MMS technology supplier. WAP penetration among O2's customer base is quite significant, especially compared with other operators (around 20 percent) and the operator anticipates a similar rate for MMS in the next 18 months.

Deutsche Telekom performed some multimedia trials over its GPRS network in 2001. In March 2001, Phillips carried out demonstrations of video and audio streaming over the GPRS network of Deutsche Telekom division T-Mobil, using PC and PDAs connected to GPRS handsets.

Telecom Italia Group (TIM), began testing MMS services with an undisclosed supplier. The company unveiled in November 2001 the TIM Photo Album, a service that allows subscribers to download photos from the Internet to be viewed on a mobile phone that supports m-services.

Spanish operator Telefonica has established a MMS relationship with Nokia. The vendor demonstrated MMS at the Nokia Mobile Internet Conference in Barcelona before any of its Spanish competitors. The operator has also undertaken testing with Ericsson and Frost & Sullivan expects Telefonica's SMS supplier will follow. Telefonica Moviles will provide WAP subscribers with a similar service to TIM's, the ability to download multimedia content to m-services handsets powered by Openwave Download Fun software. In addition, Telefonica has signed an agreement with content provider Mitsui to provide downloadable video and audio content to offer to 2.5G and then later to 3G customers. Users can download ringtones, screensavers and games that can be played via WAP.

Operators' Focus

Network operators across the world have daunting tasks and big challenges to undertake. The emergence of content-based services and new technologies, such as MMS, implies a new strategic landscape and the role of operators in the value chain. The main revenue sources, sharing and models for network operators have been described in a previous section ("Introduction and Business Models"). Operators will shift their focus and efforts to a different strategy in line with the type of network infrastructure and services being rolled out.

2.5G Operators

European operators deploying 2.5G infrastructure and services concentrate on:

- Subscriber acquisition in highly penetrated markets.
- Subscriber retention and ARPU protection for established players.
- Managing GPRS expectation gap with first-rate applications.
- Avoiding threats from services providers (such as Internet portals) with regard to subscriber ownership.
- Migration of legacy architecture to mobile Internet and IP.
- Working with their portal and application partners to introduce new Internet and MMS integrated applications.

3G Operators

They will concentrate on:

- Building the new 3G brand.
- Quick time-to-market starting to generate cash-flow as soon as possible to cover debt interest payments originated by 3G licences and infrastructure investments.
- New entrants getting established before incumbents can migrate legacy systems.
- Using full network bandwidth, ideally with a maximum proportion of data revenues.
- Minimising the costs of providing commodity voice services.
- Capturing and transferring customers from 2.5G, allowing for number portability and better service.
- New terminal types to support new applications and reduce cost of software upgrades.

Application and Content Providers

Application Developers Programmes

Handset manufacturers, network operators and network infrastructure vendors, they all can, and most do, design application and content themselves. However, they usually rely on specialist third-party developers. Most companies in every segment mentioned have created programmes and schemes to facilitate the flourishing of innovative applications and to assist in the marketing of these to network operators. Content and application developers are screened and recruited to the developers' programmes. In the case of software development,

the applications will normally only be available for use on the handset or MMS platform of the company with which the developer has partnered.

Typically, the handset manufacturer or the platform provider provides training, finance and marketing support to application developers. Some examples of these programmes are:

- Nokia and Forum Nokia.
- Logica and the Application Providers Programme.
- Ericsson and the Mobility World Community and the Developer Alliance Programme.
- Openwave and the Openwave Developer Programme and Alliance Programme.
- Comverse and the Spark Alliance Programme.
- Motorola and MAGNET (Motorola Applications Global Network) programme.

Once the operator has selected the content or application providers, these will be connected to the MMS centre using the application programming interfaces available on the system and then passed on to subscribers. While the billing of services to subscribers will presumably be event-driven or on a value basis, it is in carrier-developer situations that complex billing schemes will be used. Namely, based on the volume (packets), time to supply the content and so on.

MMO2 is putting a great effort in building a development community. Around 3000 developers have signed up to the development programme, trying to get applications and compelling propositions to market quickly. The name of the programme is Expidas.

Operators have to create a business environment where both they and the content providers can prosper, if they seek a sustainable growth model for MMS. Mobile operators in Europe are not used to dealing with content and application providers that yearn for a share of the takings, but there are indications that this is changing. Carriers are starting to recognise the need for a change of mentality towards application developers in light of the accomplishment of i-mode. Operators must realise that content that subscribers would be willing to pay for will not blossom unless the providers have satisfactory incentive to do so. In some countries restrictive regulations prevent revenue sharing. This is the case in Germany, where operators must become banks before they are allowed to share revenues with content owners.

Telenor in Norway developed a revenue sharing premium rate SMS service that now accounts for 15 percent of SMS traffic. Telia is also to adopt a new revenue sharing agreement with mobile Internet companies in a bid to stimulate growth in this area. Currently Telia charges around 50 percent of revenues as a fee for distributing the services of mobile Internet companies. Now, the operator plans to reduce its share to 20 percent.

Content and Application Providers

The leading application, content and software providers in the SMS and mobile Internet space will continue to dominate the MMS landscape. On the other hand, there are other application and content providers which either concentrate solely on MMS (such as multi-media content, streaming and entertainment platforms) or adapt content to MMS (media and news companies). Some of the major application, messaging platforms and content providers include:

- Akumiitti
- Aspiro
- Babylon
- Dialogue Communications
- Materna
- Worldzap
- Kiwi
- Anthropics
- Iobox
- FunMail
- Associated Press
- Beep Science
- Reuters
- SpringToys
- BBC
- Eurosport
- CinemaElectric
- WES
- Atchik
- Mgage
- conVISUAL
- Beatnik
- Reach-U
- FotoFunPack
- JiGami
- Mobile Media
- Plazmic
- Newstakes
- Riot Entertainment
- Jipii
- Brainstorm
- Orchimedia
- Egmont New Media
- Digital Bridges
- Extratainment
- Picofun
- Warner
- Disney
- EMI Records
- ScreamingMedia

The richer content that MMS allows will encourage media broadcasters and information businesses to enter the mobile multimedia content provision market, for example, CNN, Warner Brothers, Disney, Reuters, Cartoon Network, Eurosport and the BBC. The latter has signed a five-year deal with Hutchison 3G to create audio, video and static content for the operator's subscribers.

6

MMS Applications

Introduction

It is said that multimedia messaging is regarded itself as a mobile application, and by many as the "killer application" of next generation services. Taking the short messaging service (SMS) success as an example, industry players could not envisage the phenomenal growth that it would spawn, becoming a "killer application". The industry focused on providing technology in a usable form and the market generated the applications. Something similar will happen with the multimedia messaging service (MMS), although most applications are already set since it will be SMS's "big brother".

On the other hand, MMS, and mobile multimedia in general, can also be defined as the platform or the basis upon which many other types of applications can blossom, running over and leveraging its functionality. Unsurprisingly, the industry is still in the early stages of developing MMS applications. MMS will allow European operators to offer new types of services for each category of applications and perhaps more importantly to add a rich visual feel to the same services than those offered with SMS. In addition, users will have started experiencing a taste of this superior content with enhanced SMS.

Frost & Sullivan believes that person-to-person (P2P) MMS is going to make up for the majority of traffic and revenues, as it is the case for SMS. However, it is hard to weigh up the traffic and revenues that each type of application will contribute during the early stages of the MMS life. At the beginning, it would seem fair to say that non-P2P MMS will contribute relatively more to the overall MMS activity than inter-person communication due to the low penetration of MMS-enabled handsets.

However, Frost & Sullivan believes that even at the early days of MMS P2P messaging will grow faster than non-P2P communication due to several reasons:

- It will take time for the industry and users to respectively develop and subscribe to content and entertainment applications.
- Users can send MMS as e-mails and use the unified messaging system (UMS).
- With a suitably enjoyable experience for the recipient, MMS will generate a viral effect. That is, peers passing the message on to other peers, the same way e-mail currently does. The viral effect will be generated from day one through legacy support solutions, making any device virtually MMS-enabled. Hence, non-P2P traffic will be converted to P2P traffic, the latter exponentially growing in a very short time.

In relation to this, another important factor that will characterise the importance of P2P versus non-P2P traffic is the ease of getting the multimedia content. The easier for the users to create and manage their own content, the higher the P2P traffic. This effortlessness of creating multimedia will be determined by the following aspects:

- Digital cameras. In the last couple of years the market for digital cameras has experienced a rapid growth across the world. In addition, prices have gone down and quality has improved. A tremendous growth is foreseen in the years as shown in Figure 6-1. The user acceptance of digital photography is a key driver for MMS traffic as it enables the user to self-create the multimedia content of the message. The same goes for cameras that are built in or affixed to MMS terminals. That is the case for Nokia's and Ericssons's MMS devices respectively.
- Multimedia library or album. This element will enable users to quickly get stored pictures and files in a straightforward way. Operators' and also handset and platform vendors' portals will play an important role in providing this value-added service to customers.

Figure 6-1

Total Multimedia Messaging Service Market: Digital Cameras Shipments Forecasts (Global), 2000-2007

	2000	2001	2002	2003	2004	2005	2006	2007
Shipments (Million)	8	11.2	15.7	23.5	35.3	47.6	64.3	86.8

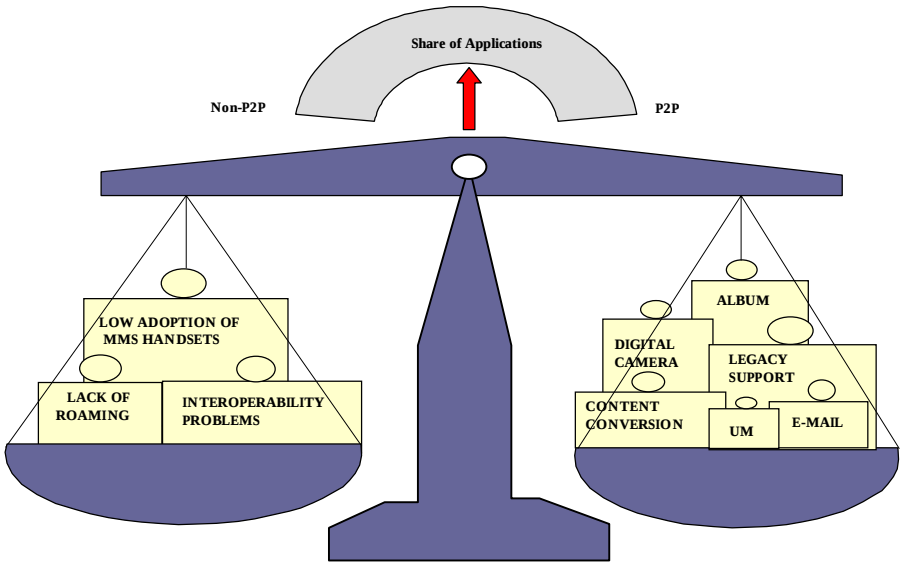
Note: All figures are rounded. Source: Frost & Sullivan

However, looking at what type of devices will become available next year, P2P revenues will be very significant from day one. Just as P2P messaging drove SMS it will propel MMS because it is the most popular application. However, certainly in the long term, non-P2P messaging will be a much important revenue generator in MMS than it was in SMS, and its percentage over the total traffic will increase.

Chart 6.1 illustrates the balance between factors driving the growth of P2P and non-P2P applications.

Chart 6.1

Total Multimedia Messaging Services Market: Balance between P2P and Non-P2P Contribution (Europe), 2002



Source: Frost & Sullivan

MMS-based Applications

Person-to-Person

- Self-created content with camera: photo and video exchange, mobile postcards, greeting cards, etc. This is expected to be the most successful of all MMS applications.
- With content not created by the subscriber: retrieved either from the multimedia library, a wireless access protocol (WAP) portal or the subscriber's PC as well as received through an MMS content service or another subscriber.

Location and presence technology will enable new ways of P2P communication, such as the user telling friends where he/she is by sending a map, together with pictures and text.

Content Services

As mentioned, thanks to multimedia messaging, operators and service providers will be able to offer SMS content services but with enhanced content and features. The following are some examples of these applications:

- Updates on company stocks including graphics of the day's activity
- General headline news alerts with images and video clips
- Sponsored news
- Sports news with pictures and video clips with the goals
- Horoscope service with graphics
- Weather forecast with graphics
- Ringtones

But also new services can blossom:

- Traffic camera images
- Maps
- Cartoon strips
- Animations
- Adult pictures and clips
- Movie trailers

The expected proliferation of content services and the rich visual nature of content will propel sponsorship as a means of both carrying out effective advertising campaigns and removing some subscription cost to the user. Frost & Sullivan anticipates only the most basic content services may be offered totally free to the user, this happening at the beginning to drive customer acquisition. The more valuable and compelling content will be based upon a subscription service, for which the user is willing to be charged.

- MMS gaming

The area of gaming will play an important role and will be one of the applications that benefit the most from multimedia. There is a high number of mobile game developers looking at how to make money out of MMS. For several years, the mobile phone has proved to be a very successful platform for embedded games. Among various SMS applications, SMS gaming gained substantial popularity among subscribers, thus fuelling the demand for innovative games and the supporting software. The same breed of games developers that designed entertainment applications around SMS will now concentrate on MMS and the possibilities that different content formats bring.

Operators are looking at developing gaming in various different ways, in terms of delivery. When combined with location-based services, new exciting possibilities open, attracting a big audience. Innovative games can be launched, such as subscribers guessing their opponent's position and destroying them via MMS. Some of the most interesting entertainment concepts are based around using games as a social tool, taking advantage of the presence localisation element to drive use. Some interesting interactive MMS applications are also dating, buddy finder and virtual pet caretaker.

In July 2001, Nokia , Ericsson, Siemens and Motorola launched the Mobile Games Interoperability Forum to define a mobile games interoperability specification for network-based servers. This global standard will enable developers to produce games that can be distributed across multiple game servers and wireless networks as well as over different mobile devices. Game publishers and developers, game platform vendors, game service providers, network operators, device and infrastructure vendors and service integrators are encouraged to join the forum. In addition to this forum, its founding members and other handset and multimedia messaging service centre (MMSC) vendors are involved in creating their own community of games application developers and end-users. All these, together with the spread of Java and wireless operating systems, will help stimulate global mobile gaming growth.

- Audio: Voice, music and ringtones

Ringtones download started as the first form of mobile music and proved quite successful. Then music download to the handset in MP3 format also proved popular, and several device manufacturers have launched terminals including MP3 players. With the enhanced messaging service (EMS) and MMS, the quality of ringtones can be improved towards richer formats, such as MIDI, which will certainly raise demand. Initially, MMS terminals will allow users to exchange short user-created voice clips, which can replace voicemails and in the long term even replace SMS as a much more realistic and fun way of P2P communication.

The real big next step in mobile music will benefit the music industry as it will allow companies to participate on content services by offering audio clips of selected artists.

- Movie trailers

The movie industry will also take advantage of the video messaging capabilities of MMS to communicate with prospective spectators. However, video messaging will not generate any sizeable volume until 3G networks are fully laid out.

Again, combined with location technologies, video messaging and streaming can impact operators' m-commerce revenues. The subscribers can receive a movie clip, then connect with a location-based system, which shows the nearest cinema showing that movie, and finally, using an m-commerce application, buy the ticket. This type of situation will not be a reality soon, but it will happen.

- Enhanced logos, icons and screensavers
- Mobile gambling

Corporate

Although MMS is conceived as a service that will primarily target a consumer audience, the potential benefits and efficiencies that MMS can bring to enterprise is starting to attract significant attention. Additionally, the first MMS phones may appeal to the technology pioneer market segment, to which the business belongs and business uses for SMS are already developing quite fast.

The immediate exchange of images and video clips from mobile to mobile, mobile to office and office to mobile allows for new applications within the business environment. Companies across all industries can use MMS the same way as they are starting to use SMS: as customer relationship management, business to employee communication and a marketing tool. An employee can send an MMS message from his/her PC to various sales workers, technicians, etc. Engineers can exchange images of spare parts in manufacturing companies. Updates on company stocks with graphics of the day's activity could be used for business purposes. Also, employees could listen to or watch an analyst's report. The multimedia library will not only be used to store and retrieve personal images but also by businesses to store and share files. Despite these and other interesting applications, Frost & Sullivan believes the use of MMS by corporate clients will be niche. Listed below are some vertical markets, which can particularly make heavy use of MMS internal communication:

- Construction
- Real estate
- Insurance
- Utilities and manufacturing
- Public services
- Security and surveillance: mobile updates from a security camera

Marketing

MMS opens better opportunities for advertising and marketing, which will play an important role. Multimedia messaging will be the most adequate vehicle to undertake advertising campaigns and these will serve both as a driver for m-commerce and real-world commerce. For the operator it supposes a viable revenue stream, selling advertisement space to corporate firms and agencies (even the voice mode can be used for product promotion).

Advertising in MMS, especially in the form of sponsorship of push information, brings clear benefits to all players involved. Subscribers will receive cheaper content services and will take advantage of special offers that are relevant to them. Operators will be paid by the advertising companies and obviously the latter will find an effective way to reach potential or existing customers.

MMS advertising continues to be a controversial subject. There is a great debate about how acceptable MMS-based advertising is for people. In relation to what was discussed earlier in this chapter, MMS will become an important viral marketing tool. It works on the basis of the approval of the subscriber, who is interested in receiving a particular message. Once received, it is very likely that the message will be disseminated amongst other consumers through P2P messaging. If the right people are targeted and they opt in, obviously MMS gives the advertiser a much richer mechanism to publicise its products and brand.

Operators' approaches to advertising will differ, and business models are still under discussion. In some cases the target user will get a reduced price on the handset, in others a lower cost of service. In both ways, advertisers are satisfied. The MMSC will provide billing information, discriminating within the call data records (CDRs), to the operator and the end-user, so the operator can capture the cost from the advertisers and the end-user is not charged for that message.

It will also be interesting to see how advertisements will be embedded within the multimedia message to be displayed in the handset. Looking at the advertising model for the Internet, banners worked (to some extent) because they were placed at the top of each page. Advertisers will be pushing for not being relegated to the bottom of the message as that defeats a significant amount of the impact of the sponsorship. On the other hand, the form factor of mobile terminals has to be taken into account as it constricts the display of advertising. If the brand is too prominent a lot of the screen space is lost to the actual content of the message. All these concerns will vanish in full-blown MMS, where the different multimedia elements of a message will appear and disappear like a self-playing presentation thanks to synchronised multimedia integration language (SMIL).

Digital Rights Management

With the increasing use of the Internet to trade and distribute digital copyrighted goods, such as music, video, documents and images, comes the need to protect that content from unauthorised use once it is outside the control of the publisher or distributor. Hence, digital rights management (DRM) technology has become a critical issue, especially considering the rapid adoption of new technologies, such as high bandwidth connections and peer-to-peer networks.

MMS devices and their ability to obtain, stream, modify and redistribute digital content is a great concern for rights holders, who seek to protect their intellectual property rights. DRM platforms track, limit and protect the distribution of content and would normally sit both on the content provider's server in the network and on the recipient side (not the phone). The real main purpose of DRM in the MMS wireless environment is to allow operators and content providers to control or restrict use for commercial purposes of the content, such as selling or advertising. By no means are they concerned with the normal content distribution.

A simple but illustrative example of DRM being required in the MMS environment would be a user who wants to download a cartoon character to send as a birthday greeting. The owner party will want to make sure that it is paid and once the user has sent it to the recipient, he/she then cannot use that character repeatedly without paying for it. The way this can be done is by associating a file with the device, locking that content to the handset that is sent to. Another method is that the actual content is never actually transferred and never leaves the network. The content is billed by referencing a file on a server.

Various companies offer DRM technology, among them are MMS infrastructure vendors such as Nokia and Ericsson. MMS platform vendors offer a DRM platform either included in their solution or that they can easily plug into.

Application Developer Communities

The leading mobile technology vendors and operators have created communities that act as incubator environments for those new up-starts looking to develop applications for MMS. These programmes typically seek to provide:

- Training and guidance on multimedia messaging
- Finance support
- Technical support
- Marketing support

Application providers usually can avail a support team from the MMS infrastructure vendor or the network operator to facilitate the interface between the applications and the MMSC. Thus, Nokia formed Forum Nokia, Logica the Application Providers Programme (APP), Ericsson the Mobility World Community and Developer Alliance Programme and Openwave the Openwave Alliance Programme

Video Messaging and Streaming

The talk of video on a mobile device has been especially around videoconferencing and video streaming, and has contributed to the 3G hype. The standard bodies allude to video streaming as a media type that will be supported by the MMS environment, but this is clearly an area that is still in the early stages of development. Initially the focus will be on exchanging discrete files, such as video or audio clips and Frost & Sullivan does not expect to see these sooner than 2003.

Video messaging (no streaming), in contrast, can be available sooner than 3G networks. The problem with not streaming is that handsets will have limited storage (around 1 megabyte). Should users want to download a video message they will have to rely on streaming, where the video clip can be seen before being downloaded. Already companies have held some video clip trials involving customers on 2G networks. The video technology used was developed by Emblaze Systems and the terminal and network from Samsung (Ericsson has also been involved). Other technology developers are focusing on these areas (see the MMS Value Chain chapter). Although video technology providers and terminal companies have started signing manufacturing agreements, commercial services around video messaging will not be seen until general packet radio system (GPRS) rollout is widespread on the terminal and the network side.

Operators hope revolutionary video messaging and streaming will help them to get a quick return on their UMTS investments. Nevertheless, the issue with video messaging is that service providers and users will find it difficult to identify a viable application. Looking at the fixed world, video clips and videoconferencing has not been the success many companies hoped for. So far, there has not been demand for storing video messages in unified messaging stores. As opposed to, for example, photo messaging, video messaging is not suited to a broad range of occasions. Players in the market need to double their efforts.

On the consumer market side, it will not be until high-bandwidth networks and devices with built-in video cameras are launched that video messaging will become an accepted inter-person communication method. As for content services and entertainment, video messaging and streaming promise things like sports highlights and music videos on demand. Record companies can take advantage of audio and video technologies to promote bands' new releases by sending a preview of the album consisting of a picture of the band, a short audio clip and finally a unified resource locator (URL) link to set up a streaming session for the music. The delivery could actually be done externally to the MMSC or as part of the MMSC.

Frost & Sullivan believes network operators will find an important revenue stream in video clips content services. However, there is a risk that such a guarantee of streaming over 2G and 3G can eventually lead to a similar disappointment than the one WAP originated.

For further information on video applications, please refer to the "MMS and Type of Mobile Network" section of this study.

7

Forecasts for MMS

Billing and Pricing

Billing of MMS

The multimedia messaging service (MMS) is designed for the general packet radio system (GPRS) and especially for 3G. The same way MMS is an evolution of the short messaging service (SMS), MMS billing will be the evolution of SMS billing. Operators and the rest of the value chain need to look at the lessons that can be learned from SMS billing and to evolve that to MMS.

The introduction of next generation networks implies a change in approach for services and a new set of business models. For starters, 2.5G and 3G change and expand the alternatives for billing. Looking at the main differences between packet-based networks and circuit-switched networks, these are not only the speed of data access and the richness of the content. Another important difference between global system for mobile communication (GSM) and GPRS data from an end-user perspective is the way operators charge for the use of it.

- GPRS: users are charged by the amount of data they send or receive, independent of the time spent online.
- GSM: users are charged based on how long they are connected to the network.

When it comes to business models, it is important to identify how players in the value chain are receiving revenues from the user. One critical issue is who owns the customer and who has direct relationships with the customer. While mobile portals can bypass network operators and charge for premium services delivered after subscription, the operator is normally the one that deals with and bills the customer. The operator gets the vast majority either through the monthly bill or upfront from prepaid customers and shares the revenues with value added service providers, content providers and network infrastructure vendors.

Hence, in the packet switching era, new forms of billing the data are available to the operator. The Third Generation Global Project Partnership (3GPP) specifications also stress the need for MMS to be able to support various charging mechanisms. Several MMS platform providers also market billing systems that allow the operator to bill for content based on virtually any criterion:

- Value or event basis
- Message type
- Volume of data: per-packet basis
- Time to supply content over the network: upload or download
- Number of messages sent
- Number of messages received
- Location
- Originator

The primary concern that the operator has is to make the billing to the end-user simple and understandable. Since they are dealing with passing messages back and forward, most operators would like this on a per-message basis, instead of based on how many kilobytes or packets are used. Given that the value of different multimedia messages can range between very simple text and image to multiple images and richer content, such as audio, the operators are planning to charge based on the content within the message. Maybe they will charge in combination with the size of the message, so for instance if the size of the message is bigger than a certain amount of kilobytes, the subscriber would pay extra. Event charging is the easiest way to charge the consumer rather than by the size and data transferred, although the latter could be implemented. Operators would most likely offer some kind of tiered pricing structure.

The capacity to do this billing is found in the MMS platform charging flexibility. The MMS system will provide call data records (CDRs) information that will be integrated to operator's billing systems, enabling them to charge in all the different ways that have been mentioned, as well as support prepaid customers to use MMS. The billing records inform operators about the size, the type of content and formats, the delivery time-span and the originator and destination addresses. This differentiated charging or content rating is crucial, due to a more extensive array of contents and premium services and subscribers will get a bill broken down by type of service. Information on specific fields helps operators identify the source of the content, so for instance, whether a sport clip was sent by a news agency or an entertainment application provider.

Billing has been a complex issue in the past and will continue to be in the near future. Several European operators' billing systems are unable to bill for premium SMS services because of lack of flexibility of billing engines. These engines are not able to accept external CDRs but only those created in their own system. Operators that can accept external CDRs (solely generated by user password) are able to charge the subscriber for a ringtone downloaded from a portal into the phone bill.

Billing Scenarios

To better understand the form that MMS billing will adopt, it is relevant to look at the way the user was billed for SMS by type of application and expect a similar model:

- Notifications: mostly free.
- Person-to-Person: per message charge to the sender.
- Content subscription: premium message charged to recipient.
- Gaming and m-commerce: variable.

MMS Person-to-Person

The sender posts a multimedia message paying a certain price, dependent on the media type. The recipient user receives a free notification informing of the type of message that waits to be downloaded. With reverse billing in place the receiver may download at a certain cost (certainly less than that paid by the originator of the message). The receiver could also pay depending on the format conversion that has to take place. Additionally, if the receiver decides not to retrieve the message but to keep it at the home multimedia messaging service centre (MMSC) permanent store, he would have to pay for it.

MMS-based Content Services (Push and Pull)

These are usually subscription premium services. Alternatively, the customer can pay the operator or service provider for the content (and the operator shares with the content provider) or pays the content provider directly. In the latter case, the content provider and the consumer would pay the operator for using the network. MMS and its notification system permit subscribers to decide how detailed or comprehensive they want the service to be at each delivery. The subscriber may receive a rugby score with a picture for 40 cents but with the possibility of retrieving a video clip for $1.

The operator will continue using billing techniques such as bundling, discounts and promotions. Carriers also can offer subscribers cross-application promotions in which with a certain amount of messages sent, the user would receive an icon or screensaver for free.

Reverse Billing

Reverse billing, where the recipient pays for the receipt of services, is increasingly becoming an important feature in the mobile data services market. The proliferation of SMS mobile-terminated services has driven the operator's demand for this kind of billing system. However, the operators' lack of ability to control incoming messages was a problem in terms of billing the recipient for SMS services, especially if the recipient belonged to another operator's network. In the MMS environment, the multimedia message flows through both the sender's and the receiver's MMSCs. This way, the recipient's operator is aware of incoming messages and can charge accordingly. This implies a different network architecture that enables operators to introduce new kinds of services, such as application-to-person services. The business segment in the SMS market was held back by the lack of development of reverse billing. The operator needs to have a registry of all those MMS clients and platforms that will originate reverse chargeable multimedia messages. In addition, there are some obvious requirements for reverse billing, such as the need for antispamming, message filtering, screening and routing capabilities.

One of the arguments in favour of reverse billing is its ability to increase the take-up rate because it allows the user to check the billing. Currently, users have to give some kind of information and establish an account arrangement with operators in order to subscribe to a service. Reverse billing eliminates that responsibility for the customer and stimulates spontaneity. Subscribers pay on a per-delivery and per-packet basis and on their monthly phone bill.

The disadvantage is that operators take all the risk for collection of the money in reverse billing. However, this risk disappears when it comes to prepaid services, where the operator gets the revenue upfront for the messages they send. In the case of handsets and networks that enable instant downloading of the multimedia message prior to the notification, problems can arise in a mobile terminated charging scenario if effective screening capability is not employed.

With some exceptions, reverse billing is not contemplated by the standards specifications and it will not be the usual method of billing. However, it is a necessary ingredient in certain scenarios.

Internet to Mobile Person-to-Person

In the MMS world, individuals or businesses can send mobile subscribers multimedia messages or e-mails from, for example, a desktop Web browser. In these cases, there is the possibility that the message is reverse-charged should the retrieval be approved by the recipient.

Frost & Sullivan does not see this model being successful. The issue here is that the recipient might not know the content of the message and who the sender is. In this case it is very unlikely that recipients will pay for messages if they are not able to preview them, as they may be of completely no value to them. Users can end up paying for junk in the same way

that people get spam e-mail today. Virtually all operators will offer a package by which MMS subscribers do not pay for incoming messages at all.

Operators have the essential need to control who can access the MMSC from the Internet or most likely the intranet. They are not willing to open up their systems out to the Internet for anyone to send multimedia messages from any PC client to a mobile phone. Instead, the subscriber would set up an agreement with the operator or with a content provider to be able to receive that information.

The majority of the operators have created a portal where users can log in and send a multimedia message in a controlled manner. The users will be charged either on a per-event basis or through a subscription service, typically through a credit card relationship with the site the user is generating messages from. These portals will play an even more important role in MMS.

Mobile to Mobile Person-to-Person

In the area of person-to-person messaging, the concept of reverse billing will prove to be hard to sell in Europe as users are used to pay for sending content and not for receiving it. Reverse billing has proved to be one of the reasons why inter-person SMS has not taken off in North America and thus all European operators seem to be committed to a sender-pays model. In the reverse billing model the screening and antispamming function becomes critical to the extent that, depending on the country, it is illegal to charge the recipient unless operators provide these capabilities. The message screening is specified in 3GPP standards for MMS as a MMSC functionality requirement.

There are some person-to-person messaging scenarios where reverse billing could apply effectively, such as the case of a user sending an invitation message to one or numerous recipients. This is a situation where the sender is inducing and is interested in receiving a response from recipients and so is willing to pay for those if they do not exceed a certain size and reply time. This reverse billing method, called "reply charging", is actually the only one included in the standards. The sender opts to pay for the responses by requesting a reply at the moment of dispatch of the message. The sender's MMSC has to understand that the messages coming back from the receivers of the invitation will be paid by the sender's terminal. While this entails a big technical challenge, operators can experience a higher take-up rate as, in this example, reverse billing encourages response.

Value-added Services

With regard to third party offerings, European operators will be encouraging them through wholesale proposition where they can create MMS-based applications to generate traffic using the operator's network as the bearer. The user, receiving a value-added service such as push stock news service, will be paying for each item of content he/she receives and a percentage of these revenues would go to the application or content provider.

Permanent Store

In this permanent mailbox, users can save their messages for a long period of time. Operators may charge users each time they retrieve a message from the mailbox.

Roaming

In those cases where the user is roaming, the foreign network charges for the message transit.

Prepay MMS Billing

Prepay billing systems facilitated the take-up of GSM services, prepay customers accounting for more than 70 percent of the operators' customer base. It will continue to play a principal role in the mass-market adoption of GPRS, 3G and MMS. The heaviest users of SMS are the youngsters and the vast majority of them are prepaid customers. It is reasonable to assume that these will be the main MMS revenue generators, especially as users can lose control of their expenses due to the differentiated pricing and billing per type of message. In any case, operators that want to target a broad audience need to have prepay billing for GPRS customers in place and currently this is not the case.

As important to carriers as prepay customers are, they also represent a problematical segment. As prepay is heavily subsidised, it becomes harder for the operator to generate returns. In addition, the operator lacks information on prepay customers and finds difficult to subsidise the device when not sold on contract, increasing its price.

With prepaid mobile services, users do not get locked into a minimum contract term. There are no bills and users have complete cost control because they pay for their services upfront. When the credit runs low users simply recharge their cards to extend their credits. From a billing perspective, the biggest challenge with prepay customers, who have a certain call allowance every month, is making sure that as they receive messages to their account, users do not exceed their current limit. Operators want to prevent prepay fraud, which accounts for big losses.

The most common prepay billing solution adopted by operators to date is the hot billing system. These automatically look up the users' credit to decide whether they can send or receive more messages and then charge accordingly. On the other hand, real-time billing is a superior and more secure billing system for prepaid. As opposed to hot billing, real-time systems check the customer's credit before sending the message and not after, avoiding revenue leaks for operators. Operators are also keen to explore either previewing or giving some indication of message size or the content before prepay users commit to downloading in order to protect the call allowance. Operators that manage to increase the average revenues per user (ARPU) of prepay customers will see their total ARPU grow.

MMS Roaming Billing

One issue that is still under discussion is MMS roaming and the billing settlements associated with it. Once interoperability between MMSCs is achieved, operators must ensure accurate billing across all networks and countries. Firstly, interconnection agreements must be put in place but it is still too early for this stage. A challenge is to be able to cater to MMS roaming, supporting mobile originating and terminating charging.

MMS is quite a commercially sensitive area at present, therefore there is not so much information that operators are willing to share with each other. Hence, operators are looking forward to seeing organisations such as the Mobile Data Association (MDA) bringing all companies together to ensure MMS roaming billing. In addition, initiatives like the Wireless Village for Instant Messaging interoperability will likely be created to achieve interoperability among different vendors devices and MMSCs.

Conclusion

As important as the billing flexibility available to operators is, success will be dictated by how effectively they communicate this to their customers. It is of paramount importance that the users understand perfectly how they are being billed. In order to do this, the choice of a good billing model has to be based on simplicity criteria.

That is the main reason why Frost & Sullivan thinks operators and service providers will base the price on the value of the message. Price would differ depending on whether the message sent or received is a picture, photo, audio, video or a combination of all those. Operators can use different mechanisms to charge content providers but complexity must be hidden from the user and the tariffing scheme simplistic.

Testing of a variety of MMS services by operators will provide essential information on what users' behaviours and reactions to MMS are. Pricing levels will be agreed once operators find out things like how many messages subscribers would like to send (and which type) and how often presence services and SMS will be used. Frost & Sullivan thinks MMS delivery will follow the i-mode model in which prices are very low and traffic and revenues are high.

Pricing of MMS

There is a great debate around what users will be willing to pay for MMS services and what operators are planning to charge. While both of these are difficult to establish with precision at this stage, the following describes some of the dynamics and factors that will impact on both sides of the equation.

Customer Expectations

Nowadays, the segment of the customer base that uses SMS is relatively small but they are heavy users. In addition, this audience shows great willingness to pay for non person-to-person (P2P) services, and an extra cost for the additional services next generation networks can provide. Some handset manufacturers, MMS platform vendors and network operators have commissioned end-user studies to try to identify customers' expectations with regard to multimedia messaging pricing. Some operators have even performed trials with employees and customers to evaluate payment models and study users' behaviour. It seems customers are willing to pay considerably more for MMS than for SMS as they see the added value of the new services. Although dependent on culture and region differences, Frost & Sullivan expects the same willingness will remain in multimedia messaging. However, SMS customers are accustomed to a low price and so expect a not much higher price for MMS, thus it will take time for MMS to become mainstream.

Personalisation of MMS services will also have an effect on price perception of customers. Users want control over the information they wish to receive, how they wish to receive it and when they wish to receive it. MMS platforms will generate information on the subscriber's behaviour and profile, that, once analysed, can enable personalised and targeted services. People do not mind paying extra for tailor-made services. In addition, the combination of MMS and other mobile platforms will allow for a higher price due to perceived higher value (MMS content services and location technology).

Operators Pricing Strategy

There are two pricing strategy approaches operators can adopt:

- High margin—low volume model. With a high MMS price, users will send fewer messages but the high cost would generate more revenues.
- Low margin—high volume model. A low MMS price will encourage the user to send a bigger volume of messages.

Operators have to design and implement a price strategy that both attracts users and optimises profitability. For the latter objective, finding sustainable price points becomes critical and thus understanding the demand. If MMS is overpriced it will not be used, if it is really underpriced, operators can become a bit pipe. Furthermore, a text message is less than a kilobyte of data and it is currently priced lower than $0.15. Just a picture message can be as much as 200 times that, which at current GPRS prices would cost around $1.50. Operators will not be able to charge customers their ideal price. Frost & Sullivan believes operators will implement a low margin strategy, which will minimise the gap with customers' expectations and drive mass market adoption of MMS handsets. Operators have to be able to capture value without holding back revenue growth. Multimedia messaging will be both a volume-based and a premium-based service.

Cost of MMS Devices

There are factors that are external to the operator and which will influence the pricing strategy it will implement. Some of these factors are MMS handsets' positioning and competition. Frost & Sullivan believes the first MMS handsets that will be introduced will be rather expensive and so will appeal to early adopters who are less sensitive to pricing. This could allow operators to set higher prices at the beginning and then to lower them as the cost and uptake of MMS terminals improves. Examining the features and how the Nokia 7650 has started to be marketed, it appears it will be targeted at the mass market. Nevertheless, it will not be priced accordingly, with an estimated cost of around $500. The same goes for the Ericsson T68, priced at $400. Without the operators subsiding the device, the target market for MMS services will be the high-end and not the SMS generation of youngsters.

The subsidisation of the handset from the beginning would have facilitated the market to pick up more quickly, but European operators will probably be reluctant to do this due to lack of cash. The operators will rather invest in offering compelling services to stimulate the purchase of next generation devices than in subsidisation. Compelling applications create a better stickiness than subsidising, but the user has to be able to afford the purchase of the terminal in the first place.

However, terminal shipments roadmaps are providing MMS across all handsets' ranges very rapidly, from the economy phone to the most upscale, in every target market segment. Frost & Sullivan expects MMS capability to spread across all ranges at mid-year of 2003, to start taking the real driver of MMS, the youth, on board.

On the other hand, competition pressure can substantially impact pricing. New entrants to the European mobile phone market will likely try to extend their customer base by offering inexpensive handsets and service provision.

Pricing Forecasts

Figure 7-1 and Chart 7.1 show a list of the average price for each type of multimedia message. Regarding the cost of the message, Frost & Sullivan anticipates the total average price for the whole period between 2002-2006 of a multimedia message will be centred around the $0.31 mark in Europe. It has to be taken into account that this price does not include the higher cost of non-P2P premium subscriptions. If this average price is compared with its SMS equivalent in 2001, the cost of sending a multimedia message will be around three times that of sending an SMS (P2P). Although significantly more costly than SMS, a threefold increase can still be regarded as a low price tag, especially taking into account that prices for SMS are expected to drop in Europe during the coming years. As mentioned, some operators will offer higher prices than others, trying to cash in on early adopters before it is too late, but Frost & Sullivan does not think this will be the rule. Various approaches to pricing are likely to be seen, although stiff competition in Europe may lead to no option but

to price MMS low from the beginning. MMS-based services, such as information services, will imply a higher cost for the subscriber. Frost & Sullivan foresees the average price for MMS following a smooth downward trend from 2002, due to the following factors:

Figure 7-1

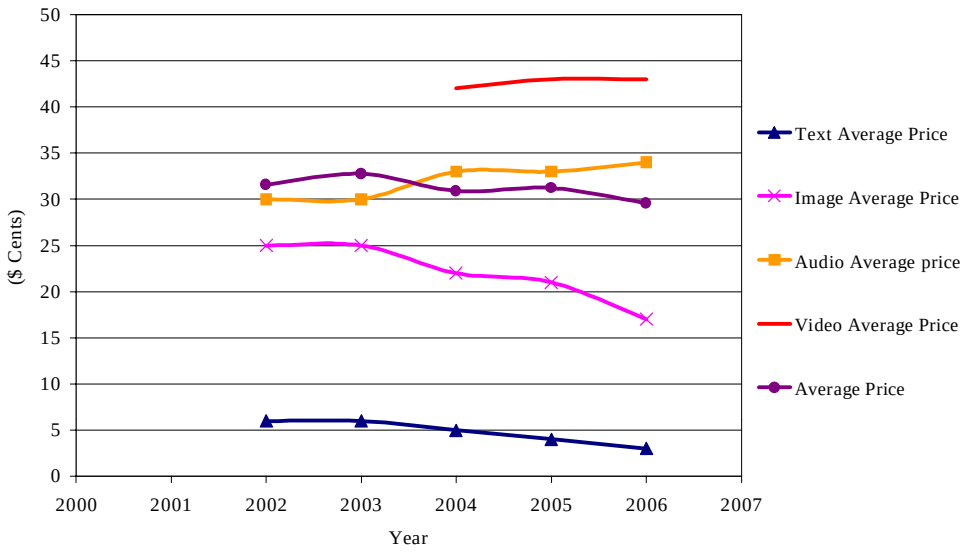
Total Multimedia Messaging Service Market: Evolution of MMS Pricing by Media Type (Europe), 2002-2006

	2002	2003	2004	2005	2006
Text average price ($)	0.06	0.06	0.05	0.04	0.03
Image average price ($)	0.25	0.25	0.22	0.21	0.17
Audio average price ($)	0.30	0.30	0.33	0.33	0.34
Video average price ($)	---	---	0.42	0.43	0.43
Average Price ($)	0.3157	0.3276	0.309	0.3122	0.2956

Note: All figures are rounded. Source: Frost & Sullivan

Chart 7.1

Total Multimedia Messaging Market: Pricing by Media Type (Europe), 2002-2006



Note: All figures are rounded. Source: Frost & Sullivan

- The decrease of average text messages price.
- The reduction of MMS terminals price.
- Increase of competition.
- The surge of complementary revenue stream, such as advertising.

Revenue Forecasts

Key Success Factors

Massive Uptake of MMS-enabled Terminals

The spread of high-speed MMS devices across Europe is the most important factor for the growth of multimedia messaging. Although there will be legacy devices support, it remains to be seen how it will be greeted by the end-users. It makes no sense to send and pay for a multi-media message if the user is not sure the intended recipient will actually receive it.

Rollout of Next Generation Networks

As MMS will use packet-based networks, the rollout of GPRS and 3G are, obviously, an indispensable requirement. The advantage of wireless access to information is the ability to get information anytime, anywhere. But wireless networks do not cover everywhere, and data-capable networks cover even less. Next generation networks need to provide coverage not only for urban centres or business areas to avoid disappointment and enable continuous use of MMS.

Interoperability

Roaming and Inter-operator Connections

An operator's MMSC should be able to interconnect with other national and international networks and MMSCs, so subscribers can exchange messages with other subscribers in any network, any country and in roaming situations.

Support for Standards File Formats by All MMS Terminals

This allows for different MMS devices to be "content compatible". Also, the use of existing standards implies that MMS can integrate with the PC and Internet-based multimedia environment far more easily than SMS (or enhanced messaging service (EMS)).

Interoperability between Different Network Types

MMS should work across GSM, CDMA and UMTS networks in order to allow a continuous service environment for customers. This way, subscribers can exchange messages between Europe, the United States and Japan.

Meet Customers' Expectations

Low MMS Pricing

The key limiting factor of MMS is the cost of using the service. In order to reach a critical mass at early stages, the price of sending a multimedia message has to be within the customer's expectations. Operators will not be able to replicate the success of SMS unless the price is relatively low.

Effective Marketing

As with any new service and technology, it becomes crucial to convey the enhanced features and user-value with effectiveness and transparency. An eagerly awaited technology like MMS runs the risk of disappointing customers the same way wireless access protocol (WAP) did. Marketing messages should make clear such aspects as the display limitations of handsets in terms of colour and size. The customer should be aware of real expected data rate and not the theoretical. Also, subscribers need to be aware of the delay they will experience should the multimedia message be downloaded after the WAP notification. This takes a lot of the value from MMS because it would not be an instant service like SMS. Accurate communication will mitigate customers' disappointment, since they no longer expect the same features as SMS, e-mail or instant messaging.

Flexible Billing Systems

In MMS, the subscriber is not charged on air time, but around the amount of data transferred. Operators need to install billing systems capable of charging based on the data volume, on the value of the content, on the type of content or on a pay-per-view basis. In addition, prepay billing systems should also be installed to cater for prepaid subscribers, regarded as the driving force behind SMS.

Content and Third-party Applications

The success of MMS relies heavily on the content available to the subscriber. Operators and MMS technology providers need to work together with application developers to establish an environment where the design, creation and channelling of innovative premium MMS applications is facilitated.

Storage and Universal Messaging Access

As mentioned earlier, with MMS the storage of the multimedia message becomes critical, both in the handset and, more importantly, in the network. Within the capabilities of the networks and the terminals, the user should also be able to access multimedia messages through numerous access points or networks, be they wireless (any generation) or the Internet.

Network Bandwidth and Capacity

Multimedia messages are much more bandwidth-hungry than text messages. European operators are already feeling the overload strain that millions of text messages originate on their networks. 3G will provide significant gains in network capacity, but the concern over capacity will remain. The ability of the communications infrastructure to transmit a given volume of messages without excessive delay or message loss needs to be ensured.

Revenue Forecasts

MMS Revenue Sources for Operators

Network operators rely on the next messaging wave to improve their ARPU by accelerating further the data revenue growth initiated by SMS. The main revenue streams derived from MMS are the following:

- P2P MMS

Interperson communication where the user creates content with an MMS-enabled terminal and sends it to another MMS-enabled terminal or e-mail address. Generally, this will be a per-message or event charge that does not require subscription.

- B2P or non-P2P MMS

Business-to-Person or application-to-person are MMS-based content services and entertainment. Information and content services will normally require that the user subscribes to them and maybe pays a premium. Entertainment will most likely be charged on a per-message basis.

- Multimedia permanent store

This is a network-based persistent storage for MMS and is offered to customers as a subscription-based service. The user will pay a fixed price for the hosting costs that operators would incur and can also be charged based on the use of the mailbox.

- Legacy multimedia mailbox

This mailbox will allow legacy handset owners to receive and send MMS. Probably, the user will not be charged for the use of this element.

- Multimedia library or album

This media directory service can be another subscription-based service that provides the user with storage for various public or private media to use in the composition of messages.

Mailbox elements will complement unified messaging (UM) (or vice versa) and operators will use a combination of both. Potentially the multimedia permanent store and the UM service will converge as the MMS is delivered to the same place where the rest of the messages are delivered.

MMS Revenue Forecasts for Operators

The potential MMS market is receiving a lot of hype at present by industry players. It seems that the potential is indeed really big, but whether the actual market will live up to its expectations is a different matter. Various requirements need to be met to achieve success. It seems clear to Frost & Sullivan that, while it is questioned how much revenues industry players in the MMS value chain will earn, there are rather clear indications that MMS will repeat the success of SMS. Hence, the reader may regard Frost & Sullivan's revenue projections as fairly optimistic although a great effort has been made to avoid over-hype.

In general terms, the volume of revenues derived from MMS for European operators is dependent on various factors:

- Rollout of operative next generation networks.
- Predictive uptake of MMS terminals and services.
- Number of messages that will be sent and received.
- Pricing of MMS.

Along with the key success factors described in a previous section of this study, packet-data networks and devices should be the real determinant for the mass market uptake of MMS. The speed that GPRS networks promise to deliver will be a sufficiently good bearer for most MMS applications, and their roll-out is crucial for the prediction of MMS revenues.

The first MMS-enabled terminals will be introduced in Europe by mid-year in 2002. As shown in Figure 7-2 and Chart 7.2, Frost & Sullivan foresees that 6.0 percent of handsets' shipments in 2002 will have MMS capabilities. The shipments of MMS terminals will increase to reach 83.0 percent of the total shipments in 2006. Thus, the MMS market will start growing rather slowly in the second half of 2002 due to the low penetration of MMS phones. Nokia claims that, at the end of 2002, around half of its devices will be MMS-enabled and all of them by 2003. Frost & Sullivan, judging from experience, believes this statement may prove inaccurate. Frost & Sullivan's research indicates that it will not be until

the end of 2003 and more noticeably in 2004 that the MMS market will experience mass-market high growth rates. Industry players are positioning MMS as the follow-on to SMS, and that can only be done if the current heavy users of SMS can actually afford the devices. With such a high price as the Nokia 7650, the shipment growth of MMS terminals will not be as soon as some hope. By the end of 2004, MMS subscribers will make up for 25.4 percent of total mobile subscribers, as shown in Figure 7-2 and Chart 7.3. In 2006, Frost & Sullivan anticipates MMS subscribers to account for 80.2 percent of total subscribers, namely almost 271 million users (98.0 percent of next generation subscribers).

Figure 7-2

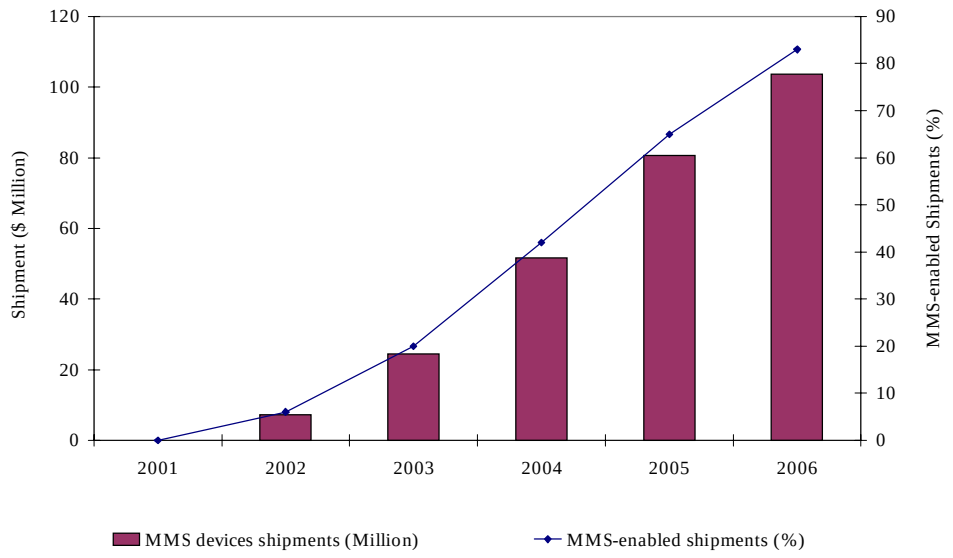
Total Multimedia Messaging Service Market: MMS Devices Shipments and MMS Subscribers (Europe), 2001-2006

	2001	2002	2003	2004	2005	2006
Total mobile subscribers (Million)	290.59	316.71	325.87	330.91	334.68	337.59
MMS devices shipments (Million)	---	7.20	24.40	51.66	80.60	103.75
MMS-enabled shipments (%)	---	6	20	42	65	83
MMS subscribers (Million)	---	7.20	31.81	83.96	165.52	270.71
MMS subscribers (%)	---	2.27	9.76	25.37	49.46	80.19

Note: All figures are rounded. Source: Frost & Sullivan

Chart 7.2

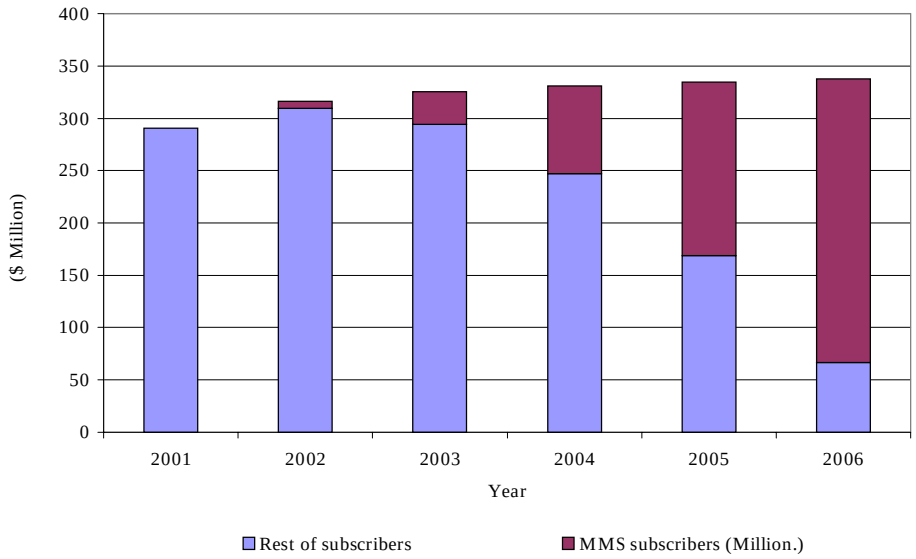
Total Multimedia Messaging Service Market: Devices Shipments Growth (Europe), 2001-2006



Note: All figures are rounded. Source: Frost & Sullivan

Chart 7.3

Total Multimedia Messaging Service Market: MMS Subscribers (Europe), 2001-2006



Note: All figures are rounded. Source: Frost & Sullivan

With legacy phones support solutions, industry participants hope to accelerate the uptake by incorporating the non-MMS handsets into the MMS world, as already mentioned.

Frost & Sullivan agrees with that prediction, the MMS market taking off quicker due to legacy handsets backing and to individuals already conversant in mobile messaging. As with SMS, Frost & Sullivan sees a reduced segment of operators' customer base using MMS, yet using it very often. This is a ready-made subscriber base of mobile users who will easily make the move to MMS. Other factors that will drive the market are the proliferation of unified messaging services and multimedia albums.

Figure 7-3 and Chart 7.4 show the number of multimedia messages sent over the forecast period.

Figure 7-3

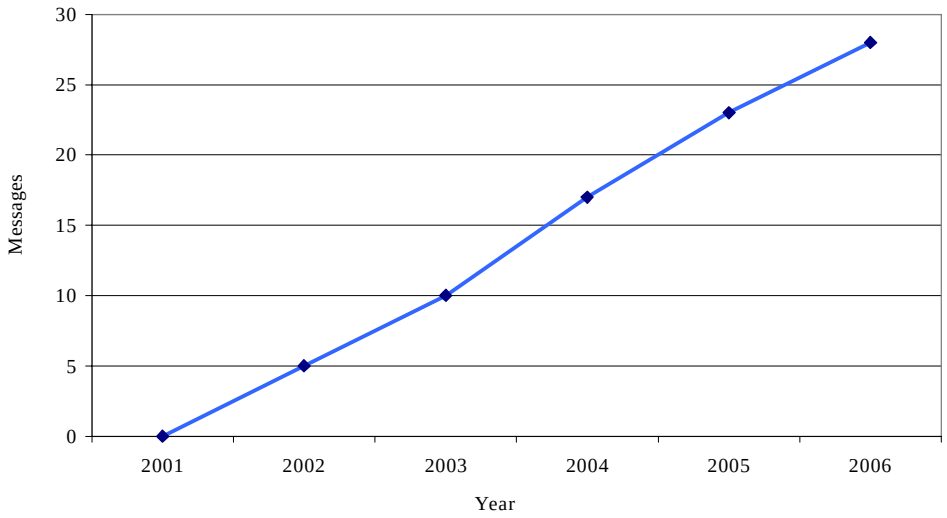
Total Multimedia Messaging Service Market: MMS Traffic (Europe), 2002-2006

	2002	2003	2004	2005	2006
Number of MMS per subscriber per month	5	10	17	23	28
Number of MMS per month (million)	36	318	1,427	3,807	7,580
Number of MMS per year (million)	216	3,817	17,128	45,683	90,957

Note: All figures are rounded. Source: Frost & Sullivan

Chart 7.4

Total Multimedia Messaging Service Market: Messages Sent Per User Per Month (Europe), 2001-2006



Note: All figures are rounded. Source: Frost & Sullivan

The correlation between the type of message or media and the type of mobile network used to convey it has been explained in another section ("MMS and Type of Mobile Network"). Figure 7-4 and Chart 7.5 show a breakdown of MMS forecasts by media type. Clearly, a combination of image and text will be the most common type of message being sent and received across the forecast period. However, as GPRS networks are enhanced and 3G networks deployed across Europe, richer multimedia messages will be viable and able to become popular, such as audio and video (and a blend of those with image and text). The traffic of audio clips is foreseen to become a highly acceptable way of exchanging music files, ringtones and voice speech as well as complementing image and animation. Frost & Sullivan's research indicates that certainly some video messaging will already happen in the short term, especially making use of PDAs. Nevertheless, it will not be until 3G that it will be feasible, and a valuable commercial application is unveiled. In addition, streaming video is a much more efficient way of transferring video to a memory-constrained device, and the high data rates of 3G are required. Finally, text will be used to accompany the richer content. The more complex and richer the adjacent content gets, the more a commodity the text will be considered and so lower the price.

Figure 7-4

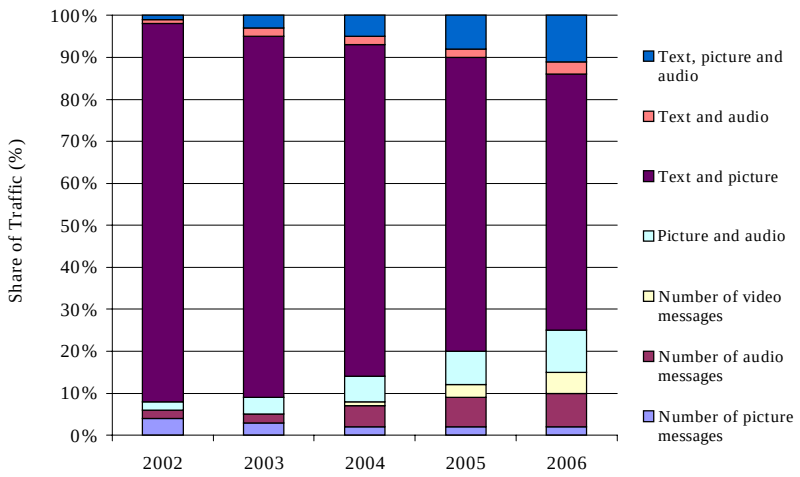
Total Multimedia Messaging Service Market: Breakdown of MMS Traffic by Media Type (Europe), 2002-2006

	2002	2003	2004	2005	2006
Number of MMS per year (Million)	216	3,817	17,128	45,683	90,957
Number of picture messages (Million)	10	195	473	1,165	2,304
Share of total (%)	4	3	2	2	2
Number of audio messages (Million)	5	130	1,183	4,078	9,215
Share of total (%)	2	2	5	7	8
Number of video messages (Million)	0	0	237	1,748	5,759
Share of total (%)	0	0	1	3	5
Picture and audio (Million)	5	260	1419	4661	11,518
Share of total (%)	2	4	6	8	10
Text and picture (Million)	227	5,578	18,683	40779	70,260
Share of total (%)	90	86	79	70	61
Text and audio (Million)	3	130	473	1,165	3,455
Share of total (%)	1	2	2	2	3
Text, picture and audio (Million)	3	195	1,183	4,661	12,670
Share of total (%)	1	3	5	8	11

Note: All figures are rounded. Source: Frost & Sullivan

Chart 7.5

Total Multimedia Messaging Service Market: Breakdown of MMS Traffic by Media Type (Europe), 2002-2006



Note: All figures are rounded. Source: Frost & Sullivan

Figure 7-5 and Chart 7.6 show the total MMS revenue growth and ARPU for the forecast period in Europe. Revenues will increase from $68.0 million in 2002 to $26.9 billion in 2006. Hence, Frost & Sullivan anticipates the MMS market to grow 395.0 percent across the forecast period with a compound annual growth rate of 345.6 percent. Each subscriber is expected to generate $8.25 revenues per month associated to MMS in 2006.

Figure 7-5

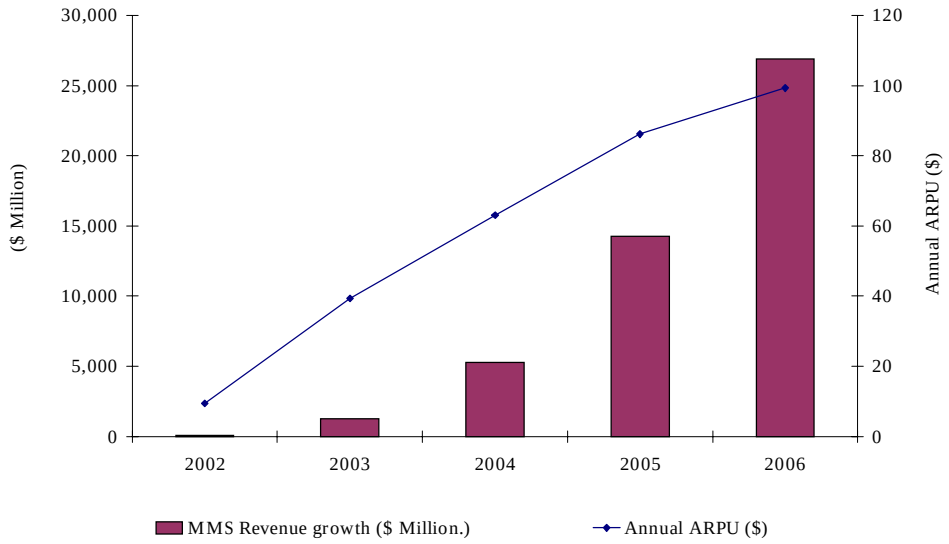
Total Multimedia Messaging Service Market: MMS Revenue and Annual ARPU (Europe), 2002-2006

	2002	2003	2004	2005	2006
MMS Revenue growth ($ Million)	68	1,250	5,293	14,262	26,887
Annual ARPU ($)	9	39	63	86	99

Note: All figures are rounded. Source: Frost & Sullivan

Chart 7.6

Total Multimedia Messaging Service Market: Revenue and Annual ARPU (Europe), 2002-2006



Note: All figures are rounded. Source: Frost & Sullivan

It has to be taken into account that the actual revenues generated by the whole area of MMS will be somewhat bigger than the forecast amount. This is due to additional revenue streams such as legacy subscribers' MMS, multimedia album and unified messaging system (UMS) subscription. Also, some premium MMS services will be priced much higher than P2P messaging and will provide additional revenues.

Total Mobile Messaging and Applications: SMS and MMS

Frost & Sullivan expects MMS to take off, eventually removing a big part of the need for communication based on SMS, both P2P and non-P2P messaging. MMS will replace to a great extent EMS and SMS revenues (not so much SMS traffic as explained below) owing to a significantly more valuable and stimulating content and to the new nature of the messaging service environment, technology and functionality.

Figure 7-6 shows a breakdown of SMS and MMS traffic by type of application, either P2P or non-P2P. Chart 7.7 shows a breakdown of the future MMS traffic growth by applications. While Frost & Sullivan expects P2P MMS to account for 80.0 percent of total MMS traffic in 2002, the growth of content services, gaming, corporate and advertising based on MMS will take that figure down to 74.0 percent (see "MMS Applications" section of this report for more details). Chart 7.8 shows the number of short and multimedia messages Frost & Sullivan estimates will be sent across the forecast period per annum.

Figure 7-6

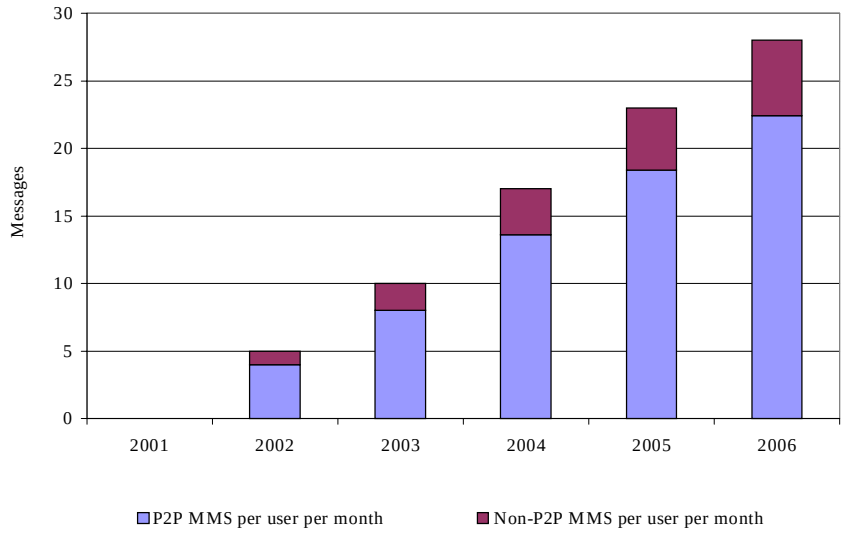
Total Multimedia Messaging Service Market: SMS and MMS Traffic by Application (Europe), 2001-2006

	2001	2002	2003	2004	2005	2006
P2P SMS per user per month	19	46	58	74	75	77
Share of total SMS (%)	96	94	91	87	85	85
Non-P2P SMS per user per month	1	3	6	11	13	14
Share of total SMS (%)	4	6	9	13	15	15
Total SMS per user per month	20	49	64	85	88	90
Total SMS traffic (Million)	69,742	186,225	250,268	337,528	353,422	364,597
P2P MMS per user per month	0	4	8	14	18	22
Share of total MMS (%)	0	80	79	79	76	74
Non-P2P MMS per user per month	1	2	3	5	6	---
Share of total MMS (%)	0	20	21	21	24	26
Total MMS per user per month	5	10	17	23	28	---
Total MMS traffic (Million)	0	216	3,817	17,128	45,683	90,957

Note: All figures are rounded. Source: Frost & Sullivan

Chart 7.7

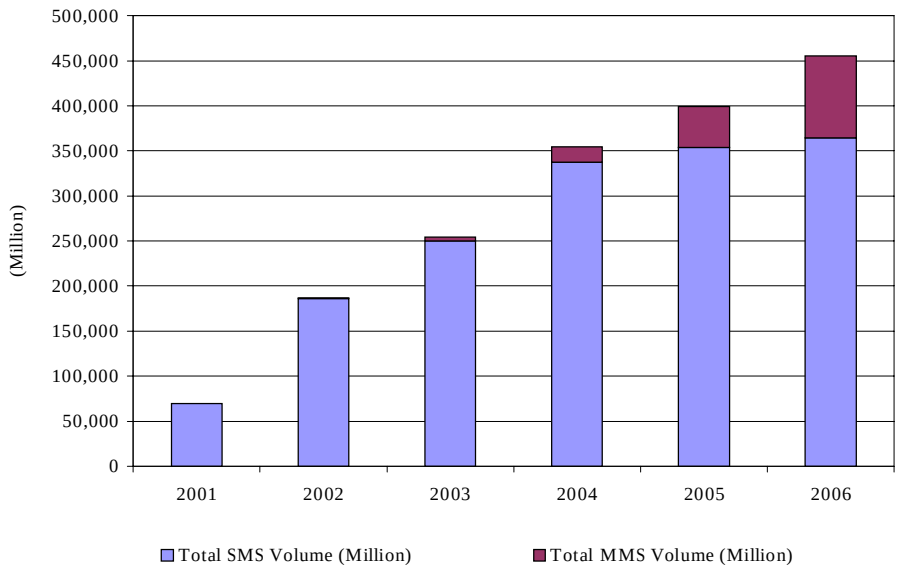
Total Multimedia Messaging Service Market: MMS Traffic Growth by Application (Europe), 2001-2006



Note: All figures are rounded. Source: Frost & Sullivan

Chart 7.8

Total Multimedia Messaging Service Market: SMS and MMS Traffic Growth (Europe), 2001-2006



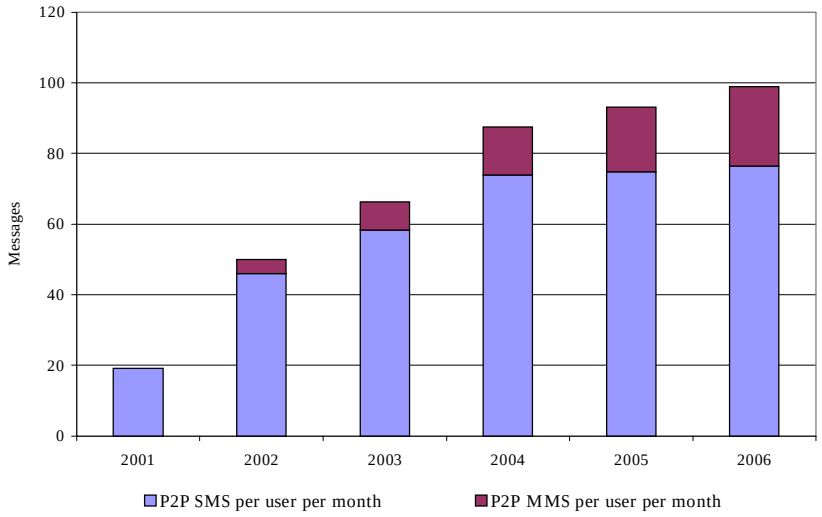
Note: All figures are rounded. Source: Frost & Sullivan

Chart 7.9 and Chart 7.10 show the breakdown of P2P and non-P2P traffic per user per month split by messaging technology. Nevertheless, there will still be a need for SMS in the near and far future. Frost & Sullivan anticipates SMS traffic growth (sent by users) will start

tailing off in about three years time, ultimately undergoing a negative growth path. SMS volume may grow significantly, but not so the revenues generated from it, as a considerable portion of this traffic will be free notifications sent by the MMSC to the MMS subscriber.

Chart 7.9

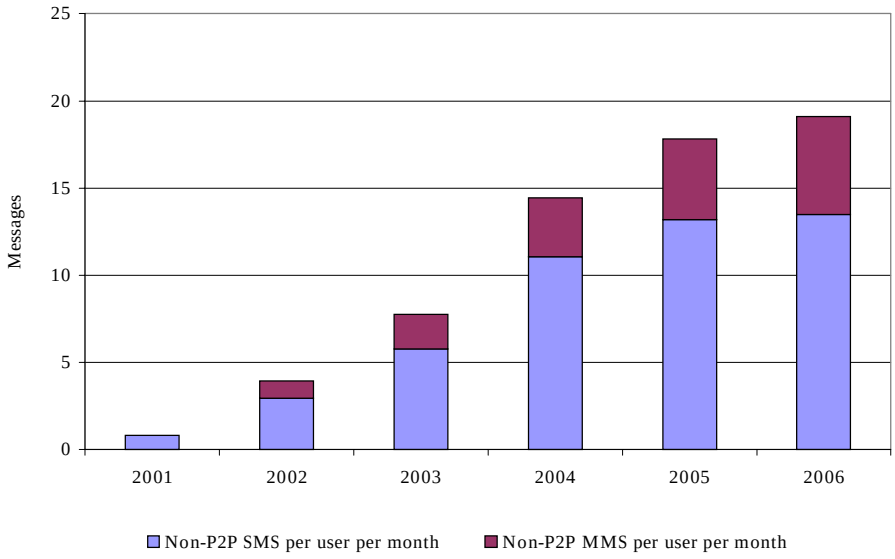
Total Multimedia Messaging Service Market: Breakdown of P2P Messages Traffic by Messaging Technology (Europe), 2001-2006



Note: All figures are rounded. Source: Frost & Sullivan

Chart 7.10

Total Multimedia Messaging Service Market: Breakdown of non-P2P Messages Traffic by Messaging Technology (Europe), 2001-2006



Note: All figures are rounded. Source: Frost & Sullivan

The evolution of the correlation between SMS and MMS is maybe best illustrated, respectively, by its radio and TV equivalent. It took radio around 38 years to capture 50 million users whereas it took only 13 years for TV to reach the same audience. SMS and MMS will follow similar adoption patterns. In addition, the same way TV took over radio in the home environment, MMS will seize SMS use.

Figure 7-7 and Chart 7.11 show the total revenue growth for mobile messaging, both SMS and MMS. It is clear how multimedia messaging will become a revenue stream of great magnitude, especially due to the higher price per message. MMS revenue growth will offset the SMS decline in the future. Frost & Sullivan expects MMS to account for 66.3 percent of all mobile messaging revenues (excluding e-mail) in 2006. By that year, each subscriber will send 118 messages per month of which 28 will be multimedia (roughly one out of four messages sent will be multimedia messages) and a total of approximately 446 billion messages will be sent.

Figure 7-7

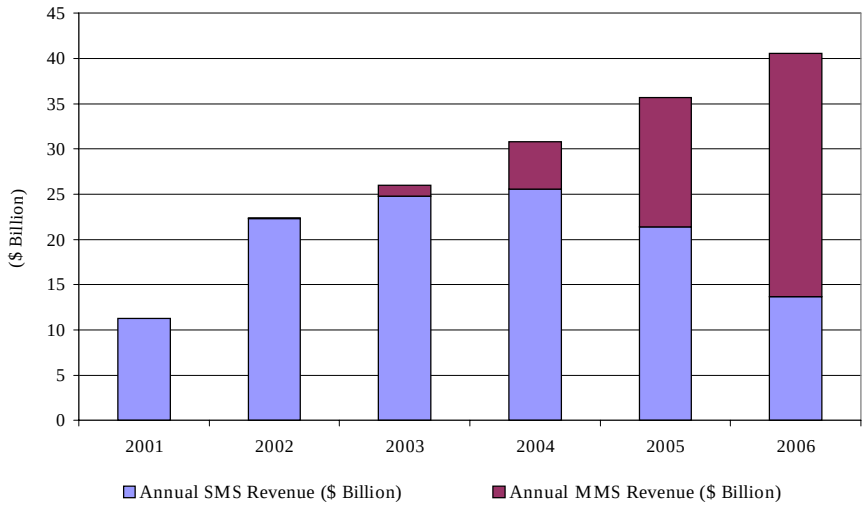
Total Multimedia Messaging Service Market: Evolution of SMS and MMS Revenue (Europe), 2001-2006

	2001	2002	2003	2004	2005	2006
SMS revenue ($ Billion)	11.26	22.33	24.76	25.52	21.40	13.69
MMS revenue ($ Billion)	---	0.07	1.25	5.29	14.26	26.89
Total	11.26	22.40	26.01	30.82	35.67	40.58

Note: All figures are rounded. Source: Frost & Sullivan

Chart 7.11

Total Multimedia Messaging Service Market: SMS and MMS Revenue Growth (Europe), 2001-2006



Note: All figures are rounded. Source: Frost & Sullivan

8

Conclusions

Strategic Recommendations

Recommendations for Network Operators

Simplicity and Consistency

Operators, like the rest of the industry players, are hoping the multimedia messaging service (MMS) to be a mass market service, just like the short messaging service (SMS). As the messaging market evolves and complexity increases, there is a need for network operators to concentrate on conveying a clear and simple message to customers. Operators must move away from offering the customer a confusing string of terms like SMS, enhanced messaging service (EMS), MMS, IM, unified messaging (UM) and mobile e-mail over the global system for mobile communication (GSM), general packet radio system (GPRS), high-speed circuit-switched data (HSCSD), enhanced data for GSM evolution (EDGE) or UMTS. Instead, carriers need to shift focus from difficult to understandable terminology and concentrate on catering for the needs of each segment of the market with valuable straightforward services. The more uncomplicated, the higher the number of subscribers and use. In addition, key to the integration success is the integration of MMS with legacy applications and systems such as e-mail services over wireless access protocol (WAP).

Another chief simplicity element must be the pricing of MMS. As opposed to the size, it should be based on the value and type of message (picture, audio, or video) and be similar to the SMS pricing model. The more complex the message (and perhaps if it exceeds a certain size), the higher the price. Operators will need flexible billing systems that are capable of coping with all types of billing models.

In addition, the operators should apply initiator or sender-based MMS billing save exceptions.

Agree on Inter-operator Roaming Quickly

Inter-operator roaming is a vital element for a satisfactory service. Operators should sign charging interconnection agreements early to aim for the deployment of a mass market service from day one. The same urgency applies to fixing mass market pricing.

Open Business Model and Operator's Prominence

MMS will be a mechanism to channel content and applications from third-party providers. The choice of the optimal business model will be a key factor in the development and uptake success of mobile data services. Operators need to develop numerous open partnerships and generous revenue sharing agreements with third-party developers to ensure a variety of high quality applications are made available to the subscriber. Although the vast majority of mobile data services revenues are derived from person-to-person (P2P) messaging, operators will have the opportunity to deliver a wider range of applications thanks to the enhanced richness and user experience of MMS and so drive use.

Having said that, it is crucial that operators retain control of messaging services and ownership of customer information and relationship if they wish to increase their data average revenues per user (ARPU). Otherwise, subscribers would not be tied to the network and operators would have to use price as the only customer retention factor, becoming a mere bit pipe.

Effective Marketing

Already mentioned as a critical success factor for MMS, effective marketing by operators implies making sure the potential customer is aware of the many advantages and new features that MMS provides in terms of advanced messages management, delivery, redirection, storage, screening, filtering, notification, etc. In addition, the target customer has to be aware that MMS is foremost a fun and personal content application.

Benefit from Advertising

Operators have the opportunity of including third-party advertising in their services. MMS will provide the perfect platform for targeted one-to-one marketing and subscribers will consent to some kind of advertising, such as a logo in the message, in exchange for paying less for the MMS service (or for free). This subsidy of the message delivery will help operators to meet customers' price expectations.

Take Advantage of MMS Intelligence to Reduce Churn

Thanks to the vast amount of information on user profile, use and behaviour that multimedia messaging service centres (MMSCs) will be able to generate, operators have the potential to tailor their services to increase customer loyalty.

Conclusion

Experience dictates that it always takes more time for new technologies and new services to be deployed than first expected. Due to the higher price margin per message, MMS will generate a substantial revenue stream rather quickly, but it will take some time until MMS alone starts to reverse the declining revenues trend affecting operators now. Operators are investing in MMS infrastructure sooner rather than later, but the proliferation of MMS handsets will hinder the market in Europe. EMS will not require improvements to the messaging infrastructure and will gain some acceptance on the way to mass uptake of MMS. However, while EMS will be a stepping stone to MMS, its lifespan will be short as developers and operators already concentrate on MMS development. SMS will continue to play a central role in the future, as a communication tool in the mid-term and rather as a support for the MMS in the long-term.

MMS will be integrated into IM, UM and e-mail and will drive total operators' ARPU, being a mass market application for HSCSD, GPRS, EDGE and WCDMA. The primary target segment will be the youth market, although MMS terminal prices must drop quickly. As with SMS, MMS will be mostly about P2P messaging, but operators are also hoping it will outperform SMS in attracting corporate users. Either way, Frost & Sullivan is confident MMS will be the key application enabling platform during the 2.5G and 3G networks era, the fundamental payback of operators' investments.

Market Engineering Awards

Market Engineering Awards for the Multimedia Messaging Services Market

Frost & Sullivan's 2002 Market Engineering Awards

Frost & Sullivan recognises outstanding industry achievements by presenting marketing engineering awards to top companies in a variety of regional and global markets. Frost & Sullivan's teams of industry experts recognise the diligence, perseverance, and dedication required to develop a successful business plan and excel in the increasingly competitive global marketplace. The awards commend excellence for specific marketing qual-

ities, such as leadership, strategy, service, innovation, integration, and development. Frost & Sullivan presents market engineering leadership awards to the multimedia messaging services industry in recognition of companies that endeavoured to make a positive contribution to the market.

Market Engineering Awards

Frost & Sullivan's team of specialised market analysts closely monitor market developments and identify market leaders for nearly every market sector. Individual awards may be presented in each market sector to businesses that demonstrate exceptional marketing skills. Award recipients may choose to enlist Frost & Sullivan to promote this great achievement.

Frost & Sullivan recognises superior planning and execution of product launches, strategic alliances, distribution strategies, and mergers and acquisitions, as well as a host of other crucial marketing factors. Frost & Sullivan Market Engineering Awards are globally recognised as a standard for marketing excellence.

Award Category: Business Development Strategy

Award Description

The Frost & Sullivan Market Engineering Award for Business Development Strategy is presented each year to the company that has demonstrated excellence in business development within the industry. The award recognises the company's ability to best perceive consumer needs, develop products and/or services that meet consumer needs, successfully introduce products or services to the industry, and identify new market segments to expand the existing customer base. Through a combination of vision, technology, and successful marketing, the award recipient has demonstrated superior market growth skills.

Research Methodology

To select the recipient of this award, the analyst team tracks all the major participants in the industry, paying close attention to their business development efforts. This process includes interviews with all the market participants, customers, and suppliers, along with extensive secondary and technology research. The companies' business development efforts are then analysed, based on the number of new customers, new segments, and commitment to business expansion. Industry participants are then ranked, based on the predetermined measurement criteria. The award recipient is ranked number one in the industry.

Measurement Criteria

In addition to the methodology described above, there are specific criteria used in determining the final ranking of industry competitors. The recipient of this award has excelled, based on one or more of the following criteria:

- Market penetration and market share growth in existing market segments .
- Development of new applications for existing products.
- Market share position in new market segments.
- Number of new customers.
- Participation in industry trade groups with goal of expanding market potential.
- Establishment of programs which allow its customers to grow, thereby improving its own performance.
- Increases in customer loyalty.

Award Winner: Ericsson

Ericsson, based in Sweden, is one of the world's largest mobile infrastructure and handset manufacturers. More than two thirds of the company's revenues come from selling its wireless telecommunications equipment to network operators and service providers. In the area of mobile messaging, Ericsson markets solutions for SMS, IM and presence, UM and MMS.

Ericsson has developed a comprehensive MMS solution which includes:

- The Ericsson Multimedia Messaging Centre (MMC).
- Multimedia library.
- MMS handsets.
- Mobile camera accessory.
- Wireless access protocol (WAP) gateway with push capability.
- Access to content and applications from Ericsson Mobility World.
- Integration services.

Ericsson was the first MMS technology vendor to demonstrate legacy phones support. In addition to a Third Generation Global Project Partnership —(3GPP) compliant MMSC and WAP gateway, the company's ability to supply an end-to-end solution to operators has earned it an early leadership position in the European MMS technology marketplace. Offerings that will allow Ericsson to grow fast in the market are the following:

- As a major supplier of billing systems, it has developed a prepaid billing solution which will support the real-time charging of MMS.
- Ericsson provides operators with the T68 MMS-enabled handsets and an attachable camera as an essential component of the trial package and eventually for selling to subscribers. The company was the first to release and ship a multimedia handset in the European market and has teamed with Sony to release new terminals.
- Finally, Ericsson offers mobile networks infrastructure for 2.5G and 3G networks.

The combination of all these offerings puts Ericsson in an excellent market position, allowing the company to grow on the back of bundling MMS technology into mobile network systems, charging software and MMS-capable terminals. Ericsson has installed its MMC as a trial system in 25 network operators' networks worldwide and 25 more internally. Furthermore, it has won a global contract from Vodafone, the world's largest mobile operator, which will roll out MMS in nine countries across Europe, with more to follow. Vodafone has purchased Ericsson's MMS infrastructure, GPRS network systems and mobility leaders content and applications.

Award Category: Competitive Strategy

Award Description

This award is presented each year to a company, the competitive strategy of which has yielded significant gains in market share during the research period. Often, the recognised company has taken advantage of recent market changes that facilitate the introduction of never-before seen methods of capturing and solidifying market presence. Alternatively, the award recipient may have executed an innovative strategy within the existing competitive landscape, empowering the company to overtake the competition. In either case, the company captures the attention of the competition, which quickly adjusts in order to protect its own market position. Frost & Sullivan analysts expect such innovations to produce lasting, precedent-setting trends in the industry.

Research Methodology

In order to select the award recipient, analysts quantify several market factors for each market participant according to predetermined criteria. The research process includes interviews with industry experts, industry participants, and end-users, as well as extensive secondary data research. Formulated criteria determine industry rankings. The award recipient is ranked number one among all industry participants.

Measurement Criteria

In addition to the methodology described above, specific criteria are used to determine the final rankings of industry competitors. The recipient of the award has excelled, based on one or more of the following:

- Percent growth in revenues
- Degree of strategy innovation
- Successful alliances, mergers, and acquisitions
- Market share growth
- "Mind share" growth
- Correlation between revenues and investment
- Penetration rate of new markets
- Organisational restructuring

Award Winner: Vodafone Group

Vodafone UK owned, the Vodafone Group is the world's largest mobile operator, with more than 100 million subscribers. It owns stakes in network operators in more than 24 countries in Europe, the Americas, Asia/Pacific, Middle East and Africa. European countries with subsidiaries include: UK, Republic of Ireland (Eircell Vodafone), the Netherlands (Libertel Vodafone), Sweden (Europolitan Vodafone), Germany (D2 Vodafone), Hungary, Greece (Panafon Vodafone), Omnitel (Omnitel Vodafone), Malta, Portugal (formerly Telecel, now Vodafone), Spain (formerly Airtel, now Vodafone), Albania, and Romania (Mobifon).

The Vodafone Group has demonstrated a clear vision in the pre-mature MMS market. It has been one of the first network operators to award a contract for an MMS solution, which will be initially deployed in nine countries: Germany, Republic of Ireland, Greece, Italy, the Netherlands, Portugal, Spain, Sweden and the UK. Some time in 2002, Vodafone will extend the contract to the rest of its subsidiaries in Europe. The company plans to launch services during the second quarter of 2002. Vodafone expects to reap between 20 and 25 percent of its revenues from data services by 2004. During December 2001, mobile data services already accounted for 12 percent of the group. In Germany, messaging services revenues represented almost 14 percent for Vodafone and in the UK and southern Europe it accounts for roughly 7 percent of total service revenues.

Through its subsidiaries, Vodafone has demonstrated the commitment for a successful launch of MMS services in Europe. Frost & Sullivan regards Europolitan Vodafone as one of the most dynamic operators in Europe, making great progress in commercial availability of multimedia services. Europolitan Vodafone teamed up with Comverse in September 2001 to conduct a trial of MMS over the operator's GPRS network. The first phase of the trial started in June 2001 and involved the Motorola Timeport and the iPaq terminals in an internal test with Europolitan Vodafone employees. During the second part of the trial, happening now, a selection of customers will test the system using the Ericsson T68 terminal and are charged for sending multimedia messages. This will allow Vodafone to evaluate pricing strategies' viability, users' behaviours and preferences as well as transcoding testing.

Award Category: Entrepreneurial Company

Award Description

This Frost & Sullivan award is given each year to the small company that demonstrated superior entrepreneurial ability in its industry. This award signifies the company's identification of a unique and revolutionary product solution with significant market potential. Additionally, the award certifies that the company's marketing strategy is sound and poised for success.

Research Methodology

Entrepreneurial ability is assessed using mostly primary research with top manufacturers and end-users in the industry. Frost & Sullivan analyst teams perform extensive interviews with the company in question to evaluate its products, business, and marketing plan. In addition, primary research with leading manufacturers is performed to benchmark the award recipient's strategy for growth against established players' strategies. Also considered are elements such as strategic alliances, expected time to market, and the senior management team. Primary research with end-users is also conducted to evaluate and compare the value of the award recipient's product solution.

Measurement Criteria

A recipient that is chosen for the Entrepreneurial Company Award must match the following criteria:

- The company must have fewer than 300 employees.
- The company must have identified a brand new and completely unique product solution.
- The product solution must have significant market potential (at least $200 million) and a high probability of reaching its potential in the next two to five years.
- Financial and employee based resources to ensure a large probability of success. Financial resources include backing from VCs, IPOs and funding from large corporate partners.
- Protection from competitors: patents, large product development lead time, strategic alliances with key component suppliers, etc.
- Strong plans for marketing: strategic alliances for distribution, relationships with key customers, voluminous positive-press in the media, endorsements from industry experts, etc.

Award Winner: conVISUAL

conVISUAL is a wireless application service provider based in Oberhausen, Germany, which specialises in developing visual messaging services for mobile networks. The company's core application platform, the Multimedia Message Broker (MMB) is designed to create, convert and distribute mobile multimedia messages to any type of device. Currently, there are a variety of mobile messaging standards: SMS, Smart Messaging, EMS, magic4 and in the future MMS. The MMB is a transcoding system that is able to convert between all these different media formats, sizes and standards so subscribers would be able to receive multi-media messages adapted to their terminal's capabilities. conVISUAL was the first company to enable this conversion of multimedia messages between diverse mobile terminal standards.

conVISUAL aggregates content from content providers and operates multimedia messaging applications as a managed service for network operators, service providers, ISPs and media companies. The MMB realises a wide range of applications for mobile "advertainment" and P2P communications, including the mobile Advent Calendar, multimedia greeting cards, Photo Community and MMS Entertainment Services (Animated Sports Quiz, MMS Comics, MMS Click). Yahoo, Vodafone D2 and WIND are customers of conVISUAL. Nokia is its major partner.

The funding for the company has been provided by the managing director of BAUMANN Group, Manfeed A. Wagner and is headed by former managers from Ericsson and Materna.