

Unclassified

DSTI/ICCP/IE(2004)14/FINAL



Organisation de Coopération et de Développement Economiques
Organisation for Economic Co-operation and Development

03-May-2005

English - Or. English

**DIRECTORATE FOR SCIENCE, TECHNOLOGY AND INDUSTRY
COMMITTEE FOR INFORMATION, COMPUTER AND COMMUNICATIONS POLICY**

Working Party on the Information Economy

**DIGITAL BROADBAND CONTENT: MOBILE CONTENT
NEW CONTENT FOR NEW PLATFORMS**

JT00183611

Document complet disponible sur OLIS dans son format d'origine
Complete document available on OLIS in its original format

**DSTI/ICCP/IE(2004)14/FINAL
Unclassified**

English - Or. English

FOREWORD

This report was presented to the Working Party on the Information Economy in December 2004 and was declassified by the Committee for Information, Computer and Communications Policy in March 2005.

The report was prepared by Ms. Christy Kunin (DLA Piper Rudnick Gray Cary, United States) in conjunction with Mr. Graham Vickery and Mr. Sacha Wunsch-Vincent of the OECD's Directorate for Science, Technology and Industry. It is published on the responsibility of the Secretary-General of the OECD.

Copyright OECD, 2005.

Applications for permission to reproduce or translate all or part of this material should be made to:

Head of Publications Service, OECD, 2 rue André-Pascal, 75775 Paris Cedex 16, France

TABLE OF CONTENTS

FOREWORD	2
PREFACE	4
SUMMARY	6
MOBILE CONTENT: NEW CONTENT FOR NEW PLATFORMS	8
Introduction and background	8
Scope: Content provided over mobile platforms	8
Market estimates	9
The user focus	10
Overview of value chains and business models	11
Technologies to enable the diffusion of mobile content	16
Deployment of advanced wireless networks	18
Handsets designed for mobile content	21
Marketing, distribution and billing technology for mobile content	25
Data transfer pricing	27
Piracy, IP rights, and digital rights management	28
The current state of mobile content	30
Music	31
Games	38
Mobile video applications	46
Enterprise applications	47
Information, location, and tourist services	48
Other mobile content	49
Policy Implications	50
Consolidated Regulatory Authority	51
Infrastructure Regulation	51
R&D and Projects to Facilitate the Development of Mobile Content	53
Public Sector Information	55
IP, DRM, Technical Standards and Interoperability	55
Competition Policies	56
Privacy and security	58
Consumer Protection	58
Payment and micro-payment issues	58
Taxation issues	59
Conclusions	60
NOTES	63

PREFACE

Digital content and digital delivery of content and information are becoming increasingly ubiquitous, driven by the expanding technological capabilities and performance of delivery platforms, the rapid uptake of broadband technologies and improved performance of hardware and software. Network convergence and widespread diffusion of high-speed broadband has shifted attention towards broadband content and applications that promise new business opportunities, growth and employment.

At its March 2003 meeting, the Information, Computer and Communications Policy Committee (ICCP) discussed interlinked broadband and digital content developments and policy issues. The Committee adopted two tracks for this work, agreeing to work: *(i)* towards a Committee statement on promoting broadband development; and *(ii)* to develop a work proposal on digital content. At its October 2003 meeting, it was agreed that the ICCP Committee should undertake more comprehensive analysis on digital broadband content, focusing on growth and value creation, drivers and barriers to growth, and changing market structures and emerging issues with development of new delivery platforms.

In February 2004, following preparation in the ICCP Committee, the OECD adopted the Recommendation of the Council on Broadband Development (see Box 1), setting out ten recommendations for OECD member countries when establishing or reviewing their broadband policies. These policy recommendations recognise the increased policy attention towards broadband content and applications. The ICCP Committee has been asked to monitor the development of broadband in the context of this Recommendation within three years of its adoption and regularly thereafter.

At its April 2004 meeting the ICCP Committee agreed to the work plan on digital broadband content, with this work being undertaken in the Working Party on the Information Economy (WPIE) in conjunction with the Working Party on Telecommunication and Information Services Policies (WPTISP). The WPIE is undertaking stocktaking studies of sectors where digital content is transforming value chains and business models. Initial sectors studied are: scientific publishing, music, on-line computer and video games and mobile content services. The studies are designed to further identify analytical, policy and measurement issues, and prepare the ground for more in-depth analysis of horizontal issues and challenges to broadband content development and applications. The WPIE held a Digital Broadband Content Panel in June 2004 and a Digital Broadband Content Workshop in December 2004.¹

Further policy analysis is being undertaken in the area of digital content. For more information see www.oecd.org/sti/digitalcontent.

Box 1: OECD Recommendation of the Council on Broadband Development, 2004

The OECD Council recommends that, in establishing or reviewing their policies to assist the development of broadband markets, promote efficient and innovative supply arrangements and encourage effective use of broadband services, Member countries should implement:

- Effective competition and continued liberalisation in infrastructure, network services and applications in the face of convergence across different technological platforms that supply broadband services and maintain transparent, non-discriminatory market policies.
- Policies that encourage investment in new technological infrastructure, content and applications in order to ensure wide take-up.
- Technologically neutral policy and regulation among competing and developing technologies to encourage interoperability, innovation and expand choice, taking into consideration that convergence of platforms and services requires the reassessment and consistency of regulatory frameworks.
- Recognition of the primary role of the private sector in the expansion of coverage and the use of broadband, with complementary government initiatives that take care not to distort the market.
- A culture of security to enhance trust in the use of ICT by business and consumers, effective enforcement of privacy and consumer protection, and more generally, strengthened cross-border co-operation between all stakeholders to reach these goals.
- Both supply-based approaches to encourage infrastructure, content, and service provision and demand-based approaches, such as demand aggregation in sparsely populated areas, as a virtuous cycle to promote take-up and effective use of broadband services.
- Policies that promote access on fair terms and at competitive prices to all communities, irrespective of location, in order to realise the full benefits of broadband services.
- Assessment of the market-driven availability and diffusion of broadband services in order to determine whether government initiatives are appropriate and how they should be structured.
- Regulatory frameworks that balance the interests of suppliers and users, in areas such as the protection of intellectual property rights, and digital rights management without disadvantaging innovative e-business models.
- Encouragement of research and development in the field of ICT for the development of broadband and enhancement of its economic, social and cultural effectiveness.

The Council also instructs the Committee for Information, Computer and Communications Policy to monitor the development of broadband in the context of this Recommendation within three years of its adoption and regularly thereafter.

Source: OECD (2004), *Recommendation of the Council on Broadband Development*, C(2003)259/FINAL, www.oecd.org/dataoecd/31/38/29892925.pdf.

SUMMARY

This study examines content being generated for deployment on broadband mobile platforms in light of the OECD Council Recommendation on Broadband Development adopted in February 2004. The current development of the mobile content industry, and the drivers for content dissemination in mobile networks are analysed, and preliminary policy issues are identified. Ongoing monitoring of the OECD Council Recommendation on Broadband Development should ensure that policies take consideration of the mobile environment.

The first section examines demand for mobile content and highlights the crucial role of user preferences in the successful development of mobile content.

- While still a relatively new field, mobile content is viewed as a major driver of growth for the telecommunications and media industries.
- Mobile content – particularly music and games – is viewed as an emerging major industry. Markets are most developed in Asia, with very large growth potential in North America and Europe.
- Ease of use and personalisation are essential to broad user uptake of mobile content.
- As mobile content markets develop, numerous players are vying to control various parts of a complex and changing value chain. These include content owners and developers, content aggregators, mobile operators, handset manufacturers and various other companies offering enabling technologies. No single dominant value chain has emerged and it is likely that different value chains will prevail for different types of mobile content, reflecting the differing nature of the industries involved, different market structures and competitive conditions and the different policy frameworks that apply to different types of content.

The second section highlights the key technologies required to enable broadband mobile content.

- Broadband wireless networks, particularly 3G, will provide the bandwidth necessary to deliver increasingly sophisticated mobile content. Earlier generation wireless networks have seen increasing customer demand for content such as ringtones, music downloads and simple games. As providers increase network bandwidth, the opportunities for mobile content will expand.
- Handset manufacturers are working with content developers, mobile operators and other industry participants to develop handsets and features that will facilitate access to and use of mobile content. To complement these initiatives, industry and government must facilitate the development of standards and interoperability guidelines.
- Technologies crucial to enabling broad content dissemination, including marketing, distribution and billing technologies, are increasingly available and will encourage further development of mobile content. Mobile portals provide many of these capabilities and occupy a primary position in the mobile content value chain. Currently, most users obtain content on mobile devices from their mobile operator through the operators' branded mobile portal that provides content from providers with whom the mobile operator has an established relationship. As new technologies are introduced, this position could change.

- Pricing of mobile content can be confusing for some customers. A lack of pricing information can leave customers unsure of the cost of acquiring or using content, due in part to data transfer costs.
- As with online content, piracy, IP rights and Digital Rights Management issues are being addressed by the mobile content industry. It is essential that as these policies develop globally, consideration is given to mobile platforms.

The third section examines mobile content offerings. While a key focus of this section is on mobile music and game content, which are more developed than other applications, the report provides a snapshot of other current offerings.

- While many possibilities exist for generating attractive mobile content, to date music – especially ringtones and most recently music downloads - is a key source of mobile content. Growth in the mobile music markets involves song reproductions or snippets that do not raise as much industry concern over copying. As offerings become more full track-oriented, however, these concerns will probably be of increasing prominence.
- Games are also a key focus of many mobile content developers, and increasingly, games are being developed for mobile platforms. To date, the market has focussed on fairly simple embedded games, but there is a growing market for more complex, interactive and multiplayer mobile games. Industry standards and interfaces would greatly enhance development of mobile games by allowing developers to address a broader market. As more sophisticated games are developed, the software can potentially be adapted for enterprise training and educational purposes.
- A variety of other content is being provided over mobile platforms, including video, enterprise and information and location services. Some of this content, including adult and gambling, raise unique policy issues that are not general to other types of mobile content. Location-based services also raise privacy concerns.

At this crucial juncture in the development of mobile technologies, government policies across an array of areas can have a significant impact. The last section reviews the various policy initiatives in OECD member countries that impact the development and growth of broadband mobile content.

- Because broadband wireless deployment is crucial to further advances in mobile content, infrastructure policies, including broadband, wireless and spectrum policies, are essential to ensure that network developments keep pace with the content being transmitted over them.
- Numerous R&D projects are designed to facilitate the development of mobile content. These, along with public sector use of mobile content applications, can forge new business models and promote user acceptance.
- IP, DRM and technical standards are essential to continued growth. Industry and government-facilitated policies to encourage consensus and development in these areas must take into account the mobile environment.
- Competition is essential to ensure that industry participants do not foreclose mobile content from new technological platforms.
- Mobile platforms raise issues of privacy and security that must be addressed by ongoing policy initiatives, and consumer protection in a mobile environment must be directly addressed.
- Payment and micro-payment policies should specifically consider the mobile content markets.
- As content flows globally, taxation policies should consider the significant impact they can have on the uptake of mobile content.

MOBILE CONTENT: NEW CONTENT FOR NEW PLATFORMS

Introduction and background

An increasingly mobile population stands to benefit greatly from access to digital content in an unwired, mobile environment. Recent advances in mobile technology, network upgrades and user adoption of initial mobile content offerings have focused increased attention on mobile content. The surprisingly robust market for ringtones – music snippets used on mobile handsets – signals to many industry participants that the mobile market is ready for digital content. Successful development of the mobile content market requires that end users obtain – and pay for – services received while “on the move.” This report looks at the current state of mobile content across the OECD member countries with an eye to taking stock and analysing changes in value chains and business models and identifying key policy issues for this growing industry.

Scope: Content provided over mobile platforms

As content becomes increasingly digital, more and more of it will be delivered over mobile platforms.² Mobile platforms are evolving and quickly becoming a very promising content delivery platform. Thus, the interplay between these two areas – mobile delivery platforms and digital content – falls within the scope and review of the OECD Council Recommendation on Broadband Development.

Within the general area of digital content, this report focuses specifically on content delivered over mobile or wireless platforms that provide users with “always on” connectivity, wire-free technologies using both licensed and unlicensed spectrum. The major licensed technologies include GSM, GPRS and 3G. Unlicensed, shorter-range technologies include wireless fidelity (WiFi), WIMAX, wireless local area network (WLAN), RFID and Bluetooth. The characteristics of each technology differ and their use depends on the specific application. The Open Mobile Alliance (OMA) defines “mobile” as “services, which can be received, used and purchased with battery-powered hand-held terminals both indoors and outdoors.”³ This analysis generally refers to the narrower mobile, hand-held environment and will consider other wireless technologies as necessary for a full understanding of developments in the mobile content area.

Three primary types of data services offered over mobile networks, include:

- **Communications-based data services**, primarily involving peer-to-peer communications such as messaging (SMS and MMS) and email.
- **Transactional data services**, including financial transaction services.
- **Content-based data services**, including music, entertainment-based educational content (sometimes referred to as “edutainment”), games, video, news, transport information, adult entertainment.⁴

This last category – content based services – will be the primary focus of this report, although the analysis will touch on the other areas as relevant.

Market estimates

While still a relatively new industry, mobile content is being viewed as a major driver of growth for the telecommunications and media industries. Estimates vary, but it is clear that the mobile content markets, particularly in the areas of music and games are undergoing substantial growth. Because mobile content services are relatively new in many areas, it is difficult to find publicly available data regarding the overall revenue projections for mobile content. Often mobile data is not yet presented separately from aggregate data. Industry or government sponsored studies focus only on certain markets or technologies and definitional constraints make it difficult to compare data across studies. Further research in this area is worth undertaking. Nevertheless, the data available demonstrates that even though the mobile portion of overall content revenues is still considered by some to be just a “drop in the bucket”, mobile content is increasingly viewed as a key driver for growth in content revenues. The growth of wireless users has to lead to an increasing market for mobile content and users are becoming accustomed to using their phones as extensions of the online connectedness.⁵

A growing number of reports provide forecasts for the growth of mobile content, although for the most part they do not use comparable market definitions and cannot be directly compared. One 2003 report estimated the Asia Pacific region mobile content market to be worth EUR 2.65 billion, rising to EUR 5.7 billion by 2006; while the European and North American mobile content markets will grow from EUR 1.8 billion in 2003 to EUR 4.3 billion in 2006.⁶ Research forecasts that the market for mobile data will grow from USD 16.7 billion in 2003 to nearly USD 78 billion in 2007, with the majority of revenues going to mobile operators and carriers, not content creators. The report also concludes that although the UniS is catching up with Asia and Europe in the number of wireless subscribers, European and Asia carriers obtain nearly 20% of their revenue from data offerings, while US carriers only have 2% of the revenues from data services.⁷

In a study commissioned by the European Commission in 2002, Andersen Consulting estimated the European mobile content market size in 2006 at around EUR 19 billion.⁸ Of this, EUR 5 billion will be in games, especially when multiplayer offerings become available.⁹ Other large mobile content segments include EUR 2.7 billion in music offerings and EUR 3.7 billion for news services.¹⁰ Mobile content and entertainment revenues for Western Europe are projected to increase by almost five times over the next four years according to a recent report on the industry. Mobile content and entertainment will continue to take a bigger slice of non-voice incomes over the same period. The sector will represent just over a third (34%) of non-voice revenue in four years time, increasing from 16% in 2002. The International Data Corporation (IDC) estimates that mobile data services, including ringtones, games, video and music will generate both traffic and cash for mobile services providers with revenues as high as USD 8 billion in Western Europe by 2008.¹¹ The Yankee Group estimates that Wireless Data will account for USD 50 billion over the next five years, fuelled primarily by wireless entertainment.¹² In 2001, Jupiter Research estimated that the Western European market for mobile content was EUR 255 million, with 70% of the content being adult entertainment content. In the United Kingdom, revenues from mobile on-line paid content are around GBP 500 million and are forecast to increase to around GBP 2 billion by 2007, based on a report produced earlier this year by Spectrum Strategy Consultants for DCMS. Strategy Analytics projects that worldwide revenues from mobile data services are expected to increase from GBP 34 billion in 2004 to GBP 106 billion in 2009, of which revenues from mobile entertainment are expected to account for 28%.

The largest areas of growth are in mobile games and downloadable music, which includes ringtones. On the music side, data is usually reported only for ringtone revenues. Overall mobile music revenues are not typically presented. Looking at the ringtone portion of music revenues, estimates vary widely. For example, in 2003, global ringtone revenues estimates ranged from GBP 1.6 billion¹³ to USD 2.3 billion¹⁴ to USD 3 billion¹⁵ to USD 3.5 billion.¹⁶ IDC estimated the US ringtone market to be USD 16.6 million in

2002 and USD 50 million in 2003. This is considerably smaller than markets in Europe (EUR 200-400 million) and Japan (USD 720 million).¹⁷

PriceWaterhouseCoopers figures indicate that spending on wireless games in Asia, Europe and North America will rise from a mere USD 8 million in 2001 to over USD 13.6 billion in 2008. In the United States, spending on wireless games will increase from USD 142 million in 2003 to USD 2.8 billion in 2008, an 82% compound annual increase. In Asia wireless games will rise from USD 8 million in 2001, where they were the only real wireless games market to USD 6.6 billion in 2008. Europe, Middle East and Africa's spending on wireless games will rise from USD 112 million in 2002 to USD 3.9 billion in 2008. In Canada, the report projects that wireless games will increase from initial 2002 levels of USD 9 million to USD 254 million in 2008.¹⁸ According to one report, the online games market is estimated to be worth USD 4.75 billion, of which 50% will be mobile.¹⁹ Screen Digest reports that mobile game revenues worldwide have already grown five-fold in value since 2002, and predicts that global mobile gaming download revenues will increase six-fold by 2010, to be worth USD 6.4 billion (GBP 3.5 billion).

These projections and forecasts are premised, at least in part, on continued 3G broadband network deployment and consumer take-up of wireless broadband data services. Furthermore, increased availability of metrics on content is desirable to demonstrate the potential of this industry.

The user focus

Rapid and broad proliferation of digital content in the mobile environment depends on user acceptance. Accordingly, successful offerings must provide a positive user experience. While some technically savvy users will be willing to purchase or use content that requires technical know-how, broad-scale consumer acceptance requires relatively easy-to-use applications. Ease of use must be an attribute of not just the actual content (such as a mobile game) but also the access, interface and billing mechanisms.

The focus of many wireless providers and handset manufacturers has been on the technical features and capabilities of the networks and end user devices.²⁰ Such technical characteristics have long been a staple of wireless industry marketing efforts. Technical capabilities may attract tech-savvy early adopters. Yet, in order to attract a broader consumer market, it is essential that end users understand what they will get out of the product. This establishes a clear-cut value proposition for the consumer. It is possible that once sufficient user acceptance of mobile content access and effective payment methods are achieved, marketing more sophisticated technical features will be effective to grow and expand the market. Likewise, the user must be able to easily determine the cost of obtaining and using content. Surprise or hidden costs will chill user acceptance of content offerings.

Elements required for successful mobile content development and use include an infrastructure that offers a wide range of quality content, simple downloads, secure and transparent billing, and fair revenue shares, while protecting content providers from piracy. Achieving a successful user experience requires co-ordination among an often complex array of service providers, including mobile operators, device manufacturers, aggregators, content publishers and content developers. Successful mobile content providers – such as NTT DoCoMo (see Box 2 in Section *Technologies to enable the diffusion of mobile content*) – have co-ordinated these disparate parts of the value chain to ensure a positive initial experience for end users. However, the conditions that enabled NTT's successful iMode launch have so far not recurred in other environments. In the United States for instance, no clear technology or service provider has emerged as dominant. Consequently, no single provider is positioned to exercise the type of comprehensive market co-ordination that typified DoCoMo's iMode effort. In the United States, the various network technologies deployed throughout the country makes it unlikely that such a co-ordinated effort will emerge from a single operator nationwide. Europe's initial launch of WAP services also led to disappointing service take-up. With the UMTS standard, Europe is progressing towards a unified network

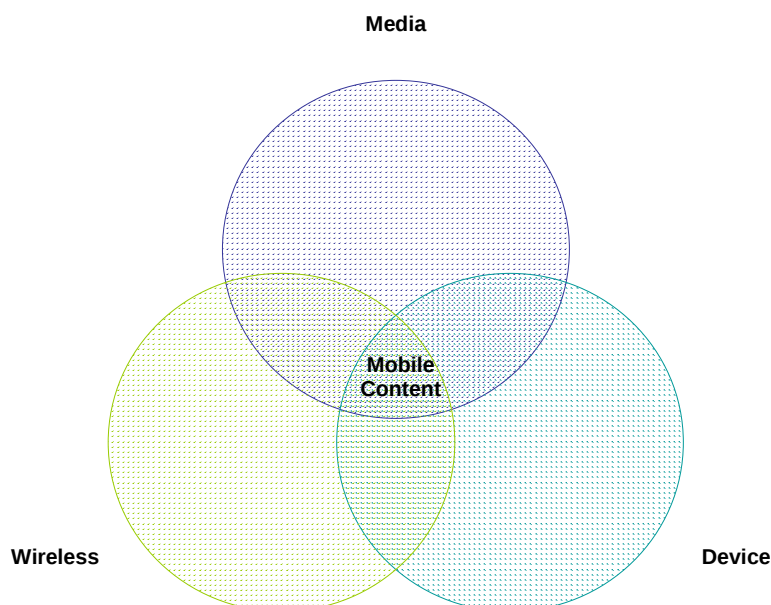
technology, but deployment is at various stages in different countries and even operators with a broad EU footprint do not have complete UMTS coverage yet. In the absence of industry leadership in co-ordination efforts, it is not clear how the necessary co-ordination can be organised.

There is wide recognition that a failed user experience is difficult to recover from. Users are less apt to respond to new offerings until they are tested and proven following disappointing initial experience. Although 3G is being successfully introduced in Japan and Korea and iMode has been outstandingly successful in Japan, the earlier experience with WAP in Europe (*e.g.* related to handset and price issues) may create a hurdle for the introduction of new 3G offerings and may be responsible for perceived consumer disinterest in 3G. Therefore, initial experiences with network performance, devices and content must meet or exceed end user expectations.

Overview of value chains and business models

This section provides a general overview of the relationship between and among major drivers as a framework for the more detailed discussion that follows. The value chain and business models that define the mobile content environment depend upon a wide range of factors, however, it is possible to identify three primary drivers. First, the underlying value chain for mobile content is still developing. This chain can be long and complex, varies for different types of content, and involves myriad players, ranging from those that are well-established to smaller start-ups. Second, in the mobile environment, service delivery is crucial because it can determine the content available, and involves how users will pay for and access the services (through their mobile operator's portal, an independent mobile portal or a Web browser, for instance). Today, service delivery occurs most often by and through a user's mobile operator, but market, technology and user demands are all exerting pressure on this model. Third, the handset or device frequently dictates or constrains a user's access to mobile content. The ability to use and enjoy rich content like video or music requires a handset with capabilities beyond those necessary for voice or messaging services. As end user devices gain computing power and functionality, the computer sector will likely expand to address the mobile market, further blurring the traditional lines between computing and communications.

Many players in the mobile content value chain come from mature industry sectors - wireless telecommunications, media/entertainment and device/computing (see Figure 1). Consequently, the mobile content industry can generally be seen as integrating the very different value chains of these three industries. Each industry approaches the market with different strengths. For instance, mobile operators and device manufacturers focus on technical capabilities. In addition, they have mobile billing capabilities and, perhaps most important, established ongoing relationships with mobile users. However, with respect to content, mobile operators' traditional focus on technology may not have prepared them to address the consumer demand for entertainment services. Device manufacturers' focus on features, functions and technical performance likewise gives them a very technical approach to the market. In contrast, media and entertainment companies are skilled at understanding mass market sensibilities. Media and entertainment companies have only recently begun to enter the mobile content environment. In some cases, this belated interest has been attributed to scepticism about the stability and size of the mobile market, as well as the fact that they do not presently occupy a central position in the value chain. Nevertheless, commentators contend that "the involvement of the media industry is important because these companies possess entertainment-related know-how financial capabilities and opportunities for cross-media marketing."²¹ As a result, of these disparate strengths, the industry is in the midst of vertical and horizontal integration, which should marry necessary skills sets for developing the mobile content market.²²

Figure 1. Mobile content lies at the intersection of wireless, media and device industries

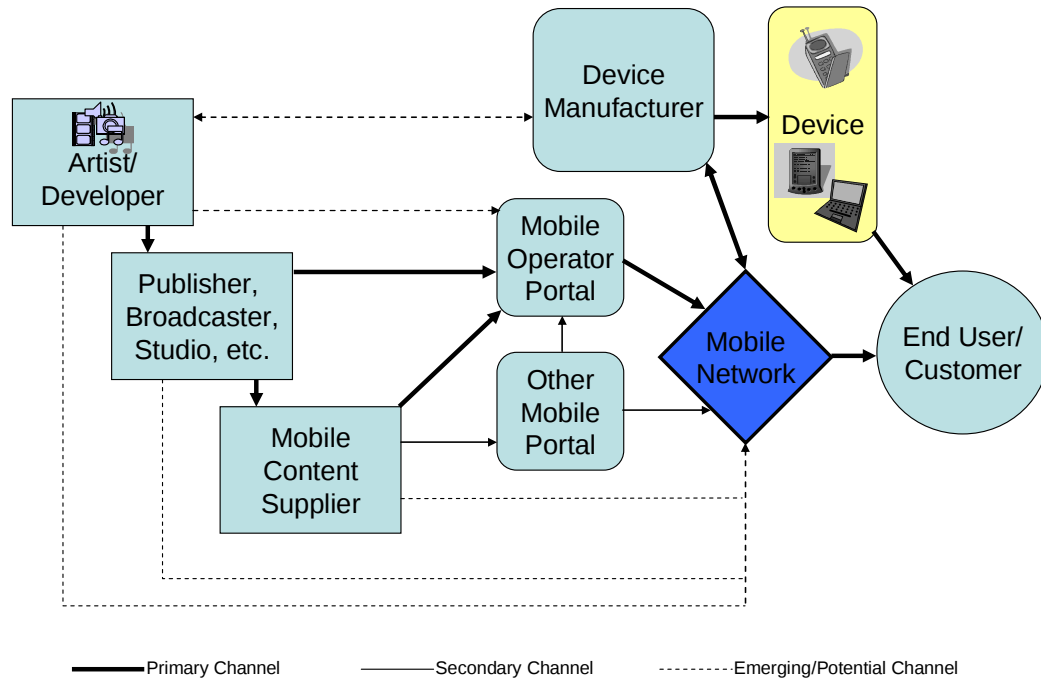
The value chain for mobile content involves both large and small players. Established players include mobile operators, device manufacturers, and content providers such as movie studios, broadcasters, record labels and game publishers. These players' existing markets are quite mature and to a great extent each actor is accustomed to controlling the mobile content value chain in their respective industries. Accordingly, each of these players is determined to preserve a significant stake in the success of their mobile content endeavours, and each is vying for a central position in the value chain. The interests of these stakeholders are often at odds, making negotiations complex and slow. In part, this stems from the highly disruptive effect that mobile content can have on traditional business models. Once content is to be made available "anywhere, anytime on any platform," business models must fundamentally change in order to meet this requirement. If users can actively pursue content rather than receive content that was programmed for them, traditional content offers – such as those that feature bundles of programming rights regardless of the delivery technology, provide geographic or other forms of exclusivity or incorporate windows for content release – are unworkable. For example, until recently European national football championships were only considered suitable for broadcast to national audiences. However, mobile platforms allow content to be delivered to niche users and mobile operators may be interested in broadcasting for example the UK Premiere League championship matches or other countries' top division matches to other countries. Such fundamental shifts in the customary approach to a content market often meet substantial resistance, if not denial.

In addition to the large players, numerous other entities have a stake in the mobile content value chain. These include, among others, aggregators, independent portal providers, game developers and artists, billing and DRM providers, which are often smaller less-established players. Many of the smaller players serve only the mobile content industry and thus have little leverage in a value chain caught in a tug-of-war among the established, large interests. It is possible that as content providers and mobile operators work more directly with one another that the role of aggregators may become marginalised.

In an effort to gain a better position in the value chain, many players are experimenting and revising their business models. Some companies “are trying to establish their technologies as standards, a situation which has created a low degree of product and technological standardisation and a diversity of networking standards.”²³ Established players are often reluctant to modify their business models to accommodate the differences of the mobile environment. For example, as video moves to a mobile platform, providers have faced resistance from broadcasters to modify the traditional rights associated with provision of premium broadcast content. These rights are not suited to the mobile platform and some companies have sought intervention from the competition authorities in order to gain access to this valuable content. While mobile operators’ direct, ongoing relationship with the customer places them at the centre of the mobile content value chain, other major players are taking steps to interact directly with customers through, for example, their own mobile content portals. Furthermore, many global content companies are only now moving into the mobile arena. When and if these major players become actively engaged, the value chain will shift to accommodate them. Consolidation, new strategic agreements, alliances and partnerships as well as both vertical and horizontal consolidation are inevitable and underway. For instance, in the United States in May 2004, Verisign acquired German mobile portal Jamba!, game company MFORMA acquired MobileGame of Korea, game publisher THQ Wireless took a controlling stake in Minick of Switzerland, and American Greetings Interactive acquired Midiringtones.²⁴

The mobile content industry is still in its formative stages, and its value chain and business models are varied, unsettled and often complex. Moreover, the value chain differs for different kinds of content; thus, the players in the value chain for a monophonic music ringtone will differ from those for a multiplayer mobile game, which in turn will be distinct from that of a video or premium sports offering. A simple music ringtone would not require the payment of royalties. Multiplayer games require close co-ordination with device manufacturers, developers and publishers including various operating platforms and development environments. And, licensing broadcast or sports content involves premium rates and negotiation for the rights to provide the content on the mobile platform. In addition, an array of supporting players exist for mobile content, including DRM, billing, marketing and distribution functions. The role these functions play can vary depending upon the particular capabilities involved in the service delivery. Further, each actor in the chain must recoup its costs from the revenues derived from mobile content. Consequently, the revenue chain can vary considerably based on any number or combination of these factors. Despite these extensive variables, however, certain basic elements are common to the value chain for most mobile content.

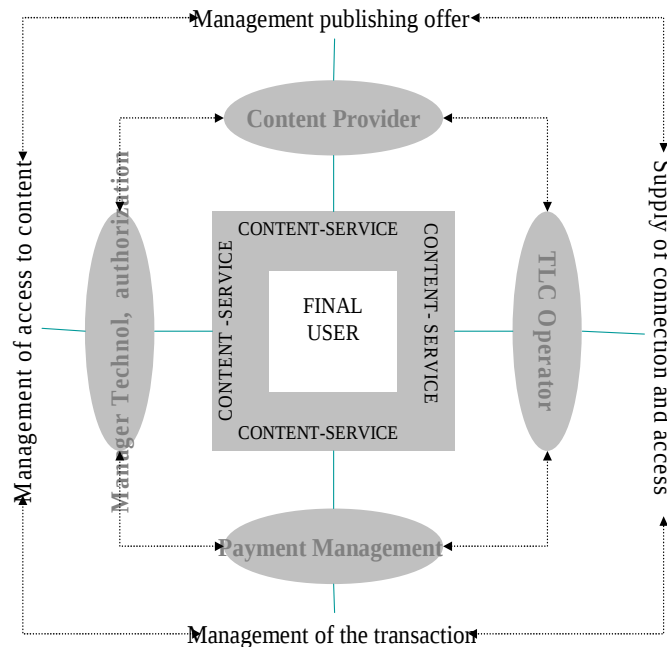
Figure 2 depicts the *basic* elements in the mobile content value chain. Content is created by an artist or developer. Generally, a publisher, studio, broadcaster or the like will work with the artist or developer to publish and market the content. This may be accomplished through a mobile content supplier or aggregator or through a direct relationship with a mobile operator portal. Careful co-ordination is required between developers and device manufacturers and between the mobile operator and the device manufacturer. Delivery to the end user is over the mobile network of the customer’s carrier to the device designed to work with the network and content offerings of the mobile operator. Figure 2 makes clear the central role played by the mobile operator in the delivery of content to the end user. It also illustrates that alternative channels for content delivery have developed and others are emerging. While this diagram shows the basic elements of the value chain, as previously mentioned there are many other players involved in successful deployment of digital content that are not included in this description. As an example, billing may or may not be handled by the mobile operator. In addition, IP rights must be obtained, managed and protected.

Figure 2. Basic mobile content value chain - Changing business relationships

Source: OECD.

In addition to the basic mobile content value chain activities illustrated in Figure 2, numerous other activities are undertaken in bringing mobile content to the user. These mirror the activities for provision of digital content in any online environment and include (1) rights/acquisition and management, (2) content protection, (3) content production, (4) sale of advertising space, (5) packaging and distribution of content, (6) marketing, (7) management of emerging publishing services, (8) profiling the end user, (9) billing management, (10) payment management, (11) customer relationship management, (12) security and control, (13) access management, as well as other activities.²⁵

These functions are summarised in Figure 3²⁶:

Figure 3. Basic activities in the online digital content value chain

Source: Weller, Dennis (Verizon), Evolution of the Value Chain: Adaptation for Digital Content Delivery in a Broadband World, presentation to the OECD WPIE Broadband Content Workshop (June 2004).

Customer access to mobile content is evolving. High-value content requires that customers have access to significant bandwidth. Mobile operators worldwide have been upgrading their voice networks to increase wireless bandwidth. With the introduction of 3G services, wireless bandwidth is sufficient to support the wide variety of content currently available in the online environment. Because transmission and delivery of content is crucial to successful mobile content offerings, mobile operators are directly involved with much of the mobile content. In addition, the mobile operators' intense need to recoup the costs of deploying 3G networks, including the costs for 3G licenses, the declining revenue from voice service due to saturation, and the recent economic climate of the telecommunications industry all place significant pressure on mobile operators to develop revenue streams from content services, an endeavour which requires them to move beyond their traditional areas of expertise.²⁷

Currently, the mobile operator occupies a central position in the value chain for mobile content because of the direct, ongoing relationship to the customer. In fact, most users obtain content on mobile devices from their mobile operator through the operators' branded mobile portal that provides content from providers with whom the mobile operator has an established relationship. A large advantage to obtaining content through a mobile operator portal is that the billing and marketing is already in place. Users can find and access content on their operator's portal easily and have a trusted and established billing arrangement in place. For these reasons, as shown in Figure 2, today, the most common – but not the only – content delivery model for mobile content is through mobile operators' and Mobile Virtual Network Operators' (MVNOs') mobile content portals. Mobile operators are actively seeking to solidify their portal role. Relatively successful examples include Vodafone live! and DoCoMo's iMode.

One area that will also be interesting to watch is developments by the phone operators on content access. Some mobile operators offer content in what is known as a “walled garden.” Users can only access content on a mobile operator’s portal. The selection and placement of links is controlled by the mobile operator.²⁸ Typically, the operator receives a portion of the revenue from the content providers that are included on the portal. In contrast, open or non-restricted access allows a user to obtain content from any provider offering mobile content. This content can be accessed through the mobile operator portal, through a link to the third-party content provider, or through a Web browser on the mobile handset. A third variation, adopted by NTT DoCoMo when it launched its iMode portal is a “semi-walled garden.” Users can access both the official sites of the mobile operator portal, as well as selected other content venues. Users often have easier access to the content on the operators’ portal, but will likely demand access to content beyond that selected by the mobile operator. In general, an open access model is favoured by customers.

Revenue models for mobile content vary widely and the industry continues to experiment with different formulations. Users typically pay data fees to use the network as well as a separate fee for access to or purchase of the content. Data fees historically have been based on usage, but some carriers are moving to flat rate pricing for data. Content can be purchased on a one-time fee or download basis, with the user paying a set fee to acquire the right to download and use the content. Ringtones, screensavers, music and certain types of games are typically purchased on a one-time fee basis. Such content offerings are usually under EUR 5, often significantly less. Alternatively, content may be provided on a subscription basis. With a subscription approach, a user has access to content for a set fee, and does not pay for each new use of the content included in the subscription. Subscriptions may be for a set period, such as a week, or may be recurring, as in a monthly fee. Some providers are experimenting with mixed fee and subscription revenue models. Higher value and premium content are usually charged on a subscription basis. For a mobile offering to succeed, the revenue model must fit the end user’s perception of the services’ value and the billing and payment system must be able to support a mix of revenue streams and payment options.²⁹ As the value chains for mobile content emerge and mature, revenue models will shake out and stabilise.

Technologies to enable the diffusion of mobile content

Successful proliferation of *mobile* content requires co-ordinated development of networks, handsets, business and operational systems, and content. One prominent and successful example is NTT DoCoMo’s launch of iMode (See Box 2).

Wireless operators are continually expanding the capabilities and bandwidth of their networks. Greater bandwidth enables larger, more sophisticated files to traverse the network in an acceptable timeframe for the particular content application. Bandwidth also affects the latency – the operational delay – of the interaction between end user and the content provider. The migration from 2G to 3G has been essential to the rise of content services, which generally require significant bandwidth. To date, most content offerings have been for 2.5G networks, and 2004 has seen an increasing number of launches of 3G offerings. The second section summarises the status of network deployment in OECD countries.

In addition to network capabilities, mobile devices and handsets must be developed that can showcase the content. The handset’s physical features as well as the operating system and software tools necessary to run content applications must all work together to ensure a positive user experience. Examples of key physical characteristics include screen size, colour and resolution, the key pad or other input device, and battery size and duration. Handsets must also include wireless Internet access, and Bluetooth or other wireless capabilities to work with certain content offerings. Additionally, the handset operating system must allow programmers to write applications to utilise these features and enable broader and more sophisticated programs, for instance, three dimensional effects or GPS location data that complies with

national privacy requirements. Handset development therefore also acts as predicate to development and delivery of digital content in a mobile environment. The state of play of handsets is examined in the section on Handsets below.

Box 2. Lessons from NTT DoCoMo's iMode

In February 1999, Japan's NTT DoCoMo launched its highly successful mobile content portal, iMode. Today, iMode remains an industry benchmark. iMode's success is largely attributed to the very strong co-ordinating role played by NTT DoCoMo in all aspects of the service launch. This control has led some to conclude that NTT DoCoMo "essentially had an industrial policy role" as the dominant force in the development and launch of iMode.³⁰ The unique service approach and flexibility to develop relationships with key industry segments was enabled by the company's independence from NTT.

In 1992, NTT partially divested its mobile communications operations into a subsidiary that would be renamed NTT DoCoMo. Faced with declining voice revenues, DoCoMo looked to data services, and the concept of iMode was born. The iMode subscriber base grew to 60 million users in the four years after iMode's introduction in 1999, generating revenues at nearly the year-2000 voice ARPU levels. DoCoMo still accounts for the lion's share of the Japanese mobile data market, but competitors KDDI and Vodafone are steadily gaining market share.

An initial key decision was to use packet-switched technology, which provided DoCoMo with the ability to charge users for data bits rather than connection time. DoCoMo also decided to use cHTML to facilitate content producers' adaptation of Internet content to iMode. Prior to commercial introduction, NTT DoCoMo worked closely with handset manufacturers to tightly control the quality, features and capabilities of the handsets and to ensure a ready supply for the iMode service launch. These handsets were specifically designed to work with iMode offerings and included a special "i" button that provided users with instant access to the iMode portal. As part of this process, NTT DoCoMo went further to develop tools, such as a micro-browser, micropayment system, and gateway for iMode content offerings.

When it came to content, DoCoMo elected not to provide content itself. Instead, DoCoMo began the process of courting content providers to develop compelling content for the iMode mobile platform. Three different types of content sites can be accessed from iMode: official iMode sites accessed through the iMode button on the phone, independent sites reached by typing a URL and corporate intranet sites. The official iMode sites had the benefit of DoCoMo's micropayment system, but were limited to one of three pricing options at roughly EUR 1, EUR 2 or EUR 3. The content charges were kept low to increase usage and were set to be in line with monthly magazine prices. DoCoMo deducts 9% of the revenues for use of the billing services and the remaining 91% is left to content providers. This split provided a great incentive for content developers to develop content for iMode. This "semi-walled garden" approach allowed DoCoMo to select superior content for its official iMode portal.

The service launched with a business focus. Of the original 67 sites, 47% were banking and financial services and only 9 % entertainment sites. In time, ringtones, screen savers and horoscopes became particularly popular with the youth segment, and entertainment content moved to centre stage for DoCoMo. Within a year, there were substantially more unofficial sites than official sites, due in part to a large backlog in processing applications to become an official iMode site. As search engines have facilitated user navigation to unofficial sites, user access to content through iMode has increased significantly.

In its next generation of services over its 3G network, DoCoMo launched FOMA in 2001. FOMA uses full 3G capabilities such as video clips, video calling and faster downloads. Users can access iMode content over the FOMA network with new FOMA handsets.

Source: Bohlin, Erik, et al., Prospects for Third Generation Mobile Systems, An ESTO Project Report, IPTS Technical Report prepared for the European Commission Joint Research Center (2003); Andersen, Digital Content for Global Mobile Services, Final Report to the European Commission Directorate-General Information Society (2002); Kangas, Sonja, Benchmarking Literature Review, MGAIN Deliverable D6.2.1 to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (August 31, 2003) and presentation of NTT DoCoMo at the OECD Broadband Content Panel in July 2004 <http://www.oecd.org/dataoecd/58/33/32145299.pdf>.

Successful content deployment also requires that basic processes for end user identification, authorisation and payment (including micropayment) be in place. To enable an end user to download

digital content, there must be a mechanism for identifying the customer and recognising the device that is being used. Once identified, it is necessary to authorise the end user. Such authorisation is necessary to identify subscription users as well as to authenticate single-use items. Upon selection of content, users must be able to securely and easily pay for the content. These facilitating mechanisms, essential to the development of a user friendly, effective market for mobile content, are examined in the third section.

Finally, it is essential to ensure that digital content delivered to mobile devices is protected from piracy and illegal copying. Digital rights management programs and technologies must be sufficiently robust to ensure that digital content cannot be subjected to unauthorised copying or unintended uses, but must accomplish this without unduly inconveniencing the user (*e.g.*, clear and fair usage rights). Once in place, DRM can become an enabler for new business models. Many industry efforts are underway to address DRM for various types of content and acceptable DRM solutions are likely to be determined by operation of the marketplace. Supplemental government policies may pick up where industry efforts reach an impasse. Furthermore, governments can – when devising IP laws - facilitate the continued development of frameworks that strike an appropriate balance between IP protection and fair use, consumer choice and access. Such policies should be consistent with the OECD Council Recommendation’s goal of balance in this area (further issues related to DRM are discussed in the last section).

Deployment of advanced wireless networks

Until recently, mobile networks did not provide sufficient bandwidth to guarantee a good user experience with more sophisticated digital content. Quite simply, they did not have the bandwidth – which translates into speed – necessary to acquire or use content of more than a few kilobytes. OECD member countries have made substantial progress in the transition to greater bandwidth networks that can accommodate larger and more complex content distribution. The transition from analogue (1G) to digital (2G) wireless networks to packet-switched, high-speed digital networks (3G) is well underway. Current 3G deployment in OECD member countries is set forth in Table 1. Each wireless network iteration provides greater bandwidth and increased functionality for delivery of mobile content.

The importance of increased bandwidth and speed to mobile content can be seen by looking at the increased capabilities that come from greater speed. Speeds of 0-10 Kbps are appropriate for interactive messaging, telematics, forms-based applications and 50-100kb text transactions. At speeds of 10-35 Kbps, users can enjoy WAP browsing, content downloads such as graphics and Poly RT, M2Email picture messaging, email (text/no attachments) and simple downloading of games. Speeds of 70 to 200 Kbps support audio streaming, video streaming, robust multimedia messaging, audio/video clips (1-2 minutes) and wireless desktop/office applications. With greater than 200 Kbps, users can have full album MP3 downloads, video conferencing, movie downloads, high resolution picture/graphics, broadband desktop experience, real-time voice over IP and multiplayer, interactive games.³¹

2G services appeared in the 1990s and most use circuit switched technology. 2G services are widely available throughout OECD member countries. GSM (Global System for Mobile) is the most widely adopted 2G technology, deployed in Europe and in the United States.³² 2G typically features speeds of 10 to 66 kbps, and is suitable for voice, voice mail, receiving simple e-mail messages, and international roaming.

Between 2G and 3G, there are several technologies – sometimes referred to as 2.5G – that increase the bandwidth of the networks, such as GPRS (General Packet Radio Service). These interim technologies feature speeds of 66 to 128 kbps, and are suitable for voice/fax, voice mail, sending and receiving large e-mail messages, Internet browsing, navigation. GPRS operates at 20 to 40 kbps. EDGE is an evolution of GPRS that gives a nominal bit rate of 110 kbps, typically 20 kbps in use. Many 2.5G network upgrades have been rolled out in OECD member countries.

While interim upgrades have enabled the launch of a host of new applications and content, the critical bandwidth expansion is expected with 3G networks, which are optimised for data transmission. 3G networks feature speeds of 128 kbps to around 2 Mbps. These networks are suitable for voice/fax, global roaming, sending and receiving large e-mail messages, high-speed Internet navigation, videoconferencing, video transmission, TV streaming, location-based services.

Most member states have already assigned licenses for 3G services and a number of OECD member countries have launched 3G networks. In Japan, 3G networks have been operational since 2001. In Europe, 3G is being deployed as UMTS. 3G mobile systems have data rates ranging from 128 kbps to 2 mbps.³³ UMTS can be migrated to HSPDA (high speed downlink packet access) to give downstream rates of 8 to 14.4 mbps. NTT DoCoMo is expected to launch 3.5G in 2005, which will give a nominal bit rate of 11 kbps, comparable to WLAN or WiFi.³⁴ In late 2004, several wireless carriers including Vodafone, NTT DoCoMo, NEC, Siemens, Alcatel and about 20 others, formed a consortium to look beyond 3G to the next generation of broadband wireless networks with speeds up to 10 times faster than 3G. The consortium hopes to develop the so-called “Super 3G” standard by 2007.

While 2G services are widely available throughout OECD member countries, 3G services have been much slower to arrive than expected, but deployment has accelerated recently. Some carriers paid very high fees for 3G spectrum licenses, particularly in the United Kingdom and Germany, and in total in Europe operators paid more than EUR 100 billion to acquire 3G licenses. For some countries, including Japan, no spectrum license fees were charged. These high payments have caused significant financial strain for many mobile operators, perhaps contributing to the slower-than-expected roll-out of 3G. However, the need to recoup these significant investments is driving mobile operator interest in content, as such data services represent the largest revenue opportunity. This drive to recoup license payments however is claimed by some to make mobile operator revenue demand unworkable. In addition to spectrum, 3G networks are expensive to build, with many carriers migrating first to 2.5G and taking their time with 3G roll-out. Even so, 2004 saw the new 3G network announcements every month in OECD countries, and 3G is set to debut in still others.

Table 1. Status of provision of commercial 3G services in OECD countries (as of July 2004)

	Status of providing 3G services
Australia	Hutchison 3G (3 Australia) started services in April 2003. Telstra started CDMA2000 1X services in December 2002. Telstra will offer 3G in 2005 with a gradual roll-out. Vodafone Australia plans to launch services by 2005.
Austria	Mobilkom Austria followed One in September 2002 for technical launch of networks, and in April 2003 it started commercial services. Hutchison 3G (3 Austria) started services in May 2003. One plans to start services in the fourth quarter of 2004. T-Mobile launched services in December 2003.
Belgium	Mobistar and KPN Orange plan to launch services during 2004. Proximus launched services in May 2004.
Canada	Bell Mobility, Telus Mobility, Aliant Mobility and MTS Mobility started CDMA2000 1X services in 2002.
Czech Republic	Eurotel and RadioMobil (renamed T – Mobile Czech Republic in May 2003) are obliged to launch services by 1 January 2006. EuroTel began trials in February 2003.
Denmark	Hutchison 3G (3 Denmark) started services in October 2003.
Finland	TeliaSonera Finland started services in certain regions in January 2003 and pre-commercial operation in December 2003. Radiolinja planned commercial launch during 2003 and began testing services in January 2002.
France	The regulator ART announced that the obligation to launch 3G services was delayed to the end of 2004 for Orange and SFR. Orange has started services and plans to launch commercial services during 2004. In April 2004, Orange launched pre-commercial 3G services in Toulouse using W-CDMA network. Orange's commercial 3G launch is slated for availability in Autumn 2004. SFR launched services in December 2004.
Germany	T-Mobile launched services in April 2004. Vodafone Germany started services in February 2003. O2 started services in April 2004. E-Plus launched services in June 2004.
Greece	Vodafone-Panafon launched services in 2004. STET Hellas telecommunications launched services in selected markets in January 2004. COSMOTE launched services in May 2004.
Hungary	No commercial service has been launched.
Iceland	No commercial service has been launched.
Ireland	Vodafone started commercial services in June 2004. O2 started limited services in selected markets in December 2003. 3 began trials in October 2003.
Italy	Hutchison 3G Italy launched commercial services in March 2003. Vodafone launched services in February 2004. TIM started services in May 2004.
Japan	NTT DoCoMo started services in October 2001 with testing services in May 2001. Vodafone Japan (former J-Phone) started services in December 2002 after testing services in June 2002. KDDI started services using CDMA2000 1X in April 2002 and launched services using CDMA2000 1xEV-DO in November 2003.
Korea	SK Telecom started services in February 2000. LG telecom started services in May 2001. KTF started services in June 2003. While both SK Telecom and KTF have used CDMA2000 technology, they also started W-CDMA services in December 2003.
Luxembourg	Tele2 (as Tango) started service trials in May 2003. P&T Luxembourg started service trials in June 2003.
Mexico	Grupo Iusacell started services using CDMA2000 1X in January 2003. Telefonica Moviles launched EDGE in July 2004.
Netherlands	KPN Mobile began trials in October 2003 and launched services in July 2004. Vodafone Netherlands launched commercial UMTS services in June 2004.
New Zealand	Telecom New Zealand started CDMA2000 1X services in July 2002. Vodafone New Zealand plans to deploy 3G networks.
Norway	Telenor and NetCom are testing services. Hutchison plans to start services, although the schedule has not been confirmed.
Poland	Sferia started CDMA2000 1X services in November 2002. The launch date of other operators has been postponed to 2005.
Portugal	Vodafone Portugal started limited services in selected markets in January 2004. OniWay implemented testing services in May 2001, but it has repealed its 3G license. TMN launched services in April 2004.
Slovak Republic	No commercial service has been launched.
Spain	All 3G operators set an UMTS system for technical trials before June 2002. Telefonica Moviles launched services in February 2004. Vodafone launched commercial services in May 2004.
Sweden	Hutchison 3G (3 Sweden) started services in May 2003. Vodafone launched service in February 2004. Tele2 launched services in June 2004.
Switzerland	Swisscom announced plans to start 3G services for business customers in the first half of 2004. 3G services of other operators are expected to start during 2004.
Turkey	No commercial service has been launched.
United Kingdom	Hutchison 3G (3 UK) started services in March 2003. T-Mobile started data-only 3G services in February 2004. Orange started trial services in February 2004 and launched commercial services in July 2004. Vodafone launched services in February 2004.
US	Several operators announced the provision of nationwide 3G services. These include Sprint, which started CDMA2000 1X services in January 2002 and is upgrading to CDMA2000 1xEV-DO services. Cingular/AT&T Wireless launched UMTS services in selected cities in July 2004 and plans to expand to additional cities before the end of 2004, and offers service in six markets and intends to launch additional markets in 2005. As of March 2005, Verizon Wireless offers its EV-DO service to 75 million people in 32 US cities. Verizon Wireless expects this will expand to include more than 150 million people by the end of 2005.

Source: Updated from OECD, Developments of Third-Generation Mobile Services in the OECD, DSTI/ICCP/TISP(2003)10/FINAL, www.oecd.org/sti/telecom.

Even where 3G networks are in place, however, subscriber uptake has not been rapid except in Japan and Korea where uptake has been good. Generally, this gradual growth in subscribers for 3G services is attributed to three factors. First, problems with handset availability have delayed consumer adoption. In 2004, as discussed below, good 3G handsets are becoming more readily available and many of the technical problems with the initial models have been worked through. A second factor affecting uptake rates has been the fact that 3G networks are limited to mainly urban areas and may not be fully backward compatible with older standards, thus limiting a user's geographic use of the phones. Over time, as 3G networks expand, these compatibility and reach issues will naturally dissipate. In the short term, however, user adoption rates will be affected by this roaming concern.

Finally, given the difficult economic situation of the wireless industry, many operators have focused on increasing the return on their investment in 2.5G GPRS networks.³⁵ There is even some concern that operators' 2.5G offerings will cannibalise the 3G market because users can obtain many of the features they desire over 2.5G networks and as yet there is no clearly compelling 3G application driving consumer demand.³⁶ The most common argument for 3G has been that it will jump-start the mobile content industry because it will enable delivery of video content. Once this delivery capability is in place, content developers will be able to produce content knowing it can be delivered to customers. This mutually reinforcing relationship – or virtuous circle – can spur further growth.

As network operators deploy more 3G, the pressure increases on remaining carriers to launch their 3G networks as soon as possible³⁷ so as not to miss a profitable consumer market window and quickly recoup their investment in 3G licenses and network build-out. Consequently, there have been many launches of 3G networks in the first half of 2004, which are expected to fuel even faster launches throughout Europe and the United States through the end of the year. According to one study, there are 57 3G UMTS networks in commercial service in 21 countries and many other UMTS networks in pre-commercial or trial phase with still other networks in planning/deployment stages.³⁸ Considering the quite nascent state of 3G networks, the GPRS networks' capabilities are still critical with respect to content services in the short and medium terms.³⁹

Handsets designed for mobile content

The availability of handsets that can take full advantage of the content developed for wireless networks is often a gating item for success. Unco-ordinated network and handset launches lead to disappointed users who will be difficult for providers to re-engage once these initial problems are resolved, particularly as content services have usually not been longer-term contracts. The success of DoCoMo's iMode service has been attributed to the careful co-ordination by DoCoMo, with capable handsets and advanced content services available upon the initial deployment of iMode.⁴⁰ Experience demonstrates that successful coordination of numerous factors is essential to realising the market potential for a particular handset, as the launch of a poorly designed or flawed device will not meet user expectations and the full market potential for the device will not be achieved.⁴¹ For example, Nokia's nGage handset, designed specifically with gamers in mind, missed its mark initially due to a design issues that made the device difficult to use for the gamers who were its target market.

Increasingly, mobile handsets have gained computing power and functionality. According to Deloitte, the growing availability of colour mobile phones with polyphonic sound, along with the improved processing power accompanying their introduction, is increasing the opportunity to sell content to phone owners.⁴² Phones today push the limits of multimedia functionality.⁴³ Mobile devices perform multiple functions for the consumer, including voice and data (SMS, MMS and email) communications, photographs, music and games. As phones gain functionality, it is easier for users to obtain, use and generate mobile content. For instance, camera phones allow a user to take and send digital photos to other users accompanied by text, voice or other graphics. Location identification features, using GPS, enable

content developers to identify and use the exact location of the user in their programs, although this can only be developed within the limits of national privacy laws. This can be particularly appealing to game developers interested in creating multiplayer games, but can also be used for other content applications. The ability to browse mobile content sites enables a user to download various kinds of content, including music ringtones and graphics, to personalize the handset. In turn, this content increasingly may be passed on to others for preview or purchase where necessary. Handset design, which historically had been driven by technology, is now also being driven by usability. Multifunctional devices focus not only on the ear, but also on the eye; as imaging becomes more important so does screen size.

Mobile operators are critical in the handset market. Operators are a primary point of sale for phones, often providing significant discounts to entice users to purchase advanced services. In Europe, Forrester estimates that operators subsidise phones on average EUR 150, with larger subsidies for high-end models.⁴⁴ Similar information on handset subsidies is not available for other markets, but overall operators balance their consumer pricing of handsets and services depending on market circumstances. Operators cannot afford to have failed user expectations for 3G offerings, and as a result, they expect that phones will perform well for the various data functions being offered over their 3G networks.

Operators demand technical handset improvements. Because 3G is marketed to consumers on the basis of enhanced offerings and service quality, 3G phones must perform at a level equal to or better than existing 2.5G phones.⁴⁵ Mobile operators are looking for significant features in 3G phones. These include reliable battery supply for use with colour video applications, which consume considerable battery power. In addition, larger, high-resolution colour screens are desirable for many of the more visual applications anticipated for 3G networks. Backlighting, which draws down battery power, is also necessary to ensure that screens remain readable in outdoor venues with lots of sun.⁴⁶ Other features sought by mobile operators include: mega pixel and video cameras, video streaming clients, video telephony, MP3 players and phones customized to the operator's portal.⁴⁷ Weight and size are also important attributes to consumers.

Smartphones, devices that while providing voice telephony, also run an operating system allowing developers to code to the machine level and control every facet of the device, are proliferating. Typically, a smartphone includes PDA features such as an address book, date book and other PDA applications. With processors of 100MHz and several megabytes of RAM, most smartphones are equivalent in computer processing power to the personal computers of 1993.⁴⁸ Thus, while smartphones provide greatly expanded handset capability, they cannot rival the power and performance of PCs and content developed for these devices must be adapted accordingly.

Backwards compatibility and handover is also important to operators and users, who require phones that successfully operate across networks using other older standards. 3G networks will roll out sporadically and users accustomed to roaming across systems as they travel will be unlikely to give up that capability. Phones will need to be able to operate on both the newer 3G and older GSM systems until 3G networks are more pervasively deployed. According to Forrester Research, "the seamless handover between 2G and 3G networks is essential to operators because 3G networks currently lack complete geographic coverage," failed handoffs can result in dropped calls or data interruptions.⁴⁹ Typically, a carrier will launch 3G services along with a choice of devices. For example, when AT&T launched 3G service in July 2004, it did so with two new handsets, the Motorola A845 and the Nokia 6641, both backwards compatible with prior generation GSM and GPRS networks. However, the handsets were not compatible with EDGE, even though AT&T had recently finished a nationwide launch of EDGE, and the AT&T data card is UMTS only.⁵⁰

Recent examples of new handsets targeting mobile content include the Nokia nGage and Sony's PSP, specifically aimed at the mobile game market. Camera phones and Internet enabled phones have spurred

the handset market substantially recently. Indeed, DoCoMo ascribed a significant addition of 1 million customers in little over a month to strong demand for its 3G FOMA F900iC handset.⁵¹ Nokia has also introduced the 7700 media device that has a full browser, 65 000 colour touch screen for Internet and video content viewing, music and video streaming capability, VGA camera, FM radio, MMS and content creation tools. The successor model will have the option of a TV receiver and tuner, which will allow customers to receive over-the-air broadcasts.

Mid-2004, T-Mobile introduced five new mobile phones that are also digital music players. The handsets use “Ear Phones” technology to store from 10 to 40 songs, or up to 100 with a memory card. Unlike Apple’s iTunes, Ear Phones does not require a computer to download music.⁵² Apple and Motorola have struck a deal to offer Apple’s iTunes services on Motorola phones starting in 2005. The T-Mobile phones are from Nokia, Sony and Motorola and are designed to entice customers to upgrade their phones. Orange, Vodafone and MMO2 have also introduced similar deals. Not giving up totally on physical media, Universal will launch a new Pocket CD that is less than half the size of conventional CDs. Each Pocket CD will carry three tracks and include codes for downloading ringtones.⁵³ Already, audio compression technology allows consumers to store over 1GB of music into one phone.

Disparate platforms spur standards efforts. While moving forward with digital music, T-Mobile is also urging competing mobile operators, handset manufacturers and record companies to adopt a standard platform for mobile music market. This effort is supported by Universal Music, Sony Music, Warner Music and all major mobile handset manufacturers. According to T-mobile, rival proprietary platforms will stunt the growth of the industry.⁵⁴

A lack of product and technological standardization is often a common symptom for a new industry, and can pose problems in successfully addressing a larger market. Today, any company acting in the mobile content field must take into account several different mobile device manufacturers that have yet to standardize their devices. The devices are technically different in areas such as user interfaces, screen size and resolution. A service application provider therefore must adjust their applications for each design accordingly.⁵⁵ Handset manufacturers, notably Nokia, have worked with industry to develop and support platforms for creation of mobile-specific content. Nokia seems to believe that mobile operators would be more successful in the long run if they work within the value Web to focus less on economic control and more on strategic networks.⁵⁶ For example, forum.Nokia (www.forum.Nokia.com) provides Web-based access to development platforms and support to facilitate development of content that eventually will lead to consumer demand for new handsets. Despite such efforts, content developers have few standards to design to. Screen sizes, varying sound solutions and different operating systems make it difficult for content developers to create content that will be widely adopted across increasingly broad range of devices. The requirement to design to multiple platforms increases the cost of content development and contributes to the fragmented supply structure for mobile content.⁵⁷ The operating system on the user’s mobile device decides what kind of content and services can be executed and played. The multiplicity of platform standards is especially affecting the companies that want to develop and provide mobile content.

There are several different platforms on mobile devices with a variety of client-side execution environments such as Sun’s Java 2 Micro Edition (J2ME) and Qualcomm’s BREW, together with operating systems such as Palm OS, Symbian OS, Microsoft Smartphone and PocketPC. For mobile games, competing game engines include Synergenix Mophun and In-Fusio’s ExEn.⁵⁸ Another battle is brewing over the preferred mobile Internet browser. Pitting Norwegian Opera Software, selected by Nokia and Sony Ericsson, against Microsoft Mobile Internet Explorer, pre-installed on Orange Smartphones.⁵⁹

Content development technologies. Several programming developments have been made with mobile games in mind, including J2ME, BREW, Murphun. Java 2 Micro Edition (J2ME) is a form of the Java language that is optimised for small devices such as mobile phones and PDAs. Many phone manufacturers

have made a strong commitment to J2ME, and as a result a vast number of phones already on the market are Java-enabled.⁶⁰ In North America, Sprint and Nextel offer J2ME. Qualcomm's Binary Runtime Environment for Wireless (BREW) has a significant presence in North America. A standard called GVM is supported by some Korean carriers.⁶¹ Another language for coding mobile games is C++, which will run on Series 60 Platform devices. Series 60 is a multi-vendor standard for one-handed smartphones.⁶²

Mobile operating systems. Varying standards and multiple platforms also create major challenges for mobile operating system developers.⁶³ These competing standards risk the emerging industry's economic status by imposing additional costs for customization.⁶⁴ It could be helpful to the growth of the industry to agree on common development principles, such as graphics, sound and game device standards.⁶⁵ Table 2 highlights various operating systems used on mobile devices.

Table 2. Major mobile device operating systems

Operating System	Features
Symbian OS:	Symbian OS is developed and licensed by Symbian which is an independent company owned by Nokia, Matsushita, Motorola, Psion, Siemens, and Sony Ericsson. Nokia, Sony Ericsson and Siemens all have Symbian phones on the markets. ⁶⁶ The Nokia N-Gage device, which is a series 60 device running Symbian OS, supports a copy-protected proprietary memory card format. This device was specifically designed for games.
Microsoft Mobile:	Microsoft Windows Mobile competes directly against Symbian in the operating system space. Microsoft offers several scaled-down Windows versions for embedding mobile devices. ⁶⁷
Palm OS:	Palm OS is a popular operating system for PDAs, including those by Palm, Sony and Qualcomm. The Palm OS has a large number of applications and games for mobile usage. ⁶⁸
Linux:	Linux operating systems were originally for PCs, but are easily adapted to mobile devices. Motorola introduced the first Linux phone in 2003.
Other Proprietary Platforms:	Nokia and other handset providers have their own proprietary operating systems for their handsets. ⁶⁹

The number of mobile operators, different mobile device specifications and variety of mobile platforms contribute to a fragmented supply structure for mobile content. Standardization initiatives such as Series 60 and OMA are attempting to address this issue, but at present the fragmentation persists. "Efforts made by trade organizations and standardization bodies to reduce the problems with lack of standardization are a force that can play an important role for the improvement of technology development and the recreation of a lesser platform segmentation in the market."⁷⁰ For the consumer, these developments will result in "increased content visibility and network speed, new device functionality, improved device performance and ease of use."⁷¹

Handset manufacturers and mobile operators are locked in a battle over the degree of influence mobile operators' exercise over phone functions. Mobile operators want more influence and handset manufacturers do not want to design to operator demands. Operators are attempting to assert more control, following on NTT DoCoMo's model, over handset design. Mobile operators are also forming alliances to exercise influence in the handset market, both over the technical specification and in purchasing power. In October 2003, Amena (Spain), mm02 (Germany, United Kingdom, Ireland), ONE (Austria), Pannon GSM (Hungary), SONOFON (Denmark), sunrise (Switzerland), Telenor Mobile (Norway), and Wind (Italy) formed the Starmap Mobile Alliance.⁷² In March 2004, Telefonica Moviles, Orange, T-Mobile, Telecom Italia Mobile (TIM) formed the joint venture Freemove,⁷³ which jointly purchased 6 million handsets from Nokia at a 10% discount.⁷⁴ In June 2004, the Open Mobile Terminal Platform (OMTP) was started by eight carriers: NTT DoCoMo, mm02, Orange, SMART Communications, TIM, Telefonica Moviles, T-Mobile

and Vodafone. OMTP is aimed at working with handset manufacturers to adopt common phone standards and a unified user interface.⁷⁵

At the same time, handset manufacturers are also working together to enhance device functionality and standardisation. Vertical integration among device manufacturers such as SonyEricsson, Nokia and Motorola is seen in their expansion into the operating system markets with Symbian. Device manufacturers – notably Nokia – also seem to be willing to increase their economic control in other parts of the value web. Several device manufacturers are also active as service providers, portals and aggregators.⁷⁶ Industry frustration with the multiplicity of platforms is spurring collaboration, which if effective, should simplify the development process. Government could act to facilitate and speed this process, but should not displace industry efforts. Of course, these processes should seek to ensure that standardization does not inhibit innovation.

In the final analysis, content also depends on users purchasing the new handsets. As the complexity and functionality of devices increases, so does the price. Historically, mobile operators have discounted phones to encourage consumers to buy new services. PDAs and smartphone penetration is still small, but varies by region. For instance, phones are ubiquitous in Japan and Korea and have strong penetration in Europe. In the United States, mobile phones are less embedded but there is a greater penetration of PDAs. Smartphones are relatively new. “There are also barriers to the penetration of devices due to high device prices and the existence of consumer-behavioural aspects regarding the reluctance to start using a new kind of device because of the perceived likelihood of obsolescence due to rapid device introduction.”⁷⁷

Marketing, distribution and billing technology for mobile content

Beyond handset and network technology, successful mobile content development depends on the appropriate tools for marketing, distribution and billing end users. Effectively deployed payment services (including micropayments), device security and digital rights management solutions create additional ways to generate revenues and ensure that both consumers and content developers trust the mobile channel.⁷⁸ A study by New Media Zero concludes that three elements are crucial to mobile content success: content visibility, payment and delivery.⁷⁹ Without easy, smooth mechanisms for these functions, it is unlikely that a mobile content provider can successfully reach a sufficient market to obtain an acceptable return on its investment.

Billing and payment tools: Easy to use, comprehensible payment mechanisms must be in place for mobile content. The major issue for small payments is that credit card companies have minimum transaction charges even for micropayments. Alternative micro payment models have not yet attained wide coverage, although payments via mobile phone billing or prepaid phone cards are appearing as a viable option in some countries despite outstanding issues with payments regulation, and NTT DoCoMo’s micropayment system has proved very successful in the rapid spread of iMode in Japan. Further, since the youth market is a common target market for mobile content and many young people do not have credit cards, the ability to have payments placed on the mobile phone bill or through deductions to pre-paid cards makes it easier for these users to make content purchases.⁸⁰ Content providers that do not have relationships with mobile operators for billing purposes may prefer to have content paid by credit card. One company, Bango, has developed technology that dynamically selects the payment option depending on where the user is connecting and from which network. In this way, the user has the option of including charges on the phone bill through operator billing systems such as Vodafone m-pay or Premium SMS. Alternatively, the user has the option to pay by credit card or by premium rate on a prepaid card or phone card.⁸¹ Bango works with many mobile operators including Vodafone, Orange, T-Mobile, Telefonica and O2 as well as with numerous content providers. In Japan, the Nomura Research Institute estimates that the market for mobile platforms that support electronic settlements and certifications over mobile devices will

double to JPY 52.2 billion in 2005, from JPY 29.8 billion in 2004, and further predicts that the market will expand by 8 times to JPY 240.1 billion in 2009.

Cross-national payment systems present a particular challenge. There are several industry forums exploring interoperable mobile payment platforms. In February 2003, Orange, Telefonica Moviles, T-Mobile and Vodafone formed a new mobile payment services association, now called Simpay. Several other mobile operators have expressed interest in joining and the founders have formally invited other operators to join. Simpay's initial product – mobile payments under EUR 10 – is scheduled for technical launch by the end of 2004 and commercial availability in 2005. Ultimately, the success of any payment system will depend upon defining a revenue model that is attractive for all parties in what may be a long chain. In the online context, for example, Paybox, a mobile payment instrument that allows Internet purchases over the Internet, has not been overly successful and actually discontinued functioning in Germany, United Kingdom and Sweden. For a review of work on online payment systems for electronic commerce including micropayment issues, see OECD work on Online payment systems for e-commerce⁸².

Mobile content portals: By far the most common method used to access mobile content by subscribers is through the content portals of the mobile operators. Since Japan's launch of iMode other operators have also rolled out content portals for their customers, with major mobile providers developing and maintaining extensive portals for access to mobile content. Table 3 sets out some major mobile operator content portals with samples of the content offerings available to their users.

Table 3. Sample mobile operator content portal offerings

Mobile Operator Content Portal	Sample Offerings
3	Music videos (streamed and downloaded), person-to-person video calling, sports highlights, ringtones, screen savers, news and sports
AT&T mMode	Ringtones, games, chat, "What's nearby?" location services, messaging and mail, screensavers, news and information, music downloads, music reviews, Web access and auctions
Bell Mobility	Email, messaging, games, ringtones, Web browser
Cingular	Ringtones, ringtunes, music reviews, downloadable music, screensavers, games
Microcell Fido	Email, messaging, ringtones, weather and information, games
Mobitel Planet	Downloadable games and alerts, ringtones, music, dating service
Nextel	Music reviews, music download, news and information
NTT DoCoMo iMode	Ringtones, ringtunes, screen savers, games, horoscopes, music downloads, sports, news and information, database services, transaction services
O2	Video trials, movable video service, ringtones, news and information, music downloads, music news
Orange World	Music downloads, ringtones, ringtunes, screen savers, news and information, games
Sprint PCS Vision	Email, instant messaging, game lobby, ringtones, ringtunes, Web access, streamed TV, music downloads, music videos, sports highlights
Rogers Wireless	Email, messaging, Web browser, games, ringtones, graphics
TIM	Video broadcast trials, sports broadcasts, music, ringtones, news and information, screensavers
Telefonica Moviles	Games, ringtones, Music Wizard, screensavers, news and information
TeliaSonera Sonera Plaza	Ringtones, games, news, hockey league, women's channel, maps, weather, auctions, Yellow Pages, Symbian applications, trial music and video offerings
T-Mobile T-Zone	Music downloads, ringtones, ringbacks, mobile lottery, screen savers, news, games
Telus Mobility	Email, messaging, Web browser, games, wireless shopping, ringtones, screensavers, <i>Info on Demand</i>
Verizon GetItNow	Music, screensavers, ringtones, ringbacks, news and information, games
Vodafone Live!	Music, ringtones, ringtunes, video clips, Pictones, location services, screen savers, games, sports highlights, video trials, gambling, adult entertainment.

Note: Availability of offerings may vary by jurisdiction.

In addition to the mobile operator portals, other content providers have begun to offer services directly to consumers, challenging the "walled-garden" approaches to the provision of content. Monsternob is a direct to consumer branded portal and Buogiorno and iTouch are content aggregator portals. These portals tend to operate on low margins, and are testing new business models. For example, iTouch, which provides ringtones, games and images, recently revised its business model to distribute its

content directly to consumers. Previously, iTouch acted as a “white label” supplier of mobile content to mobile operators and media companies.⁸³ In addition, major media companies, including record labels and motion picture studios are offering content directly to consumers, or offering services as Mobile Virtual Network Operators (MVNOs, service providers), as are game publishers such as THQ Wireless. However, as detailed in OECD’s report on 3G services⁸⁴, MVNOs have not been authorised in every jurisdiction and regulation for MVNOs varies widely.

Mobile top level domain: One initiative underway to enhance user access to content specifically designed for mobile handsets is the application to ICANN to establish a mobile Top Level Domain (e.g. “.mobi”). This domain would specifically cater to the needs of mobile users and assist them in finding content suitable for use on mobile devices.⁸⁵ Companies offering content for mobile use could augment their web offerings to include a site with a specific mobile TLD to facilitate mobile access to their products and services.

Other issues: When looking to create applications that will have a broad appeal, content developers also face other hurdles. As content for mobile phones becomes more detailed and complex, developing content that will attract users from different geographical regions is a challenge for many content providers. Key differences between the Asian, North American and European markets can require costly local customisation that extends beyond simple language translation. Often the look and feel of content must change to achieve market success from one region to another.

In the games environment, co-ordination of multiplayer activity across various networks and devices presents a challenge. Game play is often dependent on the slimmest of time margins, so ensuring that a player on one network has the same experience as his opponent across the country or around the globe on a different network is crucial to a successful user experience.

Data transfer pricing

In addition to pricing for the content itself, mobile users are often charged for data transfer to download or stream the content to their phones. Typical mobile service pricing schemes, with per-minute or per kilobyte charges, are unsuitable to broad adoption of content. End users have typically not been willing to use most of their mobile minutes for file downloads. Pricing for mobile networks is also a concern to the music industry. Metered access can deter users from obtaining rich content. As broader 3G competition emerges, however, flat rate pricing may become the norm.⁸⁶ Indeed, DoCoMo is moving to flat rate data pricing. In Verizon’s February 2005 roll out of its V CAST service, the standard pricing offer gives users access to content for a flat monthly fee of USD 15. This contrasts with the pricing for its Get It Now! portal, in which usage charges applied while content was being downloaded. With a flat rate plan, users will tend to focus primarily on the cost for the content when making a purchase.

Network operators’ pricing for data services has tended to be usage-based, as opposed to flat rated.⁸⁷ While this has been attributed to the mobile operators’ need to increase the average revenue per users (ARPU), rates for content offered by mobile operators must also take into account, and recover, their costs, including high fixed costs and, where relevant, the costs of acquiring the content. There is also evidence that pricing models are in flux as operators and other members of the value chain experiment with establishing rates that will both cover costs, which in the case of premium content can be quite expensive, and attract customers. For instance, a survey by Soundpartners in February 2003 showed that in the United Kingdom, Vodafone’s Live! portal charged consumers only a premium fee for content, but not additional data transfer fees. Vodafone changed its billing structure as of July 2003 to include both a premium fee for the game plus additional charges for data transfer. In contrast, Germany’s Jamba! mobile portal offers content such as ringtones, screensavers, mobile games and video clips for a flat subscription fee.⁸⁸ NTT DoCoMo capped rates for content on its official iMode portal to a maximum of EUR 3 in order to drive

subscriber usage by attracting them with affordable content. In addition to content charges, iMode customers also pay data transfer charges, so capping charges for content helps contain the overall cost to users. From the end-user perspective, what matters is the total price, as well as predictability of pricing. The surprise of a high phone bill due to unanticipated data charges places a significant chill on future service use, to the detriment of all providers in the content chain.

Piracy, IP rights, and digital rights management

The ninth point in the OECD Council Recommendation on Broadband Development provides that “Regulatory frameworks that balance the interests of suppliers and users, in areas such as the protection of intellectual property rights, and digital rights management without disadvantaging innovative e-business models.” A key issue facing digital content is protection from piracy and unauthorized use, and the balance between intellectual property protection and encouraging new ways of using digital content. The struggle to protect digital content in the broader realm of content is mirrored for mobile content, and the balance between protecting owners and allowing use is a major issue in mobiles. For instance, users may be reluctant to accept content use limitations that did not exist previously. When rights are limited, users could expect pricing to be adjusted accordingly. In the case of mobile content, the issues vary somewhat from other forms of online content for several reasons. First, users are accustomed to paying for content on mobile phones. The mentality that content should be free that developed for the Internet is not as prevalent with respect to mobile content. Second, until recently, much of the mobile content that was available involved simple, less sophisticated content, such as screensavers and ringtones, which both have lower user pricing and are less expensive to offer. For such content, the price points are more likely within a range that users will tolerate without resorting to piracy. As it becomes increasingly common to offer more sophisticated premium content to mobile users – such as mobile TV – which involves much higher acquisition costs, rights protection take on increasing importance. Even so, there are unique challenges to protect rights in an IP mobile network setting. Unlike WAP protocol, which allows a mobile operator to send content within the wireless network and control the use of that content, this is not possible in the IP environment of most 3G networks.

Piracy

As with online digital music offerings, piracy is a chief concern for music labels, which are wary of fostering a music free-for-all in the mobile environment (see OECD, Digital Broadband Content: Music, DSTI/ICCP/IE(2004)12/FINAL for a case study on the music sector).⁸⁹ However, many of the issues raised in an online setting have not yet arisen for mobile music content. There may be several explanations for this. First, users are generally more accustomed to paying for content downloaded to their phones. Second, to date much of the mobile content available has not been high-value content, such as music or video. This is due in part to the constraints of previous handsets and networks, both of which are now gaining the capability to handle higher value content. Third, data transfer costs for use of the network to download content in a mobile environment are still high, so users tend to minimize the amount of data transferred. Fourth, consumers may be more sensitized to copying concerns as a result of consumer education efforts in the online environment. As some or all of these factors change due to increased bandwidth, the increasingly IP nature of the networks, and more sophisticated handsets that can download and upload content, many of the concerns about piracy of digital content on the Internet will emerge for mobile content.⁹⁰

Nevertheless, there is some concern that ringtones are a piracy target as numerous Web Sites offer ringtones without the necessary licenses to do so. While some countries have agreements about the collection of royalties, often via protected national collecting societies, others have none in place.⁹¹ Government and international policies may be able to facilitate co-ordination of such efforts. A great deal of review and development of such policies is currently underway.

To stem piracy in online music, the industry has reacted with a dual approach. First, the industry has moved to stop unauthorized copying by filing lawsuits against illegal downloaders and raiding pirate CD factories. Second, industry is pursuing efforts to build viable legitimate online offerings.⁹² However, the cost can be high to develop such offerings and the investment risky. Spam, viruses and other variables that affect safe Internet access may also slow the development of online content. Further co-ordinated, cross-border efforts to protect intellectual property may be necessary to develop a secure and trusted mobile content environment.

Digital rights management in the mobile environment

Digital Rights Management (DRM) technologies are designed to provide persistent content protection and usage management for valuable digital content. Mobile platforms raise unique challenges for DRM, because the size and memory of most handsets present a constraint not present for computers. Several DRM technologies are in place or under development specifically for the mobile content environment. It is crucial to the spread of mobile content that effective digital rights management mechanisms are in place soon. Many music publishers have been waiting for appropriate DRM before making content available. But waiting too long runs the risk that users will find other means to get content on their mobile devices. Until content is fully available and easily accessible on mobile devices, there is a window of opportunity for non-commercial file sharing to develop. If a critical mass of file sharing is reached – as happened with Internet P2P music services – the problem could be difficult to correct.⁹³ Consequently, many believe that to promote the commercialisation of mobile content, users must be set up initially with appropriate DRM.

There has been significant effort and co-operation to develop mechanisms to foster legitimate downloading of mobile content, including the standards work of the Open Mobile Alliance (OMA). The specifications for OMA DRM are open and available from the OMA website. OMA DRM R1 (Release 1) is suitable for light content, such as ringtones, screen savers, and logos. The specification for Release 1 closed in fall 2002. It is a voluntary flag that says “do not copy this.” Mobile operators are hoping the OMA protection software will delay hackers until a more secure phase can be implemented. MEGE LA has formed a patent pool with five companies. They each pooled their anti-piracy patents for the OMA DRM Release 1 standard and manufacturers and content provider can license them through the patent pool. Handset makers pay USD 1 to include OMA Release 1 in a mobile phone. Content owners that elect to protect their material with the OMA DRM will pay royalties of 1% of the consumer selling price of the content.

The OMA DRM operates by separating the media content from the media rights. There are three delivery methods defined by Release 1: forward lock, combined delivery and separate delivery. *Forward lock* is intended to be used for delivering news, sports, information and images that should not be sent to others. Typically, this would apply for subscription services. A DRM message can contain a media object and an optional rights object. With forward lock, only the media object is included, so that the media object cannot be shared with additional users. *Combined delivery* allows usage rules to be set for the media object. Rights can be added to the media object to define how a device should treat the media object. For example, rights can be limited by time or count (number of copies) and a preview feature can thus be added. *Separate delivery* is intended for higher value content. It operates by delivering media content and media rights through separate channels, and is more secure than combined delivery. The media object is encrypted, while the separate rights object holds the Content Encryption Key, which is used by the device for decryption. Separate delivery enables superdistribution, the ability of a user to forward content to others for them to preview and purchase. In superdistribution, the user forwards the media, but not the rights. Superdistribution also requires a Rights Refresh mechanism that allows additional rights for the media. Recipients contact the content retailer to obtain rights to preview or purchase the media.

Enabling superdistribution is powerfully attractive to content providers because it allows viral distribution of mobile content. In effect, superdistribution creates a system that enables transmission of copyrighted material in a legal manner. The music label EMI is currently in trials with a European mobile operator to provide music download services to customers that could be forwarded and trialled for free. The service will allow a user to preview music for either a set number of times or a set time period before the DRM technology disables the song.⁹⁴ Superdistribution could also be established to provide the sender a percentage of the payment as an incentive to use this viral distribution mechanism.

Protection for premium content – music, video, etc. – protection will be provided by the next generation of the OMA DRM, denominated DRM R2 (Release 2), which provides increased security for digital content. Release 2 involves encrypting the content sent to a mobile device with a signal that will unlock it. Release 2 supports both downloading and streaming as well as the “domain concept” to enable use of the content on several devices within a defined domain. MPEG LA has targeted mid-2005 for a patent pool for OMA Release 2.

Other than OMA, several companies are also looking to implement DRM for mobile content. Microsoft has indicated that it intends to be a leader in media distribution with Janus, its DRM system, which is designed to make subscription-based content available on mobile devices.⁹⁵ Some mobile operators and handset manufacturers are also implementing their own DRM to move forward with content distribution before the finalization of Release 2. Apple uses its own Fairplay DRM for its iTunes product. Its recent announcement that iTunes will be available on Motorola phones leaves open the question of what DRM the Motorola devices will use.⁹⁶ According to Universal, Orange’s proactive approach to DRM technology enticed Universal to make its music catalogue available. Only handsets that provide a secure DRM solution for the delivery of premium music content such as truetones will initially receive the content in order to protect rights holders.⁹⁷

As DRM technologies develop in the mobile environment different DRM systems have different usage rules. Furthermore, content from one source cannot necessarily be transferred to another device. Customer confusion results. As competing technologies emerge, policies must address this user issue without inhibiting these innovative technologies. This issue is examined in more depth in the companion music study. Monitoring and continued evaluation under the OECD Council Recommendation on Broadband Development is crucial in this area.

In addition to industry DRM efforts, the applicable legal regime plays an important role in protecting copyrights. The actual requirements and application of the laws varies from region to region, or country to country, making the deployment of mobile content service a major compliance challenge for mobile operators that must obtain a myriad of licenses, often via protected national collecting societies, to be able to sell content in different geographical regions. The enforcement of copyrights on a global basis is also a major issue for content providers and distributors, including mobile operators.

The current state of mobile content

This section examines the current state of mobile content offerings, a roster that is growing and changing daily. However, by looking at the major types of content being offered to mobile users in conjunction with a sampling of content offerings just emerging, the varied business models, applications and value chain players become apparent.

Until recently, in most parts of the world, the mobile phone was primarily used for communication by voice or text. Indeed, data services, including messaging have been a major revenue source for mobile operators.⁹⁸ Music applications, especially ringtones, sparked a sharp uptake in consumer use of mobile content. The mobile industry has taken increasing note of the value of content and showed particular

interest in branded content. Rosy projections based on the success of ringtones and mobile games are encouraging but cannot be seen as indicative of the broader success of mobile content. Outside of Japan, mobile content markets remain fragmented. Despite the success of some mobile content offerings in Asia, key cultural, governmental and market differences in other major markets, including Europe and North America, must be taken into account when looking to replicate that success.⁹⁹

As network and devices develop to handle rich content, access to existing content that is available on other distribution platforms becomes a matter of great importance. The media and entertainment industries are only reluctantly beginning to explore the potential and possibilities presented by the mobile content market. In many ways, the new technological platform has been viewed as a threat to their existing revenues streams, much as cable services were often initially seen as a threat to the over-the-air broadcasters. Mobile operators contend that significant barriers exist to their access to premium broadcast programming, including live broadcasts, and sports content. This is due in part to the significant challenge the mobile platform presents to the existing business models for broadcast and sports rights, including European football clubs. Long time business models typically bundle rights, offer exclusivities and are tied to media windows; these restrictions rest on business models that fail to recognise the potential of new technologies that offer mobile use with anywhere, anytime capabilities. By relying on traditional business models that tend to favour the interest of established distributors and supply their largest revenues, broadcaster are missing the opportunities presented by the mobile content market. Consequently, these practices can unnecessarily limit the kind of content available to the mobile platform. Further, some rights may not be available at all because they have been previously given as part of an exclusive rights bundle that, in all likelihood, did not contemplate the mobile content platform. In such a case the “unused rights” preclude new technologies, such as mobile. The EU Commission is reviewing the implications of these practices for new technologies. Successful inroads have been made with respect to some premium sports rights. In Italy, football clubs have sold exclusive rights to major football matches to mobile operator H3G and TIM. These carriers have in turn sub-licensed the rights to each other to expand the mobile content offering available on their networks.

Another challenge is the country-by-country or market-by-market rights licenses. Mobile operators want to acquire rights that will allow their users to access content while roaming abroad, without necessarily obtaining licenses for every country. Thus, an Italian user who is on vacation in France may want to access content that has been licensed for use only in Italy. Obtaining a license for France to accommodate the user demand is not justifiable in light of the significant cost and small user base. The current licensing scheme makes it difficult for a content provider to offer this capability to the user. Fundamentally, jurisdiction-by-jurisdiction access to rights is not compatible with a mobile environment, and may require regulatory adaptation to ensure the availability of these services can be offered in a meaningful way over new technologies such as mobile.

Success requires providers to identify the major advantages the mobile environment offers to content providers. The rate of uptake of mobile devices is much faster than many other mediums, such as television. This puts more sophisticated devices in the hands of users sooner, allowing additional features to be integrated into the content presentation, such as interactivity. Mobile networks also give content providers the ability to bill and profile users, unlike the traditional broadcast mediums of television and radio.¹⁰⁰

*Music*¹⁰¹

With the introduction of portable cassette, CD and MP3 players, music went portable, but continued to require separate physical media (tapes or CDs) or access to a PC to music content. Today, music can also be downloaded directly to mobile devices without access to a PC, and the market is growing. Music content has been a major driver of mobile content use by consumers, largely due to ringtones, now recognized as having promising potential.¹⁰² First and foremost, ringtones caught the imagination of the

public, and particularly the youth segment, generating a large market for mobile music. This market has been a financial windfall for mobile operators. Ringtones' appeal stems from the ability to personalize a mobile device, a primary driver for mobile content. Now, music labels, mobile operators and others are developing a broad array of music content for use in the mobile environment. This section examines the current landscape for mobile music. There are two basic ways of transferring music to mobile devices: through file transfers over local connections (fixed networks, WLAN, Bluetooth) or over the air (GPRS, UMTS, Digital Radio/Digital Audio Broadcasting).

The music recording and publishing market is highly concentrated and recently becoming even more so. Four record labels dominate the music market: Vivendi Universal, EMI, AOL Time Warner and the recently merged Sony/Bertelsmann Media Group (BMG).¹⁰³ These major players in the music industry have recently been entering the market through distribution deals with mobile operators and independent mobile music portals and device manufacturers. Nokia and Warner teamed up to provide a phone that supports MP3 and AAC audio files and has a built-in FM stereo.¹⁰⁴

Ringtones

Beginning in Asia, ringtones became popular with the youth market. Initially, monophonic ringtones changed the device's ring to a recognisable tune. Relatively simple, ringtones customised the sound the phone made when a call was received. The typically short tunes were familiar or popular tunes using the monophonic keypad tones for the mobile device. As device audio sophistication advanced, so did the ringtone, becoming a polyphonic tune.

Despite their seeming simplicity, ringtone providers still need to grapple with some technical issues to maintain a quality product. In Japan, for example, content providers who create ringtones for iMode must take into account the differences in sound quality among various handsets that work on the carrier network. Even though all iMode ringtones are made in the same MFi format, the same tone will sound very different when played on a Sony phone than when played on a NEC phone. This is because Sony and NEC use different sound generation methods. Such fragmentation makes it quite difficult for content developers to create a quality product that will hold across device platforms.

Ringtones are very popular. Users are willing to regularly purchase new ringtones. Ringtone revenues outstrip CD single sales in some markets, including the United Kingdom and Germany.¹⁰⁵ For example, in the United Kingdom the single "Round Round" by the Sugababes sold more ringtones than singles when it was released in the summer 2003.¹⁰⁶ In the United States, more people now download ringtones based on popular songs than they download the songs themselves from the Web's many music services.¹⁰⁷ Another benefit of ringtones is that they help expand awareness of licensed music services.¹⁰⁸

All this consumer interest in ringtones is generating significant revenues for the industry (see section above). The popularity of ringtones is illustrated by the mid-2004 launch by the OCC of the United Kingdom's first chart for mobile phone ringtones in association with the Mobile Entertainment. Sprint reports 2003 ringtone and screensaver downloads of 20 million at USD 1-2.50 each.

Typically, mobile operators charge around EUR 1 to EUR 2 per ringtone, though a variety of pricing schemes exists. Some ringtones are available at no cost and other "premium" tones cost EUR 2.5 or more. The revenues from ringtones are breaking the stalemate with record companies and introducing them to the mobile landscape as a lucrative music market. However, it is unclear how ringtone revenues are apportioned along the value chain, with many conflicting reports. According to one estimate, music labels portion of revenues from ringtones ranges between 25% to 55% of the price paid by end users.¹⁰⁹ Another source concludes that technology providers, rather than traditional artists and record labels, are receiving the bulk of revenues from the latest services.¹¹⁰ Infoma Media Group states that authors' collection

societies collected USD 71 million in royalties from ringtone sales in 2002, with royalties typically accounting for 10-15% of total sales from ringtones.¹¹¹

There are many new ringtone deals. EMI, one of the world's largest music groups, has begun to enter the digital music market.¹¹² Virgin Digital is set to launch music services in United States and the United Kingdom in Autumn 2004. The service will include music-derived mobile ringtones, music hardware and possible full-length videos. Orange has a deal with Warner and other content providers for ringtones.¹¹³ In other arrangements, companies such as Bonjourno of Italy and Finland's Akumitti buy the digital rights from music groups and then sell on the ringtones to mobile operators.¹¹⁴

Some conclude that ringtones have begun to look like a product in a fairly mature phase of its product life cycle.¹¹⁵ As the industry approaches commoditisation, the industry is undergoing substantial acquisition and consolidation.¹¹⁶

Ringtones

Ringtones laid the groundwork for Ringtunes, snippets of actual recordings that are downloaded and used as mobile phone rings. Unlike ringtones, which are recreations of popular music titles, ringtunes are actual clips of original sound recordings by the original artists. These clips are downloaded to the phone and play whenever a call is received. Ringtone providers seek to appeal to consumers by differentiating their service with unique benefits, such as access to certain titles or in broad access to a wide range of titles.

Many mobile operators have established deals with recording labels or intermediate providers to provide their customers with ringtunes. Cingular has contracted with Moviso, a unit of Infospace, to acquire ring tunes. Sprint agreed to co-operate with BMG and several other major labels and will sell ring tunes for USD 2.50 each under its Music Tones services.¹¹⁷ Universal Mobile, the mobile division of Universal Music, has reached an agreement with Orange enabling Orange customers to access "truetones" via their mobile phones.¹¹⁸ Ringtunes provide a revenue stream for operators, recording artists and record companies' future products may be offered on a subscription basis, but there is as yet no detailed generalisable information available on ringtone revenue splits.¹¹⁹

It is very important that reasonable rates for royalties are being charged. There is uncertainty in the market as to the correct market price. Music labels and other content owners may extend their market power and ask for excessive royalties. This may not be in the interest of this nascent market. Ringtunes, however, is one area where record companies are embracing mobile content. Ringtunes, unlike ringtones, incorporate master recordings and provide revenues to the recording studios as well as to the artists.¹²⁰ Royalty rates to the mobile market must be set with careful attention by the recording industry as well as the complex value chain interactions to ensure continued success of ringtones in the consumer market.¹²¹ Initial royalties rates have led some ringtone retailers, such as Songseekers, to produce cover versions of ringtunes.¹²²

Box 3. Snapshot: Musiwave's ringtone offering

One example of a ringtone provider is Musiwave. Musiwave's Musitones allows mobile users in 14 countries on three continents (e.g. Australia, Europe, Hong Kong (China), New Zealand and Chinese Taipei) to hear their favourite music whenever their mobile phones ring. Musiwave has deals with three of the largest record companies – BMG, EMI and Sony Music – as well as 30 smaller labels.¹²³ Although users can choose from more than 5 000 monophonic and 3,000 polyphonic tones, the most popular downloads are the more than 1 500 Musitones that play actual recordings of popular songs. Once downloaded, a song clip plays whenever a user's phone receives a call. Users can designate different tunes to play for different callers or groups of callers. Musiwave sees download rates as high as four Musitones per minute in some markets. Wireless subscribers pay EUR 0.82 to EUR 4.08 (USD 1-5) for each ringtone.¹²⁴

In January 2004 Musiwave announced Pictones, the first multimedia ringtones, that combine music and video into video clip ringtones for mobile devices. Users select music videos, movie scenes and other theme-based videos as their personalised ringtones. Vodafone Germany launched Pictones in March 2004. Initially, Pictones is available exclusively on Series 60 Nokia devices, though the company has plans to expand the service to other devices soon.¹²⁵ Users pay between EUR 1.5 and EUR 5 (USD 1.84 and USD 6.12) for a music video ringtone.¹²⁶

Music Wizard is the result of a partnership of Musiwave, Philips Electronics and Gracenote and allows a user to look up a song's title and artist. As the song plays, in a store or elsewhere, a consumer can sample the song by recording a few seconds of the music and email it to Music Wizard. By comparing the sample to its database, Music Wizard can identify the music. A follow-up text message is returned to the phone with details of the artist and title, as well as links for downloading related content, such as wallpaper, images or a Musitone. Currently, Music Wizard is only available in Spain.¹²⁷

Source: Forum Nokia, *Musiwave Case Study*.

Ringbacks

Ringback tones allow the user to select what callers hear before the phone is answered. Ringbacks are another way that users can further personalise their mobile phones, which seems to be a major driver in user interest in mobile content. The ringback tone is not limited to music; jokes, clips of celebrity voices are also potential ringback candidates.¹²⁸ While ringbacks are popular with the youth market, they also have a corporate following. Companies can use ringbacks to have customers listen to their jingles or advertisements. One estimate suggests that at least a quarter of ringback revenue will come from corporations.

South Korea Telecom (SKT) first launched ringback tones in April 2002. SKT realized revenue of USD 100 million within 15 months and subscriber penetration of 35% after 18 months.¹²⁹ Globe Telecom signed up 100 000 users for ringback service during the initial week of its April 2004 launch. US wireless carriers are all in the process of buying the equipment necessary to enable ringbacks. T-Mobile launched ringbacks in the United Kingdom and Germany and has seen an even higher take up in Germany. The carrier plans to launch the service in other markets. In the United States, T-Mobile, Sprint and Verizon have launched ringback services.

Unlike ringtones, which are downloaded onto the phone, ringback tracks reside in the carrier network. Carriers install servers that contain the ringback recordings and send the called parties ringback through the telephone network to the caller. Because ringback operates from a network server, ringbacks work with any kind of phone, wireless or landline, unlike ringtones, which work only on wireless handsets capable of downloading, storing and playing music.¹³⁰ Moreover, callers tired of the same audio clip when they call may pressure their friends to update the outdated ringbacks, stimulating repeated purchases. With caller line identification, users can select different tones for different callers.

Ringbacks require a significant network investment by the operators and take a significant amount of time to be deployed. Depending on the number of subscribers who must be supported, the hardware and

software for a national ringback rollout is estimated to cost from USD 2 million to USD 45 million.¹³¹ In Chinese Taipei, carriers that deployed ringback gear from Alcatel have seen the service pay for itself within 2 to 4.5 months. Further, because the software and hardware that contain the ringbacks are server-based, tracks are never downloaded so there is significantly less risk of piracy.¹³²

Ringbacks provide two revenue streams. Mobile operators charge users a subscription fee to activate and use the ringback offerings. In addition, users pay for each track uploaded to the network and each change in that content. Where ringbacks have been launched in Asia, users pay at USD 2 - 5 per month subscription and then USD 1 per track downloaded for ringback service. In the United States, T-Mobile charges a monthly subscription fee of USD 1.49 and a one-time charge of USD 1.99 per "CallerTune" ringback audio clip. Ovum research forecast that the global ringback market could reach USD 2.4 billion by 2008.

Full track downloads

One of the more recent and anticipated developments in the mobile music world has been the development of downloadable full music tracks. According to one US research study, consumers are ready to move beyond ringtones and acquire more full featured music/audio services for their wireless phones, including music and news/talk content available as downloadable content or on demand. The greatest interest, according to the study, was in downloadable digital music files, followed closely by the ability to listen to streamed music on demand. Total monthly wireless spending among likely mobile music adopters is 14% higher than the general subscriber base in the US.¹³³ Today, users for many mobile providers can download music directly to their mobile phones to play as an MP3 or, most recently, to share with friends. While music tracks have been available in Japan for some time, delays in other markets in the launch of these services can be attributed to licensing, technology, DRM and revenue issues.

Box 4. Snapshot: Chaoticom music tracks

Chaoticom has succeeded in bringing music to music lovers on their mobile phones. Unlike services that require special phones to access and download full music tracks, Chaoticom offers full track music downloads to a wide range of mobile phones from several European carriers, including Orange UK, Eurotel and Telenor Mobile Norway. Through these carriers, the service is now available to some 20 million mobile phone customers. Chaoticom has contracted with Warner Music, Sony, BMG, among others, to offer a wide selection of music choices. With the direct-to-mobile music download service, customers of these carriers can now browse, preview and download and store hundreds of full music tracks, master-recorded ring tones, wallpaper and artist information directly to their mobile phones. The services are delivered over-the-air without the need for any additional specialized hardware required by some services. Subscribers can listen to their music without interfering with incoming call reception or other calling services. The list of tracks is continually updated to provide customers with latest releases and a wide range of song choices.

The service is compatible with more than 15 existing handset models on 2.5G networks including Windows Mobile- and Symbian-based devices from Motorola, Eurotel, Nokia, Samsung and Sony Ericsson. Consumers with compatible phones will first need to download the KOZ Player, which ranges from 200KB-500KB in size, depending on the size of the user interface developed by the mobile operator. The songs are in the company's proprietary KOZ format, which compresses a tune to roughly 750KB, a quarter of the size of a typical MP3 file and consumes significantly less battery power than other solutions on the market. The songs are downloaded to the handset, so users can listen to their playlists even in places where there's no signal to connect to the mobile network, such as on the subway or in an office building. The typical download time for a full-length track is 90 seconds. Most compatible phones can store up to 100 songs in the KOZ format. Pricing for downloads is set by the mobile operator. In the UK, Orange charges user GBP 1.50 per download.

With the Mobile Music Solution, Chaoticom provides operators with everything they need to offer a music download service - hosting, aggregation, a Web presence, editorial content, integrated DRM and even the licensed music content as well as the client software. Because of Chaoticom's built-in DRM, users can't share the tracks.

Source: Chaoticom.com, Press Releases.

Outside Asia, O2 first launched mobile music service in the Autumn of 2003 that allowed users to download actual songs as MP3 files to memory sticks to insert and play on their mobile phone.¹³⁴ In July 2001, Orange announced a new MusicPlayer service, powered by Chaoticom, that will allow full-length music downloads directly to the phone (see Box 4). The price is GBP 1.5 per track. The deal is exclusive to Orange for 12 months. Orange has deals with V2 and Warner Music and is concluding deals with other major labels and independents. The service launched with over 200 artists. The service is compatible with nine phones. MusicPlayer is downloaded free from the Orange World portal and is about 600 kbps. Orange will also offer users the opportunity to remix tracks using Bounce Technology's Fireplayer. Fireplayer is also available on an exclusive basis. The Fireplayer application allows users to add their own sound and vocals and to save the mix as a ringtone. Fireplayer is downloaded free by users from the Orange World portal, and tracks are downloaded for mixing at a price of GBP 3.5. At launch 20 tracks were available to download from Fireplayer.

MMO is ready to launch its own full downloading music service with five major labels: Universal, Warner, BMG, Sony and EMI. The studios are satisfied that MMO has resolved key digital rights management issues. The service allows users to download tracks on their mobile phones and share this with other devices including PCs. Users will even be able to burn downloaded tracks to CD. Yet its encryption technology prevents tracks from being posted on the Internet for non-commercial file sharing.¹³⁵ Rolling Stone ringtones service was launched by Dwango to allow users to download popular music via their mobile phones. The service also provides access to current music reviews from the *Rolling Stone Magazine* and is available from AT&T Wireless, Cingular and Nextel across a variety of handsets.¹³⁶

As detailed in Box 4 another provider that has served as a full service platform for mobile roll out of full music downloads is Chaoticom.¹³⁷ Chrysalis has a new mobile division allowing listeners to download songs onto mobile phones, initially ringtones, but the technology permits MP3 downloads as well. While ringtones only require payments for the music publishing rights, MP3 and similar formats will require royalty payments to record companies for master rights as well. Chrysalis wants to become the aggregation company for the major record labels. Chrysalis runs the Heart and Galaxy FM networks and operates its own music publishing and recording business. The new mobile division will bridge the gap between these and its radio operations. The CEO expects mobile music downloads will be even more popular than Internet downloads because they will enable impulse purchases and because consumers will be more comfortable paying via their mobile phone bill than by credit card over the Internet.¹³⁸

Other full-track applications are also being introduced. For instance, Gracenote Mobile MusicID can identify snippets of songs through a cell phone. Music fans can dial a number and hold up their mobile phone near a radio, for instance, and Gracenote's service will send a message to the phone identifying the tune being played. Listeners then have the option to buy it as a ringtone or digital download. Mobile ID has launched with carriers in Europe, Asia and the United States.¹³⁹ Mobile operator mmO2 is finishing trials on their music service and a digital music player that plugs into a mobile device so the user can download music from charts, for example from MTV. Little information is available on the revenue split between various players in the value chain for these new offerings.

T-Mobile's MobileMix offering – launched in mid 2004 along with five new music phones – permits users to download from a catalogue of 500 mobile mixes a condensed version of songs lasting 90 to 120 seconds. Each download costs roughly EUR 1.50, well above the average price of a full track download to a PC. T-Mobile promises a catalogue of 250 000 full length tracks, following developments in bandwidth and digital rights management software for protecting copyright.¹⁴⁰ T-Mobile is working with Universal Music, Warner and Sony/BMG as well as independent labels Chrysalis Mobile and V2.¹⁴¹ Mobile Mix is based on an open standard. On a 2.5G phone, download is about 2 minutes per mobile mix track. On 3G phones, it is around 30 seconds. To entice customers, T-mobile will allow customers to download new singles up to two weeks before they are in the shops.¹⁴²

Music videos

One logical extension of the music download offering is the move into music video downloads. MTV and Motorola have reached an agreement that will allow MTV content to be downloaded onto mobile phones. 3, a 3G mobile provider, announced a deal with MTV giving users daily video newsreels as well as exclusive MTV footage of live band performances from the TV channel.¹⁴³ MTV also recently entered the market as an MVNO, offering hit list music, news and chat to their subscribers all over Europe.¹⁴⁴

Beyond clips and news items, actual streaming of music videos directly to mobile phones has begun in the United States. Idetic launched MobiTV service that enables Sprint customers to watch live TV, including three music video channels, through their mobile phones. Sprint is currently working on an ecommerce solution that will allow viewers tuned in to the music video to buy the video, ringtones or music from streamed videos.¹⁴⁵

UK mobile operator 3 signed a video content deal with BMG UK & Ireland, to provide users access to videos from Christina Aguilera, Dido, Outkast, Britney Spears, and Justin Timberlake. Users select either streaming or downloading content for GBP 1.50 (USD 2.74). A flat-rate streaming option for both video and audio music content is also available for GBP 10 (USD 18.22) per month. 3's initial foray into music videos was through a deal it struck with MTV in Autumn 2003 and also offers person-to-person video calling over 3G networks.¹⁴⁶

Other music-related mobile offerings

There are several other music or music-related mobile content offerings, and new offers are announced regularly. These offerings range from SMS/MMS on favourite artists, artist and logo screensavers to new music applications. Many mobile operators make music and artist content available to the mobile customers for use on either a regular or sporadic basis. For instance, Orange allows customers to tailor their WAP home page to their key interests, including their musical interests. Not only does such customisation appeal to users, it also provides interesting marketing opportunities for music groups.¹⁴⁷

Mobile phones are also being used in creative promotions for music artists. For instance, Breed 77 fans received a bar code on their mobiles that entitled them to a discount on music recordings. The bar code sent to fans' phones was read by a specialised reader, printed and then scanned into the register for the discount. The information is used to compile a fan database for future notifications regarding the band.¹⁴⁸ Again, the fans are pleased to have an opportunity to obtain key information about their band and the band has a unique opportunity to extend its reach to a highly targeted audience. Using mobile devices for such marketing and advertising mechanisms is becoming increasingly common. One music industry veteran, Ralph Simon, is preparing to launch a new global mobile entertainment platform that will provide music fans with dedicated artist channels. Content such as ringtones to messaging will be available, which could be a harbinger of future marketing channels for independent artists who would seek to develop their mobile brand.¹⁴⁹

TellMe Networks has developed a service called "call soundtracks" that allows a mobile user to listen to background music while on the phone. The music's volume declines automatically when callers are talking and rises during pauses. Either party can turn off the music during the call. The hardware and software for this offering is similar to that used for ringbacks.¹⁵⁰

In addition, more traditional radio services are available today on mobile phones equipped with FM receivers. Ofcom, the British regulatory agency, notes that listening to radio on mobile phones has increased significantly in the past 3 years, particularly among 15-24 year olds. This trend is expected to continue as more phones are available with FM receivers. Furthermore, Ofcom anticipates that phones will

soon include Digital Audio Broadcast receivers as well.¹⁵¹ GWR and BT announced a partnership to provide multimedia data to mobile devices using Digital One's broadcasting capacity.¹⁵² Nokia is developing Visual Radio for its handsets that enables the handset to receive FM radio signals and matches the audio content with related pictures, graphics and other content.¹⁵³ Visual Radio pilots are being tested in Finland.

Games¹⁵⁴

In the early 1980s, Nintendo first made electronic games portable, and in the 1990s altered the games world permanently with the introduction of its GameBoy console. Mobile phone manufacturers entered the game market in 1997 with *Snake*, embedded on Nokia Phones and received a positive public reception.¹⁵⁵

Today, the mobile game industry is emerging and most mobile devices include simple embedded games. But the market is also beginning to develop to include more sophisticated downloadable and multiplayer games. Outside of Asia, games as a revenue source are just starting to emerge. The mobile game industry still faces multiple obstacles to more sophisticated games, and market growth depends on developing the right content for the particular screen size at affordable prices (price transparency). This section reviews the state of mobile games content, value chain and obstacles for this industry. [See also OECD report on online computer and video games DSTI/ICCP/IE(2004)13/FINAL].

At present, the most advanced business models and game concepts for mobile devices are in Asian markets. While the mobile game industry is well developed in Asia, particularly Japan and Korea, it is still nascent in other regions or as a global market. While mobile games are gaining a footing in Europe, they have been slower to take hold in North America. Many major game developers are only just entering the mobile game market, led by THQ Wireless, Sega Mobile and Disney. Activision, Atari, Electronic Arts, and Microsoft have licensed their content for mobile games. In addition, Japanese game companies, including Bandai, Namco, Taito and Dwango are becoming active on a more global scale.¹⁵⁶ As these developers increase their stake in mobile games, it can be anticipated that the value chains will adjust to accommodate these large, mature players and consolidation can be anticipated. But the industry is still fragmented and relationships between various players in the value chain are still developing and shifting. Mobile games are also forced to overcome the poor user experience with introduction of WAP games.

Handset developments and restrictions for mobile games

More than most other applications, handset capabilities, while not the only obstacle faced in mobile game development, have been one of the key constraints. 2.5G networks provide enough bandwidth – at least 20 kbps – to purchase and download simple games. Phones based on 2.5G also generally support rich and polyphonic sound – prerequisites for current games. 3G networks support download speeds in excess of 100 kbps – making it possible to download games that are even more complex and compelling.¹⁵⁷ The increased 3G speeds will also enable faster game interaction and response times and location-based features, which can only be offered within the bounds of national privacy laws.

Despite the success of simple embedded games, more sophisticated games have been hampered by limited capabilities of mobile devices. The current state of mobile game content reflects this fact. Technical improvements such as more powerful end-user devices, the advent of high-resolution graphics, multiplayer features, Bluetooth connectivity, colour screens and improved transmission capabilities for mobile networks are key to the development of more complex mobile games. Because of such technical obstacles, it is difficult to adapt online games to the mobile environment without creating different versions to work with the vast range of handsets. Efforts and standardisation will enable game developers to take advantage of the unique aspects of a connected mobile device for games, without have to redesign for every handset.

Even with these handset improvements, the quality of the games experience is not as rich as that of current game consoles, but instead is comparable to 1980s video games. Due in part to phone screen size and colour limitations, as well as memory constraints, some of today's most popular wireless games titles come from that era, including Tetris, Pac-Man and Ms. Pac-Man.¹⁵⁸

Recently, however, several handset manufacturers have debuted or announced devices specifically aimed to mobile gamers and game developers. Nokia unveiled N-Gage in fall 2003 to address the gamer market with a device that looked much more like a game console than a mobile phone. N-Gage, which is more a game console than a phone, also includes Bluetooth to allow play between opponents in close proximity.¹⁵⁹ Additionally, traditional game console manufacturers are adding communications features to their mobile game consoles.¹⁶⁰ Both Sony and Nintendo appear to be moving in this direction. Yet, even with improved handset technology and improved device functionality, it is essential that game developers produce games that will appeal to the mobile user and the advantages and constraints of mobile technology. Handset enhancements, while important, are not the only factor, and successful games in the mobile environment will develop content that takes advantage of the unique capabilities of the mobile environment.

Embedded and downloadable games

Embedded games run on the phone's chipset, are installed at the factory, and shipped with the phone. Nokia's popular Snake game is a prominent example.¹⁶¹ Similarly, Ericsson licensed the popular Tetris title for its mobile phones.¹⁶² Although most phones come with some embedded games, users cannot buy and purchase embedded games, and therefore such games do not result in substantial revenue stream. Embedded games are popular with consumers, but they are not the key feature in phone sales. However, such games do serve a useful function by introducing mobile users to games with their phones, and thus create the prospect of stimulating demand for additional titles.

In contrast to embedded games, downloadable games are selected by the user and downloaded into the phone. These games tend to be played in short spurts, while users are on breaks or waiting – typically 10 to 15 minute intervals. Such games are developing a growing customer base, and are currently the largest source of mobile game revenues. Downloadable games from a mobile operator portal or other Web portal, raise revenues for wireless carried in two ways: through per minute charges and download charges on the transmission of games. Sprint reports game sales of 3.5 million games, selling at between USD 1 and USD 6, with limited time games at the lower end of that range and unlimited use at the higher end. Sprint offers more than 9.5 million titles and recently upgraded its games offering with "Game Lobby", an online information centre and store. The service enables a gamer to rely on a single user name and password to access games of many publishers, provides a centralised listing of high scores and a buddy list for tracking friends. To date the service has over 60 000 subscribers, paying USD 2-5 for each game downloaded to Java-enabled phones.¹⁶³ Software suppliers also have taken steps to tailor their products to the online games market's current capabilities focusing on games where data input is simple such as Jeopardy, Wheel of Fortune and trivia games.¹⁶⁴

Online mobile games: SMS/MMS and browsing

Many of the earliest mobile games were based on Short Message Service (SMS).¹⁶⁵ Players were charged per message and the revenue was shared by the operator and game provider. SMS is commonly used for answer/response games, such as quizzes and for lottery and puzzle games. Trivial Pursuit, Who Wants to be Millionaire, Tic Tac Toe and Hangman are some examples of this type of game.

SMS games use short text messages from phone to phone for game play. Users typically pay about USD 0.10 per message. SMS games are played by sending a message to a phone number that corresponds

to the game provider's server, which receives the messages, performs some processing and returns a message to the player with the results. SMS is not ideal for game play because users must enter text. Moreover, it can be expensive for the user if the game has any depth because they are charged for each message. Multimedia Message Service (MMS), which incorporates pictures, sound and video clips, may have some possibilities, but essentially will suffer from the same economic constraints as SMS.¹⁶⁶ For SMS games, operators normally charge users a premium SMS fee that is higher than the regular SMS fee. They share a portion of this premium SMS revenue with the game provider – typically 20 to 50%. The game provider must have a business relationship with the carrier to ensure a short code to which messages can be sent. Developers therefore make deals with aggregators who have existing relationships with carriers - such as wireless portals or mobile game publishers – to share revenues from SMS games.¹⁶⁷

SMS is also a component of more advanced games. *Botfighters*, from *It's Alive*, is a location-based game in which each player controls a combat robot and travels in the real world to find and fight opponents.¹⁶⁸ Attacks are launched on players within 2 meters by sending an SMS to the game server. A newer iteration of *Botfighters* communicates with the server via GTTP rather than SMS. Players with this version can opt to pay a flat monthly subscription charge of EUR 6, or pay by the message.¹⁶⁹ The operator must be willing to share the LBS information with the game, and so the game has not been launched everywhere.¹⁷⁰

Browser-based games are played by going through the game provider's URL, usually through the mobile operator's portal, downloading or viewing pages, making a menu selection or entering text, submitting that data to the server and then viewing more pages. Browser games use WAP, xHTML or cHTML.¹⁷¹ Some WAP games allow the user to download decks. Although friendlier than SMS, and generally less expensive, it is a static browsing medium, with all the game play done over the network with processing by a remote server.¹⁷² Operators typically share a portion of air-time revenue or (for packetised air networks) a share of data transfer revenue. This share can range from 10% (in North America) to 89% (iMode). Because inputting URLs on handsets can be difficult, game providers achieve substantially higher revenues if their game is placed on the operator portals or with game publishers that have deals with the carriers.¹⁷³

Multiplayer games

Multiplayer games are some of the most successful games in the non-mobile Internet market. They are successful because they allow social interaction with other players. Mobile devices are ideally suited to multiplayer games because they are always connected, allowing social interaction wherever the player happens to be located.

Technical limitations exist in the mobile multiplayer game environment. In general, two different formats for multiplayer games are provided using two primary types of network configurations: remote server games and quasi peer-to-peer games. In remote server games, the server sits in the centre of a hub and spoke configuration, communicating with the players, co-ordinating their moves and returning game information to players. Remote server configurations are necessary for Massively Multiplayer Online Role-Playing Games (MMORPGs), and require a significant investment by the game operator for bandwidth, servers, hardware, maintenance and support.¹⁷⁴ The same servers that are used for online MMORPGs with a PC can be used for mobile MMORPGs.

Quasi peer-to-peer games use one player's device as the server for the other players. Player devices communicate only with the server, but chat is directed to each player individually.¹⁷⁵ In some games, players initially contact a remote server, which matches players and hands the game off to one player's machine. While this approach involves some ongoing cost, it is much less costly than for an MMORPG and there are also advantages. It provides an easy, immediate way for players to join a game and the server

can check ping times to appoint the best connection to the server, improving everyone's playing experience. For mobile play, quasi peer-to-peer games can only occur with the use of a Bluetooth-enabled device. Bluetooth can be used to establish a short-range network, called a piconet. Bluetooth piconets are limited to eight participants, which thus limits the number of players. Without Bluetooth, a server is required, which is typically paid for by the mobile game publisher or the mobile game developer. If phones have IP addresses, then a quasi peer-to-peer approach will become feasible in the same manner as that used for Internet games.

When a gamer wants to play, an opponent must be available to match. If there is no matching service, then players must seek each other out. In this configuration, there are no ongoing costs for the game, although it is more difficult for players to meet. Some third party tools, such as Gamespy Arcade, perform automated searches for servers. The as yet limited base of players for mobile multiplayer games can make player matching fairly difficult, so some games provide artificial intelligence (AI) opponents when real players cannot be found.¹⁷⁶

A number of issues are common to most or all multiplayer mobile games: user authentication and sign on, the need to match players with opponents, and accepting client requests and responding to them.¹⁷⁷ Several companies, such as Digital Bridges, Cash-U Mobile technologies and Mforma have developed server side platforms to address these issues. A standard server-side platform, if universally adopted by operators, would facilitate multiplayer mobile game development by removing the need to address these issues in the game development process. However, use of such platforms adds another link in the revenue chain, with fees that are often unappealing to mobile operators. As a result, industry organizations, including OMA are working to establish a set of open standard API for use in mobile games. If successful, such standards would facilitate multiplayer game development.

Latency is an issue for multiplayer games. Latency is the amount of time involved in transmitting information over the network. Internet gamers are used to low latency over broadband connections, but mobile networks tend to have fairly high latency periods. For action games, latencies of a second or more are unworkable because the pace of the game is too fast to accommodate such slow response times across the networks. As providers move to 3G this latency will improve.¹⁷⁸ However, at present game developers must design games with significant latency in mind. This presents an opportunity for network operators and game developers to work to optimise game performance. In the United States, however, carriers are concerned that optimising the network to meet these latency needs could trigger a filing obligation under current rules of the Federal Communications Commission (FCC) requiring ONA/CEI plans to be filed if the carrier were to become involved in the hand-off at certain points in the network.

Location-based games

Location-based games take advantage of mobile phone technologies that identify the player location and use that information as an input to the game. Location-based games can be either single or multiplayer games. They can use location information on a static basis, at the time of connection, or use continually updated location information throughout game play. Another advantage of location information is identifying players in close proximity to one another to engage in game play. However, these games can only be developed to the extent permissible by national privacy laws.

Orange France has launched MobiMushi, which involves caring for a creature; the care options and responses depend on the player's location. Telefonicas Moviles' Corsarios and Kigen, by Newt Game, also use location technology.¹⁷⁹ Botfighters and Attack of the Killer Virus also use geographic positioning to allow players to move about and play with others in close proximity.¹⁸⁰ Undercover, by yGames of Portugal, is a multiplayer game that uses location as the primary tool in the game.¹⁸¹

Cross-platform games

Games that use the mobile device to interact with other media have proven quite popular. Such cross-platform games may have the user vote with SMS to respond to a TV programme, such as “American Idol,” “Who Wants to Be a Millionaire?” and “Big Brother”. Public response to such interactive cross-platform game play has been overwhelming.¹⁸² WaterWar is another example. The game is transmitted daily on a Finnish TV Channel called SubTV and players use mobile phones to control characters. There is also an integrated chat feature.¹⁸³ WaterWar has been licensed to several TV channels in Europe and Asia.¹⁸⁴

As music has become an increasingly crucial element in game development, mobile games present an additional revenue source for the music industry. Games in general generate substantial revenues for recording labels. With the increasing sophistication of mobile games and the significantly improved audio capability of handsets, mobile games have strong potential to supplement the music industry game-related revenues.

Public sector game applications

Games provide a rich platform for other types of learning and training applications. Several government initiatives as well as private industry collaborations have been developed to explore the application of game techniques to mobile learning. These include Ultralab, Games-to-Teach and MOBILearn. In addition, mobile game-based training can be used by corporations for corporate learning programs. Games2Train provides game-based training solutions to corporations for use on handheld or mobile games.¹⁸⁵ Despite the obvious cross-over applications from games techniques and software development to learning environments, exploitation of this potential is only just beginning.

Business models and industry structure

Game developers, game publishers and mobile operators are still positioning themselves in the value chain for mobile games and negotiating their share of the revenues from these activities. The revenue shares are shifting constantly and no settled pattern has emerged across the industry. Even so, according to one report, wireless games are a steadily increasing proportion of game revenues. See Table 4 and OECD report DSTI/ICCP/IE(2004)13/FINAL, “Online computer and video games” for more detail.

Table 4. Computer and video game market by sector 1999-2008 (2003-2008 estimate)
USD millions

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Console games	12 100	11 488	12 748	14 934	15 325	15 805	15 601	17 817	21 834	22 522
Pc games	5 936	5 650	5 375	4 384	3 755	3 857	3 464	3 401	3 238	3 144
Online games	0	135	393	884	1 498	2 445	4 187	6 928	10 973	15 488
Wireless games	0	0	8	903	733	1 593	4 561	7 373	10 065	13 639
Grand total	18 036	17 273	18 335	21 105	21 791	24 041	27 843	35 519	46 110	54 793

Source: PriceWaterhouseCoopers (2004), Global Entertainment and Media Outlook: 2004-2008.

This robust growth is a key driver of mobile content. One observer notes that in recent months, the success of mobile games has spurred mobile game publishers to expand their focus to provide mobile operators with a wider array of mobile content, including music, video and imaging services. As mobile operators and media companies work more directly, aggregators could be marginalised by these developing business models.

Mobile game design is an interdisciplinary, collaborative effort. It is not sufficient to create high quality game titles. The key to business success is mastering marketing and distribution operations as well.¹⁸⁶ While the game markets are promising they are still very fragmented. At present, the most advanced business models and game concepts are in Asia.¹⁸⁷ Asia, due to Japan and Korea, has the largest wireless market and is years head of the markets in the United States and Europe.¹⁸⁸ The largest potential mobile game markets are Asia – including Japan, Korea and China – the US and Europe. Today, most mobile games are downloads, not interactive games.

Marketing and distribution. In the traditional game publishing business, game distributors carry out marketing activities and sales take place mainly in retail outlets. In the mobile game business, telecom operators and online/mobile portals generate most of the sales and implement to a great extent the marketing activities. In some cases, roles combine. For instance, THQ Wireless acts as both a mobile games publisher and to an extent also application service provider. In September 2003, THQ launched its own multinational mobile games portal. In this regard THQ Wireless acts as both portal and supplier to other portals, such as those operated and branded by the mobile operators.¹⁸⁹ In the case of nGage, mobile games are sold in retail stores. Mobile operators often prefer to deal with a select number of developers, and therefore many developers work with mobile game publishers or other aggregators to be placed on the operator deck. In Europe where handset sales are not controlled by operators, developers make deals with handset manufacturers or mobile portals to achieve access to large numbers of gamers. Billing is typically through the portal, rather than on the phone bill.¹⁹⁰

Games programmed on handsets that support an operating system such as Symbian OS are also generally provided on an application-sale basis. Because they tend to be much larger applications, they are normally transferred to a handset via hot-sync, rather than over the air. The greater bandwidth of 3G networks enables direct downloads of more complex games. Handsets with an IR port or Bluetooth port allow users to beam games to each other. Accordingly, developers need to provide some copy-protection scheme to maximise revenues.¹⁹¹ Since users must go to a Web site for these games, the operator does not control access and games are normally distributed by handset manufacturers, wireless portals or other aggregators.¹⁹² Nokia's nGage games are purchased on memory cards sold through retail channels and inserted into the device, along the lines of a console game such as Nintendo Gameboy. The nGage also operates as a mobile phone, but game play is not dependent on over-the-air transmissions. Thus, the business model is largely the same as for other console games.¹⁹³

Revenue source. For all mobile game types, consumers act as the key revenue source and the money they generate is distributed to the rest of the players in the value chain.¹⁹⁴ A typical game title is valid for the market and sells well approximately 6-12 months depending on its geographic distribution range. The initial price for a mobile game has been relatively low, around EUR 2 to EUR 7 per game, with the exception of nGage cartridges which are priced at EUR 20 to EUR 40 per title. One analysis projects that game prices will remain relatively stable through 2008 at USD 4 per month in the US.¹⁹⁵ It is important to price games according to their perceived value. Older games may have to be cheaper and prices may have to decrease as new titles are available. Consumers either pay a flat fee for the game or they pay monthly subscription fees. Additional revenues may be available for advertising and sponsorship deals. It is more and more common that movies, PC console games Web site and mobile games consist of similar elements and promote the same sponsors throughout the digital medium.¹⁹⁶

Currently, customers can be quite confused by various and changing charging mechanisms used by mobile operators, portals, and content providers.¹⁹⁷ As mobile operators deploy packet-based 3G networks, airtime charges, which bill customers on the basis of time (minutes) are likely to be replaced by data traffic charges, which bill customers based on the number of bits transmitted. Such usage-based pricing makes it difficult for users to predict the cost of game acquisition or game play. Flat rate pricing, which is beginning to emerge from some mobile operators, mitigates customer uncertainty. Present data traffic rates can result

in unacceptably high charges for game play, even though most mobile games are designed for short session play. Over time, mobile operator data rates may decline, just as voice rates have, bringing the cost of play more in line with user expectations. However, in the meantime, successful games will likely feature minimal data traffic, for instance by transmitting changes rather than whole game states. Minimising the number of bytes transmitted lowers user costs based on data bits.

Dividing the revenue stream. Key issues from the revenue perspective are what share each actor in the value chain takes of the consumer payments. The revenue split varies widely from carrier to carrier and region to region. It is not unusual for game publishers to take 50-60%, mobile operators to receive 20-25%, licensors to get 15-20% and game developers take 10-15%.¹⁹⁸ Estimates of the cost of game development also vary. One report states that a new mobile game costs USD 50-100 000 to develop, but then developers incur additional costs to modify games for each phone type.¹⁹⁹ In Europe, games must also be modified for language. A different analysis says it takes a few hundred thousand euros and 2-4 months to develop a simple game, and 4-6 months to develop a more complex mobile game. Games are sold as an additional service by the mobile operator creating a revenue stream from data transmission charges or a share of the content fees.²⁰⁰

For SMS games, consumers pay for game access, usually at a premium SMS charge for each message. For browser games consumers pay airtime or data transfer charges. For application games, they pay a one-time application fee. The business model for single player mobile games typically involves a user fee of a few Euros or Dollars to download and install the program. Thereafter, users do not pay to play.²⁰¹ The fee is split between the operator or portal site, game publisher, and game developer, and any other technology or billing provider involved.²⁰² This model was pioneered by NTT DoCoMo with the launch of its iMode portal. DoCoMo retains 9%, with the remainder split among other participants. The operator passes a portion of this fee on to the aggregator, which may be a mobile games publisher, a wireless portal, a handset manufacturer or some other intermediary. The portion of revenue passed to the aggregator varies depending on game type, region, operator and ranges from 5% to 89%. The aggregator passes some portion of the revenues to the game developer, which can also vary, but typically ranges from 10 to 50% of the aggregator's revenue. Developers may also provide games to aggregators for a one-time development fee, and receive no ongoing revenue share.²⁰³ Some aggregators also develop some or all of their games internally, removing a link in the value chain. If the operator bills the customer through a third-party provider, this billing party will typically take 3 to 10% of the revenues.²⁰⁴

This single player model is in place for networks worldwide for devices running J2ME, BREW or Symbian OS, although the revenue splits vary by operator and region. The value chain for mobile games differs depending on the type of game and the region where the game is distributed. In Asia and North America, the value chain typically includes the mobile operator. Users pay a fee to download the game over the air. In Asia and North America, the mobile operator presents a WAP deck to the user who selects games from that deck. Developers that partner with operators through revenue-sharing arrangements typically receive 20 to 50% of the revenues.²⁰⁵ For native OS games or interpreted language games in Europe, the value chain is usually shorter. Usually the consumer pays a one-time fee for the application. The aggregators, such as a handset manufacturer, game publisher, wireless portal or Web site, offers games to consumers. The aggregator assumes the cost of credit card or billing as part of its expense, and passes on a portion of revenues, typically 15 to 50%, to the developer.²⁰⁶

Multiplayer games involve ongoing costs to the developer so the business model differs. There are several revenue options for multiplayer games. At present a disconnect exists between mobile multiplayer games and the business model for mobile games, which involves one time payments with no ongoing revenue stream.²⁰⁷ JAMDAT and Unplugged both charge users a flat fee, similar to a game download fee, which gives players a license to play for a set time period, after which the multiplayer capability is disabled. The subscription fee varies by the license time period. This model works for BREW games

because Qualcomm's billing system provides for limited duration licenses. For Java applications, the billing system of the carrier must permit such limited duration billing.²⁰⁸

Subscriptions and SMS-based games are early ways of developing a revenue stream for mobile games. Another option is sharing airtime or data traffic revenue. When T-Mobile Germany launched CipSoft's TibiaME MMORPGS in 2003, users were not charged for the application and there was no subscription fee. Instead, users paid for data traffic on T-Mobile GPRS network. The cost to the user therefore depends on their specific data package with T-Mobile, but typically varies between EUR 10 per 10 kilobyte to EUR 0.01 per kilobyte for large data packages. The typical player generates about 400 kilobytes per hour of play, for a cost of between EUR 4 and EUR 0.80 per hour. T-Mobile pays CipSoft a fee for each user based on server usage.²⁰⁹

Gamers playing over the air are charged for the airtime by mobile operators. The high cost associated with airtime along with unpredictability of such costs by the end user can cause a significant chill on game play.²¹⁰ Nokia suggests that to reach a mass audience, mobile operators will need to start charging a flat fee, or charge subscription fees: "Today users who wish to play a multiplayer game with a mobile device start by buying – and paying for – the client application. Then, each time they connect, they pay more. And, as with the old commercial online services, they mind find themselves paying large bills at the end of the month."²¹¹

Uniquely mobile games. Given the constraints of mobile devices used for games, game developers must develop games that are uniquely geared to the mobile market. Short session playtimes, large latency periods, small screens and limited input options dictate that a successful online or console game cannot be simply exported into the mobile game market. Indeed, while vintage 1980 games are popular today, the mobile game developer should really look to develop games that exploit the unique characteristics of mobile play.

Standards and interoperability. One thing that would facilitate game development is the use of interoperability specifications and standards. The Open Mobile Alliance (OMA) is working with industry to develop and define mobile game interoperability specifications and programming interfaces. In Korea, WIPI (Wireless Internet Platform for Interoperability) is a government-defined standard as of 2004. According to one analyst, game developers in Europe can end up creating over 150 version of a single mobile game by the time they make versions in five languages, seven mark-up languages and account for handset variations.²¹²

Addressing the global games market. The transition from one market to another is not a simple or easy task for game developers. Language and cultural expectations make it difficult to translate complex games successfully from one market to another. In game markets as a whole, it has been difficult for game developers to move from the Japanese to the US game markets with blockbuster success. Korea is also – with various efforts - trying extensively to market its very successful games outside Asia (see Box 5). It requires considerable attention to language and cultural details to successfully translate a game such that it will become successful.²¹³ The translation issue is even more complex in Europe. But the current interest in simpler game formats mitigates this problem somewhat.

Box 5. Snapshot: Korea – Game On!

In the games arena, Korea rises to the top with some of the largest market shares and game production activities in the world. Korea's strong presence in games is the result of a concerted government policy designed to place Korea at the forefront of the games community through broad support to the Korean game industry. So far, these policies have allowed Korea to take a leading position. Whether Korea remains a leader as global markets take off is an open question, but the clear focus of the Korean Ministry of Information and Communication and the Korean Ministry of Culture and Tourism demonstrates how government policies can shape a content market. As part of its policy initiative, the Korean Government has developed multiple avenues for support of the game developers, including financial support, creation of the "Game Academy," which runs 2-year education courses in game development related areas, foreign marketing support and development of core technologies for game application. In addition, the government has provided subsidies and support to keep phone and service prices low. This accounts in part for the significant growth in Korea's mobile games sales, which overtook stand-alone PC game sales in 2003.

Source: Korea Ministry of Information and Communication, *IT 839 Strategy: The Road to \$20,000 GDP/Capita* (2004) and Ministry of Culture & Tourism, 2004, *The Rise of Korean Games: Guide to the Korean Game Industry and Culture*, Korea Game Development & Promotion Institute (2004).

Mobile video applications

Mobile video applications have often been heralded as the promise of 3G. With greatly expanded network capacity, 3G enables mobile delivery of video content. Projections vary as to whether and if a mass market exists for such content. In the meantime, mobile operators and content providers have developed several video offerings that are available over today's 2.5G and 3G networks. The quality over 2.5G networks can be a problem, however, resulting in choppy viewing. At present, mobile video offerings are mostly short clips of selected content specifically targeted to key user interests. Thus, the content needs to be suitable to be packaged into short clips; many believe that most mobile video content will need to have a maximum length of about a minute or two.²¹⁴ However, initiatives are underway to develop handsets that can receive broadcast TV signals and maintain those signals as the user moves from place to place. In addition, limited service is available from some carriers for streamed live TV content. This section highlights the activity in the mobile video area.

Sports Clips: Sports video content has proved to be a particularly popular content offering for mobile operators, although the operators are reluctant to disclose the popularity of their services with their customer base. In a mobile environment, video sports clips and premium video content can be viewed in new places and under new conditions; 3G will even allow users to access highlights of nearby sport matches as they travel.²¹⁵ Highlights from sports events are streamed to a mobile phone for viewing, along with sports scores, athlete interviews and other related information. A host of sports-related offerings are available around major sporting events. For the Olympics, for instance, Samsung gave Athens Organising Committee and VIPs a mobile phone at the 2004 Greece Olympic Games for real-time scoring, event timetables and logistics.²¹⁶ In Sweden, TeliaSonera offered free Olympic Games broadcasts for its subscribers in an initiative to introduce mobile users to video capabilities and offerings. In October 2003, 3 and Vodafone struck a deal with the FA Premier League for mobile rights to three seasons for video match highlights, previews, archive footage, roundups, audio bulletins, near-live picture messages and match scores.²¹⁷ Sprint PCS in the United States offers a highlights packages to its mobile users as well as a live, streamed sport channel. TIM offers Sports broadcasts in Italy as part of its mobile TV offering.

Mobile video content can be downloaded or streamed. Mobile devices can also be equipped to receive digital TV signals, something NEC states they are developing with an eye to a year 2005 commercial launch. Mobile video also means consumers can use their mobile devices to record and share their own video content.²¹⁸ There are lots of mobile video initiatives underway. O2, using Oplayo's Oplayer, and Vodafone, using RealNetwork's RealOne Mobile Player, have launched consumer trials of video services. In Italy, TIM offers television broadcasts to mobile phones, which include RAI. Siemens

and German TV channels are working to put TV on mobiles. Sports content is popular on 3's mobile network.²¹⁹

In October 2003, O2, the UK mobile operator, launched mobile video services on its 2.5G GPRS network. Users can stream or download video clips of content such as news, comedy, music, fashion and sport, which average 30 to 90 seconds in length and have been provided by sources such as ITN, CNBC Europe and Classic Comedy. O2 offered the services for free at launch and began charging in February 2004 for between GBP 0.35 and GBP 1.25 per item. The service allows users with appropriate handsets to make and send 10 second video clips to video phones or to an email address via mobile multimedia service (MMS), charged at the normal MMS rate. The service in the United Kingdom was supported by Nokia and Sony handsets and Siemens and Motorola will also offer handsets.²²⁰ Film clips are on the horizon for Bell Mobility.²²¹ In February 2005, Verizon Wireless introduced V CAST multimedia offering for its 3G customers. V CAST gives users access to video clips ranging from 30 seconds to 3 minutes, 3D games and Web browsing for a monthly fee of USD 15. This fee gives users access to around 300 news, sports, weather and entertainment video clips. For some applications - including 3D games, premium short content such as exclusive sports clips and music videos - additional download fees apply, but there are no airtime charges for downloading these services. For 3D Games, users can opt to pay between USD 2.49 and USD 2.99 for monthly access or, for most games, users can obtain unlimited use for a fee of between USD 8.99 and USD 9.99. Music videos cost USD 3.99, and access to premium sports content ranges from USD 0.49 per clip to USD 0.99 for premium clips. Some content is specifically developed for mobile users, such as mobisodes based on popular television series and formatted especially for V CAST users.²²²

Mobile broadcast services. Mobile broadcast refers to services that can be used with a mobile handheld or portable terminal. Such services may be free-to-air, can be purchased, or may be offered on a subscription basis.²²³ Mobile broadcasting involves a wide array of stakeholders: Mobile network operators, mobile service operators, broadcast network operators, broadcasters and media companies, terminal vendors, network and IT infrastructure vendors.²²⁴

Live, streamed television. MobiTV, offered by Sprint PCS, provides live, streamed television to mobile phone customers of Sprint PCS's Vision service. MobiTV has contracted with several content providers to offer a variety of channels for streaming, including music video channels. The pricing is still a bit steep for Sprint PCS customers who pay a subscription fee for the TV access and data fees as part of their Sprint service.

Enterprise applications

Most of the attention by operators and content providers has been on the consumer market. There is however ample opportunity to serve the business/enterprise markets with mobile content. Businesses must see either a rapid return on investment (ROI) or a clear competitive advantage. As enterprises look to develop a basis for the business uptake of mobile devices, whether PDAs, mobile phones or other handheld or wireless devices, ample opportunities exist for content geared to this market. As businesses look at an increasingly mobile workforce, they are seeking ways to permit secure access to corporate information over mobile platforms.²²⁵

Some early economic analysis shows that mobility has major effects on labour productivity at firm level. Computer portability and to a lesser extent wireless connectivity boosts labour productivity significantly, and new mobile and portable computing capabilities are likely to be major sources of productivity growth.²²⁶

Compelling enterprise applications allow workers to be productive out of the office. Beyond email, content delivery applications – including the ability to view documents, participate in video conferences,

and access company software tools – offer particular promise for an increasingly mobile enterprise workforce. When one considers that nearly 40% of European workers are away from their desks more than eight hours a week, there is clearly a demand for mobile email.²²⁷ According to Deloitte, “[o]ne immediate action that operators should take is to ramp up business usage of messaging, whether business to customer, business to employee or business to supplier.”²²⁸ Mermit MISP SMS uses open standards such as Java 2 Platform Enterprise Edition (J2EE) and Symbian OS to develop applications that allow businesses to improve real-time management of business processes. In one case, a large restaurant chain in Finland implemented an SMS solution to manage frequent last minute staffing replacements in its restaurants. The SMS message cost roughly EUR 0.10 to EUR 0.20 per message. By sending messages to their workforce asking for replacements, rather than attempting to phone them, the company streamlined this process and realised significant cost savings.²²⁹ A wide range of businesses are using text messages for a range of applications, including a bank that has improved customer loyalty, a car showroom that has generated servicing sales and a hairdresser that has improved yield.²³⁰

Many mobile enterprise applications are custom developed to work with the company’s specific IT network. Such customisation allows businesses to maintain their system security while allowing their employees to access crucial company data and information. Some current applications demonstrate the potential. United States-based Nextel built its business by catering to business needs. It has developed numerous applications geared toward specific corporate needs. For example, Celesta has developed an mBusiness Platform, which allows access to key business forms by mobile workers equipped with smartphones.²³¹

Mobile enterprise applications are also being implemented in the public sector. For a large public school system, Nextel worked with a J2ME applications developer to create a truancy application that provided instant access to student information. Nextel also helped a city police department to design a mobile phone application for dispatch, officer communication and access to federal, state and local computerised information files via a special law enforcement telecommunications system. Issy Mobile has developed a wireless payment solution for parking authorities. The service allows users with a prepaid card to deduct parking payments by dialing a toll free number. They receive a SMS 10 minutes prior to expiration of the parking time. The city can check whether a payment has actually been arranged by pointing a barcode scanner at the sticker and then transmitting the information to a smartphone via Bluetooth, which provide access to the customer’s account information.²³²

Information, location, and tourist services

One area with large potential is the provision of information, location and tourist information services over mobile platforms. While this area is just beginning to develop, the importance of spatial and locational information of all kinds, from simple directions and location of particular facilities to more complex spatial data, is seen to be a key area for mobile content development, and handset suppliers are beginning to provide handsets with enhanced spatial and locational features and services. Again, location-based services must be developed to comply with national privacy laws. As consumers move about, the location-specific information they need increases and is constantly changing. From maps and directions to information on tourist attractions, bus and public transportation routes and other location-driven information become a critical component to mobile content programs. Most mobile operator portals contain location-based data. Map services, such as Mappy, in France and Mapquest, in the United States, offer maps and directions for download to mobile devices, such as PDAs.

A key component to most mobile operator portals is access to location-specific information, such as restaurants locations, tourist attractions and weather information. COSMOTE (Greece) will showcase its 3G offerings during the Olympics, highlighting such features as video calling and Internet browsing. Also, a multilingual “tourist guide” uses voice recognition and location technology to direct visitors to a host of

attractions, restaurants, and beaches, as well as providing users with transportation schedules and emergency numbers.²³³ In August 2004, Primedia and MForma announced an agreement to provide the targeted consumer-driven content from About.com and Intellichoice.com to wireless platforms. Such alliances are designed to bring popular Internet consumer information resources to customers on the move.²³⁴

Other mobile content

While music and games have been a large focus of the mobile content industry, video content will open the door to an even broader array of content offerings for mobile users. Below is a snapshot of some of the variety of other content available or being developed for mobile use.

Publishing/News Services: Apart from sports information, discussed above, general news services and publishing are also going mobile. News information is generally available on mobiles for free, although certain premium services require a subscription. In the United Kingdom, T-Mobile has launched a mobile newsstand called “News Express”, which is delivered twice-daily to T-mobile handsets. The service includes four channels: news, sports, weather and entertainment, using Macromedia Flash Lite 1.1 technology. While initially free, users will subsequently be charged a fee for the service. T-Mobile expects to expand its offering to other news and lifestyle magazines, essentially creating a virtual newsstand for its mobile subscribers. One report suggests that newspapers, while likely to be slow to embrace the mobile environment, will find many benefits. Mobile interactivity allows readers to communicate quickly and easily with news organisations. Another benefit is the increased ability to target news, and advertising, to specific audiences.²³⁵

LexisNexis, a provider of legal news and business information services, has worked with Blackberry to create new search capabilities for that mobile platform that makes it easier to search and obtain its databases while on the move.²³⁶ Another development is the extension of the popular Web log into the mobile environment.²³⁷

A programme funded by the EC’s eContent Programme called MINDS is a consortium of news agencies, publishers, technical partners and carriers in Europe. The group aims to facilitate delivery of compelling news content in the mobile environment, including real time news, personalised news and even regional paper pictures to mobile users.

Some trade and technical publications have used SMS and email to deliver articles to non-subscribers. Users send an SMS to the publisher identifying the article and receive the article in a PDF. The Finnish Taxpayers’ Association offers this service with its trade magazine for EUR 1.5 per message paid on the mobile phone bill.²³⁸

Wireless payment services. One developing mobile application is access and use of financial services for wireless payments using the mobile phone. Introduced in June 2004, DoCoMo’s FeliCa mobile wallet service – QUICPay – enables customers of its iMode service to use their cell phones as a debit card. Users can make payments, check balances and payment records with the service. In July 2004, the service was enhanced to allow users to access their JCB credit cards via the IC chip, with charges appearing on their credit card statement. Other credit card companies are expected to be added in the future.²³⁹ Combining these payment capabilities with content offering may facilitate use and access to a variety of mobile content. See also OECD work on Online payment systems for e-commerce.

Branding/Advertising. Branded mobile services are becoming more common. In an effort to solidify and extend their brands, several companies have branched into the provision of mobile content. Virgin, 7-Eleven, Tesco and MTV all offer branded mobile services. These companies are MVNO service providers

with content, phones and the look and feel all tailored to their brands. Disney, Time Warner and Wal-Mart have indicated that they are also exploring this option.²⁴⁰

Messages. SMS and MMS are not used solely for user-generated content, although there is certainly a substantial amount of user messaging. Mobile users can now opt to obtain SMS/MMS messages tailored to their interests. For instance, Airborne Entertainment allows customers to sign up for daily text messages from Deepak Chopra. Crazyfunbabe produces content focused on young women, aged 16 to 24 and works with Telus and Verizon in North America and Virgin Mobile in the United Kingdom.²⁴¹

Gambling and adult entertainment. Despite initial scepticism over whether adult entertainment would migrate to the mobile platform, early indications suggest that there is consumer demand, although some operators hesitated to provide access to such services. Nevertheless, the revenues are attractive and several adult entertainment companies have entered the mobile market. Significant market opportunities also seem to exist in the case of gambling. For example, in the United Kingdom, where gambling laws are more relaxed than for example in the United States, mobile gambling is developing rapidly. As with the Internet, gambling and adult entertainment services have proven popular on mobile devices through some mobile operator portals. Mobile gambling involves the ability of a user to bet money. Manufacturers are also exploring mobile betting capabilities. Sporting events present likely candidates for mobile gambling. Both mobile gambling and adult entertainment implicate a variety of government policies and regulations targeted to protection of minors and restrictions on gambling.²⁴² As IP access on mobile devices becomes more commonplace, these policy concerns are likely to take on greater importance, especially in light of the high proportion of youth users.

Public safety information. Mobile devices are uniquely positioned to assist authorities in dissemination of public information. One recent application by Nextel shows and innovative use of the mobile networks to advice the public. Nextel's AMBER Public Alert SMS system, launched July 2004, will enable text alerts that are timely, unaltered and geographically targeted to be sent to mobile users through the Emergency Alert System (EAS).²⁴³

Policy implications

Mobile content lies at the centre of digital convergence. Implementation of many of the policy recommendations from the OECD Council Recommendation on Broadband Development will have a real and direct impact on the development of mobile content. These recommendations, set forth in Box 1 at the start of this paper, provide broad directions for the development of all broadband industries, including mobile content.

In many OECD member countries, content policies vary depending on the specific platform over which the content is delivered. Many OECD member countries are in the process of realigning their regulatory regimes to deal with convergence in light of the disparities that have arisen as Internet content has proliferated. The mobile content area highlights the need for policies that are not platform-dependent. While many of the current policy debates pertaining to the Internet are relevant to the mobile environment, it is crucial that as laws and regulations are revised to account for Internet content, they are not tied to the wireline Internet. Most of the same issues also arise when the Internet is accessed over wireless networks. As mobile content providers seek to tap into global markets, they face not only cultural issues, but also disparate regulatory issues. In a recent report to the European Commission, the issue was highlighted as follows:

“The management of content regulation where operators and service providers operate across national borders creates several challenges for regulators due to the different cultural and legal standards. In addition, the variety of content and services categories which are subsumed under the general heading

of mobile entertainment (e.g. games, ringtones and logos, video clips, music, etc.) create an increasingly complex set of regulatory issues for the mobile entertainment industry.”²⁴⁴

Consolidated regulatory authority

One area that is particularly relevant is the increasing trend toward consolidated regulatory authority for electronic communications. This process is consistent with the OECD Council Recommendation on Broadband Development’s call to consider “that convergence of platforms and services requires the reassessment and consistency of regulatory frameworks.”²⁴⁵ Several OECD member countries have or are in the process of realigning regulatory authority to move away from platform-centred regulatory regimes, where regulations that apply to providers and content vary depending on how the content is delivered. For instance, many countries maintained different rules and agencies for broadcast and telecommunications content delivery.²⁴⁶ For instance, in the United States and United Kingdom, regulatory purview over both telecommunications and broadcasting fall to the same agency. In the United States, policies focus primarily on infrastructure rather than on content.

Infrastructure regulation

In many OECD member countries, regulations pertaining to transmission and regulations pertaining to content have been separated. For instance, in Europe, the New Regulatory Framework (NRF) specifically separates transmission and content regulation and seeks to create a unified regulatory structure for various transmission technologies.²⁴⁷ “[T]he NRF does not apply to content. Content remains subject to other rules set out in European or national regulation. Limitations are imposed on the Member States, particularly in areas where the European legislator has already intervened.”²⁴⁸ Because of the strong link between the delivery platform and the type of content that can be delivered, however, transmission policies can still impact the overall outlook for mobile content. In the United States, infrastructure regulations fall within the FCC’s jurisdiction, including wireless, broadcast, cable and telephony. To the extent that content is regulated – for instance, children’s programming and advertising, indecency, broadcast flag (a sequence of digital bits embedded in a TV programme to signal that the programme must be protected from unauthorised distribution), or political access – these rules are also within the FCC’s jurisdiction. In the United States, this has not always resulted in consistent treatment for content delivered over different technologies due to legal and constitutional distinctions that are beyond the FCC’s jurisdiction. Thus, in the United States, for instance, broadcasters are held to a different standard of indecency than for cable providers. The FCC is working to conform its infrastructure regulation to minimise or eliminate distinctions in the regulatory treatment of different infrastructures. This section reviews some of the key policy considerations for infrastructure that impact mobile content.

Wireless and spectrum regulations

Policies impacting the specific transmission technology affect content. This is particularly so in the mobile environment, where development of ubiquitous wireless broadband networks – particularly 3G – is crucial to growth of the mobile content industry. OECD member countries are well underway with the transition to advanced wireless networks that can support digital content.

The investment costs in deploying 3G networks mean that network operators are keen to see the promise of mobile content realised as soon as practicable. This interest has fostered co-operative support for industry development of digital content as well as continued operator subsidies for advanced handsets. As discussed previously, the content industries have not been successful in pressuring network operators to reduce fees for downloads. Users faced with large data or minute charges are discouraged from purchasing digital content over mobile platforms, and depressed consumer demand benefits nobody.

Two policy considerations that may reduce investment costs faced by mobile operators include spectrum trading and network sharing allowed in general for antenna sites but not switches. Spectrum trading [see DSTI/ICCP/TISP(2004)11/FINAL], “Secondary markets for spectrum: Policy issues”²⁴⁹] gives license holders the ability to transfer some or all of their spectrum rights and obligations to a third party. In theory, spectrum trading is one of the policies that will lead to a more efficient use of spectrum, by permitting the rights to be obtained and used by entities more efficiently through the creation of secondary markets. The United States has authorised secondary markets for some spectrum bands. In August 2004, Ofcom issued a statement outlining its intention to phase in regulations to permit spectrum trading over the next four years.²⁵⁰ Spectrum trading policies are also often accompanied by a relaxation of license provisions specifying a particular use for the spectrum in question.

In contrast to spectrum trading, network sharing involves sharing all or part of the network infrastructure between mobile operators. A number of European carriers have already reached network sharing agreements, such as Group3G and KPN in Germany.²⁵¹ One area where this is helpful is in permits for antenna sites, which have become increasingly difficult to obtain. Network sharing allows operators to offer services in areas where their networks have not been built, expanding their coverage. Many countries permit network sharing, but often with specific conditions to ensure that competition is not distorted. To the extent that either spectrum trading or spectrum sharing policies encourage faster deployment of broadband wireless networks or reduce costs for carriers, then they could speed broadband infrastructure build-out necessary for delivery of high-value content.

As discussed above, most OECD member countries are well underway with implementation of 3G initiatives. Some countries, however, have been slower to issue licenses. One of the keys to 3G deployment will be ubiquity. The European Union has adopted UMTS as the 3G technology and put in place benchmarks for country deployment. Many countries missed these initial dates, although as illustrated in Table 1, most are underway now with UMTS deployment. In contrast, the United States has not mandated any particular timeframe or technology for 3G deployment. The consequence is that the United States lags many other regions in deployment of 3G, and there are several competing technologies for advanced wireless communications. Strong support of 3G and other wireless broadband policies by OECD member country governments will encourage the infrastructure development necessary for a robust mobile content industry.

In the mobile content arena, Mobile Virtual Network Operators (MVNOs) have been especially beneficial, allowing operators and content providers to collaborate in the development of content targeted to a specific market group, such as the Disney and MTV MVNO offerings. As discussed in OECD’s report on 3G Deployment, DSTI/ICCP/TISP(2003)10/FINAL, MVNOs have not been authorised in all countries and the regulation of MVNOs varies widely. Branding opportunities facilitate mobile content dissemination and MVNOs are one attractive branding approach.

Broadband policies

Numerous OECD member states have active broadband development policies. These policies are typically aimed at infrastructure development, a crucial piece of the mobile content value chain. It is increasingly important that these broadband policies remain or become technologically neutral. Promotion of wireless broadband, particularly 3G or integrated unlicensed technologies, will further the development of mobile infrastructures that can support a broad range of mobile content, including video. Accordingly, policies to promote broadband regardless of platform and therefore including wireless platforms will spur development of greater wireless bandwidth necessary for content to develop.

Broadcasting and cable policies

Another set of infrastructure regulations apply to broadcasting, cable and radio activities. Often these regulations were tied quite closely to content policies for the material delivered over these facilities. One reason for these close ties was the considerable influence that mass broadcasts had on the public at large. Originally tied to spectrum scarcity rationales and a corresponding scarcity of outlets, broadcast regulation focused on plurality and localism. Today, these policies vary considerably from one country to the next, and many OECD countries are currently reviewing their regulatory regimes.

Efforts in Europe and in the United States are aimed at eliminating disparities in the treatment between different infrastructure technologies. In Europe, the underlying transmission facilities are governed by the NRF, which are being implemented by each of the member states to ensure technological neutrality. Content policies are specifically excluded from the NRF directive. In the United States, the FCC recently attempted a comprehensive revision of its broadcast policies and rules that prevented cross-ownership of different media types. This initiative foundered, however, as the FCC's rules were appealed and important portions of them overturned and returned to the FCC for review.²⁵²

As content industries develop, cross-ownership restrictions will significantly impact the nature of consolidation within the various industries that interact in the mobile content value chain. As discussed above, these industries are taking various approaches to consolidation, integration and co-operation. The regulatory rules that govern the nature of these relationships may in significant measure determine how this process will progress.

R&D and projects to facilitate the development of mobile content

The final provision of the OECD Council Recommendation on Broadband Development is for the "[e]ncouragement of research and development in the field of ICT for the development of broadband and enhancement of its economic, social and cultural effectiveness."²⁵³ Demonstration projects or projects where governments invest money to increase the speed of innovation/to bring together relevant market players facilitate the development of content markets. There are many examples of such efforts underway in Europe and Asia. For example, the EU'S Information Society Technologies work plan includes the following initiatives:

- **Mobile and wireless systems beyond 3G:** To realise the vision of "Optimally connected anywhere, anytime". Early preparatory work has characterised Systems beyond 3G as a horizontal communication model, where different terrestrial access levels and technologies are combined to complement each other in an optimum way for different service requirements and radio environments. They may include the personal level (personal/body area/*ad hoc* network) the local/home level (W-LAN, UWB) the cellular level (GPRS, UMTS) the wider area level (DxB-T, BWA)²⁵⁴
- **Networked audiovisual systems and home platforms:** To develop end-to-end networked audiovisual systems and applications, and open trusted and interoperable multimedia user platforms and devices, notably for broadcasting and in-home platforms with full interactivity capacity.²⁵⁵
- **Cross-media content for leisure and entertainment:** to improve the full digital content chain, covering creation, acquisition, management and productions, through effective multimedia technologies enabling multichannel, cross platform access to media entertainment and leisure content in the form of film music, games, news and alike.²⁵⁶

- **Applications and services for the mobile user and worker:** To foster the emergence of a rich landscape of innovative applications and services for the mobile user and worker and to support the use and development of new work methods and collaborative work environments.²⁵⁷

In the United Kingdom, as part of DTI's 4-year GBP 370 million Technology Programme, one of the key themes is collaborative research and development for pervasive systems, including mobile content.

The German MobilMedia Project includes five projects, funded EUR 15 million.²⁵⁸

- **MoBüd** –The project MoBüd mobilises the services of the public administration in providing support where the citizens are located, for example in a shopping mall.
- **Mobiko** - The mobile assistant supports building constructors in all their activities and duties, even displaying construction plans and legal issues on the site.
- **V-Card** - The goal of this project consists in the implementation and testing of a universal message-hub in order to augment the mobile communication with special features like personalised video streams on the mobile device.
- **HyNet** – This project combines point-to-point communication via GSM networks to distribute personalized information and DAB (Digital Audio Broadcasting) for generic issues. The use case is the linkage of route finding and new navigation functions.
- **MoMa** - The research goal of the project MoMa – Mobile Marketing - consists in developing the technical bases for mobile marketing and LBS services, for example context sensitive pull services, user friendly push services and smart pull services based on mobile agent technologies.
- **INA** – Mobile solutions for the agricultural industry. From automatic settings for agricultural machinery over the air to complete tracking and documentation for agricultural food production throughout the process (from seeding to the consumer) INA supports a highly traditional industry with mobile technology.

Government support for development of local content. In Europe and parts of Asia, there has been significant government support for development of indigenous content. In Europe, partially government-owned telecommunications companies provide money for research and development of mobile technologies. In addition, many member states financially support content development. Government support varies from sponsorship for local content industries at major industry events, fact-finding missions to improve local company competitiveness, sponsorship of local or regional forums to specific government support for development of content by local developers. For example, the French Government is offering grants toward development of new games, with the government paying up to 40% of the development costs of a new game.²⁵⁹ [More information on policies for online computer and video games development is in OECD Digital Broadband Content: The online computer and video game industry DSTI/ICCP/IE(2004)13/FINAL].

In Finland, Nokia provides considerable support to content developers through forum.Nokia.com. The Finland National Technology Agency (TEKES) allocated EUR 39 million for mobile entertainment projects, technology development and game production. In addition, there are pan-European support programmes for audio-visual content. Media Plus, an EU-funded initiative, supports production of European content. Other EU countries have curricula on games funded by the government.

In the Asia-Pacific region, there have been several government-funded approaches to game development. In Japan, CG-Arts and the government funded Toward a Culturally-Oriented Nation, and the Japan Arts Fund and Arts Plan 21 provide financial support for performance expenses.

In Korea, Game Infinity by the Korea Game Development & Promotion Institute is a government sponsored non-profit agency to foster the growth of Korea's game industry. In Australia, the government has supported the local computer game industry through the Game Developers Conference and developed several plans aimed at positioning Victoria as Australia's computer games centre. Canada also has a proactive strategy to attract and nurture the video and computer game industry.

Public sector information

Governments generate very large amounts of content that is susceptible to be used over mobile platforms. By setting the example, and getting crucial government information to mobile users as they move about, governments can introduce mobile users to the value of obtaining content on mobile devices. Accordingly, government initiatives to bring content to mobile are particularly attractive as a means of facilitating up-take and use of mobile content. In the EU, the eContent program of the European Commission specifically contemplates such efforts by government. "Applications based on, amongst others, public sector information can become a catalyst"²⁶⁰.

By way of example, in the United Kingdom, Project Nomad (www.projectnomad.org.uk) is dedicated to mobile computing in local authorities. The objective is to create, under one umbrella, a comprehensive set of deliverables that should enable any local authority wishing to establish a mobile computing operation to do so with ease and confidence.

IP, DRM, technical standards and interoperability

The OECD Council Recommendation on Broadband Development calls on policy makers to develop "[r]egulatory frameworks that balance the interests of suppliers and users, in areas such as the protection of intellectual property rights, and digital rights management without disadvantaging innovative e-business models."²⁶¹ For content providers, development and enforcement of copyright and other IP rights are crucial. The lessons from the music industry in the Internet environment drives many content provider concerns today. While not radically different from the issues raised in the Internet context, the mobile environment does pose some additional challenges. It is crucial that efforts aimed at protecting digital content over wireline infrastructures take into account the mobile content industry. This means not only including mobile content within the protections accorded to other digital content, but also ensuring that the protection mechanisms include technologies, requirements and obligations that can be implemented on the mobile platform.

Despite co-ordinated international agreements on IPR (in particular copyright) established at WIPO, OECD member country copyright, patent and other IP protection schemes vary. Not every OECD member country has ratified the WIPO Internet treaties at this time. National IP laws are often at odds with one another, making it difficult for companies to comply. Accordingly, managing IP rights globally continues to be a major challenge for content providers and distributors, including mobile operators. In Europe, the European Commission has recognised these difficulties. Currently, in the EU copyright law is governed by each individual state. In April 2004, the European Commission called upon the legislature to enact Community legislation on collective rights management. Uniformity across Europe would speed the development of mobile content, as licensing across multiple jurisdictions has been an obstacle to the introduction of some high-value content, notably music. The European Commission has highlighted this area as requiring continued vigilance regarding mobile content.²⁶²

Rights and liabilities under various copyright regimes differ and create managerial challenges for companies offering digital content on a global scale. Industry efforts at Digital Rights Management for mobile platforms are making progress. Key issues in this area include interoperability of DRM technologies and consumer acceptance of the changes such technologies place on the use of digital content. These issues are primarily industry's to resolve, but there is recognition at the European Commission that government efforts may be required on issues of interoperability and DRM to actively facilitate industry efforts.²⁶³ Allowing industry to resolve issues with government initiatives to facilitate those activities is consistent with the "[r]ecognition of the primary role of the private sector in the expansion of coverage and the use of broadband, with complementary government initiatives that take care not to distort the market."²⁶⁴ When it comes to the intellectual property right framework, OECD countries are adopting their frameworks. Signatories of the new WIPO Treaties (WCT and WPPT) have pledged to create "adequate legal protection and effective legal remedies against the circumvention" of technological protection measures (TPM).²⁶⁵ These legal protections may be needed so that DRMs may operate as intended.

In addition, some government-mandated copy protection mechanisms have emerged. A notable example is the Broadcast Flag requirements adopted in 2003 by the US Federal Communications Commission (FCC). On 4 November, 2003, the FCC adopted rules targeted at stemming illegal Internet redistribution of digital broadcast programming. Under these provisions, all digital broadcast receivers must be capable of recognising and giving effect to the so-called "broadcast flag" by July 2005. The flag is digital coding that signals receivers to limit the indiscriminate redistribution of broadcast programming. In order to effectuate the rules, the equipment must meet the FCC's "compliance" and "robustness" rules. The compliance rules dictate how the content may be used with compliant devices, and the robustness rules are designed to prevent "hacking" of the system. The FCC established an interim process for certification of compliant technology, and several technologies have received certification.

Another area where co-ordination among OECD member countries could benefit the development of mobile content DRM relates to enforcement efforts against piracy. Currently, nationally-set penalties and enforcement mechanisms vary considerably with OECD member countries, making rights enforcement complicated and difficult.

In July 2004, the UK government led the initiation of the Creative Industries Forum on Intellectual Property. The forum is a cross-Government body with representatives from across the creative industry sector, including film, music, publishing, design and computer games, as well as telecommunications companies, hardware manufacturers and consumer groups. The goal is to bring these various stakeholders together to maximize the benefit from appropriate intellectual property right protection.

Competition policies

Another area presenting significant policy issues for the current mobile content value chain is competition policy. As a nascent industry with major players, there is a vital role to be played in ensuring that control over certain aspects of the value chain is not leveraged to preclude development of some or all industry segments. At the same time, there must be flexibility in competition policy to permit necessary monitored arrangements that will enable industry participants to develop and thrive. Ultimately, this is an area where vigilant activity by competition authorities with respect to mergers and acquisitions will likely be necessary.

Box 6. EU Competition policy focus — Mobile sports rights

As established industries come together in the mobile content arena, each is entering new territory that brings its own expectations and perspectives. This is particularly obvious with respect to media rights for sports events. Many mobile operators consider sport entertainment to be of crucial value to their customers and critical to successful development of mobile content offerings. The significant number of sports-related offerings already on the market seems to support this view. Yet, media rights for sports events have not traditionally considered mobile platform distribution. This creates significant issues for providers trying to negotiate for such rights. The rights are often too broad for appropriate use on a mobile platform, may have been subsumed under rights long since licensed to another platform or fail to have payment alternatives that are significantly tailored to make economic sense for the more limited mobile uses contemplated.

In the United States, sport rights have not raised nearly the same issue for mobile providers as in Europe.²⁶⁶ A robust competitive market for sports rights across new and old media exists in the United States. Accordingly, there has not been a need for competition authorities to intervene.

The concern is sufficiently strong in Europe, however, to have prompted competition authorities to open investigation into sports rights on mobile platforms in 2004. Competition law concerns include barriers to entry, including the inability to obtain premium programming, excessive pricing of premium programming, conditions on offering additional services (for instance, the 2010 Olympic tender document requires licensees of game content to provide hundreds of hours of traditional coverage, a practical impossibility over mobile platforms), outright refusals to supply content. For instance Telecom Italia Mobile (TIM) has been refused permission to retransmit football highlights because of concern over copyright ownership. Much significant content comes from state-owned or licenced terrestrial broadcasters, which own the rights to broadcast premium sports as a result of government regulations. Another concern is the threat of foreclosure, due to perceived cannibalization of existing services. Other concerns are collusion and bundling.²⁶⁷

As a result of its investigation into mobile sports rights, the EC announced that it had reached preliminary agreement to modify media rights for games transmission starting in the 2006-2007 season. The changes are designed to ensure that German football matches will be provided on 3G handsets.

Another area where competition authorities may be required to direct their attention is to cross-subsidies between and within countries.²⁶⁸ As mobile operators with licences across various countries offer a variety of new services across their networks, spanning several countries in the case of pan-European operators for instance, opportunities for cross-subsidies between 2G and 3G offerings as well as from low cost to high cost countries will proliferate. Competition authorities will be called upon to exercise their competition policies in these areas, and must exercise flexibility to ensure continued robust mobile content markets. In another area, the EC granted antitrust clearance to a package aimed at giving 3G mobile equipment manufacturers better access to patents.²⁶⁹

As industry players realign to gain a foothold in the digital environment, competition oversight is crucial. Merger and other competition controls will also play an important role in development of the mobile content market to carefully balance the positive business justifications against potential anticompetitive effects. “For instance, while vertical media mergers between content providers and delivery companies may allow parties to realise economies of scope and offer new products and services to consumers, they may also create the risk of discriminatory access to content. Similarly, while horizontal mergers may allow parties to realise economies of scale, they may also strengthen market power at the upstream and/or downstream level(s), thus triggering the risks of foreclosure effects.”²⁷⁰ The recent merger of music labels Sony and BMG provides an example of the concerns raised by such a horizontal merger. European and United States regulators gave this merger significant scrutiny, particularly given independent label and artist concern that the merger would result in foreclosure (see also the OECD Music study). And while many industry participants raised significant concerns, both agencies ultimately approved the merger. Other recent decisions by the European Commission have focused on content as well.

In Europe, the competition law provisions in Articles 81 and 82 of the EC Treaty prohibit restrictive agreements between competitors and abusive conduct by dominant operators. Merger Control Regulation prevents mergers that “significantly impede regulation.”²⁷¹ Media rights markets in general, and in the

mobile environment in particular, can be greatly influenced by competition law decisions. Indeed, in addition to the specific rules set out in competition decisions, either those that relate specifically to selling and buying of media rights or those pertaining to mergers, the review process often results in significant concessions or commitments by the parties.²⁷²

Privacy and security²⁷³

Privacy and security are key areas of policy and regulation pertaining to electronic commerce, including the delivery of mobile content online. The OECD Council Recommendation on Broadband Development specifically recognizes that it is important to implement “a culture of security to enhance trust in the use of ICT by business and consumers, effective enforcement of privacy and consumer protection.”²⁷⁴ Extensive policy work has already been undertaken at the OECD in these fields, and should be taken into consideration also in the mobile environment.

As regards the protection of privacy, *Privacy Online: OECD Guidance on Policy and Practice* (2003), addressed to OECD member countries, business and industry, and individual users, focuses on the implementation of the 1980 *OECD Guidelines on the Protection of Privacy and Transborder Flows of Personal Data* in the online environment. The Guidelines, and subsequent guidance for privacy on-line, offer recommendations concerning the collection and management of personal information, which are applicable with regard to any technology used for collecting and processing personal data. With respect to the mobile environment, specific privacy issues to be addressed may include in particular the processing of personal location information, in addition to the processing of transactional information (e.g. “click stream data”, or personal information about payments) common in “fixed” e-commerce.

As concerns the security of information systems and networks, which is equally important for delivering mobile content, the 2002 *OECD Guidelines for the Security of Information Systems and Networks: Towards a Culture of Security* call for a greater awareness and understanding of security issues, including the need to develop a “culture of security”. The Guidelines apply to all “participants” (governments, businesses, and end users) according to their role in the information society. Availability, integrity and confidentiality of content delivery (e.g. by tackling worm/virus/malicious content problems) should also be ensured in the mobile environment, based on the Guidelines and ongoing work related to their implementation.

Consumer protection

In the area of consumer protection, the OECD Council Recommendation on Broadband Development calls for policies that ensure consumer protection, including cross-border co-operation.²⁷⁵ Work is underway by the Consumer Policy Committee to examine new services that take advantage of mobile communications technologies, but which may raise consumer protection issues regarding, for example, the use of location information for advertising purposes, the effectiveness of information disclosures on small screens, and the use of mobile devices as a payment mechanism. This examination will take into account the *OECD Guidelines for Consumer Protection in the Context of Electronic Commerce* (1999) designed to help ensure that consumers are no less protected when shopping on-line than they are when they buy from their local store or order from a catalogue. In addition, work on spam policies is proceeding at OECD and in many OECD member countries. OECD has set up a Task Force on Spam which is examining potential solutions that can be taken at the international level to help combat spam (see www.oecd.org/sti/spam).

Payment and micro-payment issues

Facilitating global transactions and micro-payments will be crucial to development in this area.²⁷⁶ In general, satisfactory micropayment systems have been slow to develop at national level and cross-border

micropayment systems are even more problematic. The overwhelming majority of online payments for e-commerce are made with credit cards except in a few countries where e-banking solutions are available. Alternative systems have been slow to develop, in part due to regulatory constraints and because they have had difficulties reaching a critical mass. In the European Union, work undertaken for the European Commission by the Institute for Prospective Technological Studies concludes that “Europe cannot wait for the emergence of a dominant operator capable of internalizing the financial infrastructure. Further European action needs to be taken here, and the financial infrastructure must be developed in such a way as to support growth, innovation, competition and new entrants (guarding against anti-competitive effects).”²⁷⁷ The report calls on the European Commission “to take an active role in providing the legal and procedural foundation for a functioning pan-European micro-payment system.”²⁷⁸ For a review of work on online payment systems for electronic commerce including micropayment issues see OECD work on Online payment systems for e-commerce. Governments can facilitate online payment solutions by clarifying the regulatory frameworks applying to non-bank payment intermediaries in countries and regions which have not yet done so. This is particularly crucial in the area of micropayments where non-bank intermediaries may play an important role in providing payment services, e.g. for content.

As business models evolve for digital content, evolution in payment mechanisms will play an integral role in for all varieties of mobile content. At a European level, the European Commission is reviewing the e-Money Directive and working on a payment directive.²⁷⁹ The e-Money Directive, which seeks to protect consumers from unscrupulous financial practices, is viewed by some as an obstacle to the development of e-money business models. In the United Kingdom, for example, a mobile user is able to use phone credit to buy a new ring tone from Vodafone, but not always the new Harry Potter computer game. Such concerns have been recognised and the European Commission has just concluded a consultation with industry into the effects of the Directive. One of the issues raised is the ability of mobile phone owners to use their phone credit to buy without recourse to credit cards. This is particularly important for young people who may not have credit cards but are an important market for music, games and sport. The outcome of this consultation could facilitate the development of business models for e-Money for mobile content.

Taxation issues

Tax policies can significantly influence the development and uptake of mobile content. As content developers and distributors look to global markets, managing the variety of taxation regimes can become costly. In the EU, electronic services downloads, including those over mobile phones, are subject to the Value-Added-Tax (VAT), regardless of where the selling company resides. The European Union implemented the VAT Directive in July 2003 removing tax on exports of electronic services from the EU and, at the same time, requiring collection of VAT on electronic services imported into the EU by consumers from suppliers outside. In order to facilitate collection of VAT on these imports the EU followed a recommendation in a 2001 OECD report by allowing overseas suppliers to use a simplified on-line system of registration, reporting and payment. Non-EU companies can register in the EU country of their choice for purposes of collecting the VAT.²⁸⁰

In the United States, the Federal government has not determined whether similar downloads are taxable, although under the Mobile Telecommunications Sourcing Act, states have the legal right to tax mobile download, although not every state has elected to do so.²⁸¹

At the international level, issues arising with regard to consumption taxation of cross-border electronic commerce have been addressed by the OECD. The 1998 Ottawa Taxation Framework Conditions provide that consumption taxation of cross-border electronic commerce should result in taxation in the jurisdiction where the consumption takes place. This, whilst preserving tax neutrality, raises practical difficulties in ensuring collection of consumption taxes on cross-border business-to-consumer

transactions of electronic services and intangible products (OECD, 2001 and 2003²⁸²). Collecting consumption taxes directly from the consumer is not efficient given the administrative difficulties. For cross-border supplies of goods (a far greater trade than for services and intangibles) the problems are much reduced as Customs administrations are able to ensure collection of any consumption tax due before releasing the goods to the customer. Unaccounted (*i.e.* untraceable/anonymous) payment systems could pose even greater problems for tax administrations.

Conclusions

There is growing opportunity and demand for mobile content and mobile content is viewed as a major driver of growth for the telecommunications and media industries. While still relatively new, mobile content is becoming an increasing source of digital content. As the world becomes increasingly wireless, policies that are established today for mobile content will take on increasing prominence, and it is essential that policy discussions, such as those highlighted in this report, take immediate and careful consideration of the impact on the development and dissemination of mobile content. The review undertaken in this study leads to the following conclusions.

- Mobile content – particularly music and games – is viewed as an emerging major industry. Markets are most developed in Asia, with very large growth potential in North America and Europe.
- As mobile content markets develop, numerous players are vying to control various parts of a complex and changing value chain. These include content owners and developers, content aggregators, mobile operators, handset manufacturers and various other companies offering enabling technologies. At the same time, all players (and in particular content and service providers) should increasingly have a shared objective of deriving revenues from digital content based on adequate protection of content, on the one hand, but also the removal of barriers to new business models on the other.
- Ease of use and personalisation are essential to broad user uptake of mobile content.

For mobile content markets to flourish, certain technological predicates must be in place. There has been significant advancement in these technologies recently. Continued growth of mobile content depends on fostering these technologies.

- Broadband wireless networks, particularly 3G, will provide the bandwidth necessary to deliver increasingly sophisticated mobile content. Earlier generation wireless networks have seen increasing customer demand for content such as ringtones, music downloads simple games. As providers increase the bandwidth of networks, the opportunities for mobile content will expand.
- Handset manufacturers are working with content developers, mobile operators and other industry participants to develop handsets and features that will facilitate access to and use of mobile content. To complement these initiatives, industry and government must facilitate the development of standards and interoperability guidelines.
- Technologies crucial to enabling broad content dissemination, including marketing, distribution and billing technologies, are increasingly available and will encourage further development of mobile content. Today, mobile portals provide many of these capabilities and thus occupy a primary position in the mobile content value chain. Currently, most users obtain content on mobile devices from their mobile operator through the operators' branded mobile portal that provides content

from providers with whom the mobile operator has an established relationship. As new technologies are introduced, this position could change.

- Pricing of mobile content can be a source of confusion for some customers. A lack of pricing information can leave customers unsure of the cost of acquiring or using content, due in part to data transfer costs.
- As with online content, piracy, IP rights and Digital Rights Management issues are being addressed by the mobile content industry. It is essential that as these policies develop globally, and that consideration is given to mobile platforms.

No single dominant value chain has emerged and it is likely that different models will prevail for different types of mobile content, reflecting the differing nature of the industries involved and the different policies that apply to different types of content.

- While many possibilities exist for generating attractive mobile content, to date music – especially ringtones and most recently music downloads -- is a key source of mobile content today. Growth in the mobile music markets involves song reproductions or snippets that do not raise as much industry concern over copying. As offerings become more full track-oriented, however, these concerns will be of increasing prominence.
- Games are also a key focus of many mobile content developers. Increasingly, games are being developed for mobile platforms. To date, the market has focussed on fairly simple embedded games, but there is a growing market for more complex, interactive and multiplayer mobile games. Industry standards and interfaces would greatly enhance development of mobile games by allowing developers to address a broader market. As more sophisticated games are developed, the programs can be adapted for enterprise training and development and educational purposes.
- A variety of other content is being provided over mobile platforms, including video, enterprise and information and location services. Some of this content, including adult and gambling, raises unique policy issues that are not general to other types of mobile content. Location-based services also implicate privacy concerns.

At this crucial juncture in the development of mobile technologies, government policies across an array of policy areas can have a significant impact.

- Because broadband wireless deployment is crucial to further advancements in mobile content, infrastructure policies, including broadband, wireless and spectrum policies are essential to ensuring that wireless network developments keep pace with the content being transmitted over those networks.
- Numerous R&D projects are designed to facilitate the development of mobile content. These, along with public sector use of mobile content applications, can forge new business models and promote user acceptance.
- IP, DRM and technical standards are essential to continued growth of mobile content. Industry and government-facilitated policies to encourage consensus and development in these areas must also take into account the mobile environment.
- Competition is essential to ensure that industry participants do not foreclose mobile content from new technological platforms.

- Mobile platforms raise issues of privacy and security that must be addressed by ongoing policy initiatives in this area, and consumer protection in a mobile environment must be directly addressed.
- Payment and micro-payment policies should specifically consider the mobile content markets.
- As content flows globally, taxation policies should consider the significant impact they can have on the uptake of mobile content.

NOTES

¹ The June 2004 panel is summarised in OECD (2004), *Digital Broadband Content, Panel and government session*, DSTI/ICCP/IE(2004)15/FINAL, www.oecd.org/dataoecd/53/39/34579763.pdf.

² Accenture, "Competing on Digital Content: The New Frontier of Value Creation" (2004) at 1.

³ OMA, *White Paper from the Broadcast Services BOF* (Mar. 30, 2004).

⁴ "Capturing User & Business Requirements", eContent, MUSICAL, Deliverable D1.1, EDC-22131 – Musical/27193 (December 12, 2002) at 10.

⁵ PriceWaterhouseCoopers, "Global Entertainment and Media Outlook: 2004-2008" (2004) at 17.

⁶ See Pearce, James, "Death Knell for Mobile Content Providers", ZDNet Australia (Aug. 10, 2003) (reporting on the findings of Graham Brown in his report *Winning and Losing in Mobile Content*).

⁷ Garfield, Larry, "Mobile Data Revenue to Surge", infoSync World (April 10, 2004).

⁸ Andersen, "Digital Content for Global Mobile Services", Final Report to the European Commission Directorate-General Information Society (2002) at 12.

⁹ Ibid at 184.

¹⁰ Ibid at 153, 209.

¹¹ Sharma, Dinesh, "IDC: games, Video to Fuel Europe's Mobile Market", CNET News (May 21, 2004).

¹² Yankee Group, *Press Release:* "Data Will Account for All Mobile Revenue Growth in Western Europe until 2008" (June 17, 2004).

¹³ "Music Firms Warned Over Ringtones", BBC News (July 8, 2004).

¹⁴ Kharif, Olga, "America, Get Ready for "Ringbacks", Business Week Online (June 28, 2004).

¹⁵ Informa/Media Group, *Mobile Music 2ed.*, Press Release (June 2004).

¹⁶ Burt, Tim, "EMI Savours Growing Global Digital Pie", *Financial Times* (July 3, 2004).

¹⁷ Kangas, Sonja, *Benchmarking Report*, MGAIN Deliverable D6.2.2 to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (December 31, 2003) at 49, 56, 64.

¹⁸ PriceWaterhouseCoopers, *Global Entertainment and Media Outlook: 2004-2008 – Video Games Chapter* (2004).

¹⁹ Behrendt, Wernher, *et al*, *Dossier on Digital Games & Learning – Paradigms, Markets and Technologies*, EP2010 (Sept. 2003) at 27.

²⁰ Bohlin, Erik, *et al.*, *Prospects for Third Generation Mobile Systems*, An ESTO Project Report, IPTS Technical Report prepared for the European Commission Joint Research Center (June 2003) at 48.

- 21 Kangas, Sonja, *Benchmarking Report*, MGAIN Deliverable D6.2.2 to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (December 31, 2003) at 56.
- 22 Ollila, M., *et al*, *Mobile Entertainment Business*, MGAIN Deliverable D5.4.2 to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (September 29, 2003) at 7.
- 23 Ibid at 6.
- 24 "The Consolidation of Global Mobile Content", Forbes.com (June 9, 2004).
- 25 Weller, D. (Verizon), "Evolution of the Value Chain: Adaptation for Digital Content Delivery in a Broadband World", presentation to the OECD WPIE Broadband Content Panel (June 2004), available under www.oecd.org/dataoecd/58/34/32145282.pdf.
- 26 Presentation available under www.oecd.org/dataoecd/58/34/32145282.pdf. Panel information under www.oecd.org/sti/digitalcontent.
- 27 Ollila, M., *et al*, "Mobile Entertainment Business", MGAIN Deliverable D5.4.2 to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (September 29, 2003) at 6.
- 28 Noam, Eli M., "Access of Content Providers to Wireless Mobile Carriers: The Problem of the Walled Airwave", Presentation at Columbia University's CITI (April 2002) at 5.
- 29 "Capturing User & Business Requirements", eContent MUSICAL, Deliverable D1.1, EDC-22131 – Musical/27193 (December 12, 2002) at 47.
- 30 Bohlin, Erik, *et al*, "Prospects for Third Generation Mobile Systems", An ESTO Project Report, IPTS Technical Report prepared for the European Commission Joint Research Center (June 2003) at 63.
- 31 3G Americas, "The Evolution of UMTS : 3GPP Release 5 and Beyond" (June 2004) at 6.
- 32 OECD, *Developments of Third-Generation Mobile Services in the OECD*, DSTI/ICCP/TISP(2003)10/FINAL at 6, under www.oecd.org/sti/telecom.
- 33 Ibid at 7.
- 34 Antikainen, H., S. Kangas, S. Vainikainen, "Three Views on Mobile Cross Media Entertainment", MGAIN Research Report TTE4-2204-17 (Mar. 22, 2004) at 21.
- 35 Shillingford, Joia, "Rise in Subscribers Set to Follow 3G Launches", FT.com (May 12, 2004).
- 36 Decima, "Unwired 'Net: Consumer Attitudes on the Wireless Internet Using Personal Wireless Devices" (June 2003) at 38, 69.
- 37 Taylor, Paul, "Dialling for Dollars with Data", FT.com (July 1, 2004).
- 38 3G Americas, "The Evolution of UMTS : 3GPP Release 5 and Beyond" (June 2004) at 3.
- 39 Ollila, M., *et al*, "Mobile Entertainment Business", MGAIN Deliverable D5.4.2 to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (September 29, 2003) at 41.
- 40 Bohlin, Erik, *et al*, "Prospects for Third Generation Mobile Systems", An ESTO Project Report, IPTS Technical Report prepared for the European Commission Joint Research Center (June 2003).
- 41 Costikyan, Greg, "The Mobile Platform Wars", The Themis Group (2004).
- 42 Deloitte, "Mobile and Wireless Predictions" 2004 (2004) at 7.
- 43 Raiskinen, Ilkka, "Mobile Lifestyles", FT.Com (June 28, 2004).

44 Van Veen, Nick, de Lussanet, M., "What Operators Want from 3G Phones", Forrester Research (August 11, 2004) at n.2.

45 Ibid.

46 Bohlin, Erik, *et al.*, "Prospects for Third Generation Mobile Systems", An ESTO Project Report, IPTS Technical Report prepared for the European Commission Joint Research Center at 48 (June 2003).

47 Van Veen, Nick, de Lussanet, M., "What Operators Want from 3G Phones", Forrester Research (August 11, 2004).

48 Costikyan, Greg, "The Mobile Platform Wars", The Themis Group (2004).

49 Van Veen, Nick, de Lussanet, M., "What Operators Want from 3G Phones", Forrester Research (August 11, 2004) at n.7.

50 Smith, Brad, "AT&T: UMTS As Good As EV-DO", *Wireless Week* (July 20, 2004).

51 Rush, Susan, "QUICPay Serves DoCoMo's M-Wallet", *Wireless Week* (July 20, 2004).

52 Malkani, Gautam, "T-Mobile Urges Mobile Music Standard", *Financial Times* (June 29, 2004).

53 Burt, Tim, "Universal to Launch Pocket CD Format", *Financial Times* (June 21, 2004).

54 Malkani, Gautam, "T-Mobile Urges Mobile Music Standard", *Financial Times* (June 29, 2004).

55 Ollila, M., *et al.*, "Mobile Entertainment Business", MGAIN Deliverable D5.4.2 to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (September 29, 2003) at 41.

56 Ibid at 42.

57 Ibid at 41.

58 Ibid at 41.

59 Pelkonen, Tommi, "Mobile Games", ACTeN E-Content Report 3 (February 2004) at 14.

60 Nokia, "Introduction to Mobile Game Development", forum.Nokia.com (January 2003).

61 Ibid.

62 Ibid.

63 Pelkonen, Tommi, C Melakoski, T Rissanen, "Challenges and Opportunities in the Emerging Mobile Games Markets", ACTeN, Business Roundtable 11 (Nov. 12, 2003).

64 Ibid.

65 Ibid.

66 Ylianttila, Mika, "Existing and Imminent Mobile Entertainment Technologies", MGAIN Deliverable D4.1.1, to the European Commission User-friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (April 30, 2003) at 15.

67 Pelkonen, Tommi, "Mobile Games", ACTeN E-Content Report 3 (February 2004) at 14.

68 Ylianttila, Mika, "Existing and Imminent Mobile Entertainment Technologies", MGAIN Deliverable D4.1.1, to the European Commission User-friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (April 30, 2003) at 16.

69 Ibid.

70 Ollila, M., *et al.*, "Mobile Entertainment Business", MGAIN Deliverable D5.4.2 to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (September 29, 2003) at 7.

71 Ibid.

-
- 72 www.starmapmobile.com.
- 73 www.freemovealliance.net.
- 74 Van Veen, Nick, de Lussanet, M., "What Operators Want from 3G Phones", Forrester Research (August 11, 2004).
- 75 Ibid.
- 76 Ollila, M., *et al*, "Mobile Entertainment Business", MGAIN Deliverable D5.4.2 to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (September 29, 2003) at 41.
- 77 Ibid at 7.
- 78 Ibid.
- 79 "Distribution is Key to Mobile Success", New Media Zero (July 17, 2003).
- 80 Kangas, Sonja, "Benchmarking Literature Review", MGAIN Deliverable D6.2.1 to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (August 31, 2003) at 36.
- 81 "Sales of Mobile Content Triple Through "Browse and Buy" Sites", TelephonyWorld.com (May 19, 2004).
- 82 To be published on www.oecd.org/sti/information-economy later in 2005.
- 83 Pesola, Maija, "iTouch Close to Reaching Profits", FT.com (March 17, 2004).
- 84 OECD, *Developments of Third-Generation Mobile Services in the OECD*, DSTI/ICCP/TISP(2003)10/FINAL, www.oecd.org/sti/telecom.
- 85 UMTS Forum, *mTLD Group White Paper: The Mobile TLD* (July 2003).
- 86 Butcher, Mike, "Music to Ears", Guardian (June 10, 2004) www.guardian.co.uk/print/0,3858,4943175-110837,00.html
- 87 Goldman Sachs Global Investment Research, *New Industry Perspective: Wireless – United States* (Apr. 16, 2004) at 7.
- 88 Ollila, M., *et al*, "Mobile Entertainment Business", MGAIN Deliverable D5.4.2 to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (September 29, 2003) at 41.
- 89 *OECD Information Technology Outlook 2004*, Chapter 5 under www.oecd.org/sti/information-economy or www.oecd.org/dataoecd/55/57/32927686.pdf for the OECD study on filesharing. The content studies will be posted on www.oecd.org/sti/digitalcontent.
- 90 Budden, Rob, "Mobile Music Moves on to the Next Stage", FT.Com (October 6, 2003).
- 91 "Music Firms Warned Over Ringtones", BBC News (July 8, 2004).
- 92 Burt, Tim, "Singing a Happy Tune: Why the Music Industry is Upbeat about Online Sales", *Financial Times* (June 30, 2004).
- 93 Butcher, Mike, "Music to Ears", Guardian (June 10, 2004), www.guardian.co.uk/print/0,3858,4943175-110837,00.html
- 94 Digital Media Europe, "EMI to Trial Mobile Music Distribution with European Operator", dmeurope.com (August 3, 2004).
- 95 Butcher, Mike, "Music to Ears", *Guardian* (June 10, 2004) www.guardian.co.uk/print/0,3858,4943175-110837,00.html

- Digital Media Europe, "Apple and Motorola Give Bare Bones in Music Deal That's Full of Both Promise and Unanswered Questions", *dmeurope.com* (2004).
- "Orange Strikes Pan-European Truetones Music Deal", Orange Press Release (June 25, 2004).
- Decima, "Unwired 'Net: Consumer Attitudes on the Wireless Internet Using Personal Wireless Devices" (June 2003) at 69.
- See "Mobile Entertainment Concepts and Cultures", MGAIN Deliverable D3.2.1 to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (September 10, 2003) .
- Nokia, "Musiwave Case Study", *forum.Nokia.com* (May 31, 2004) at 5.
- See OECD, *Digital Broadband Content: Music*, DSTI/ICCP/IE(2004)12/FINAL for study on the music sector. Available under www.oecd.org/sti/digitalcontent (forthcoming).
- Ollila, M., et al, "Mobile Entertainment Business", MGAIN Deliverable D5.4.2 to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (September 29, 2003) at 41.
- Andersen, *Digital Content for Global Mobile Services*, Final Report to the European Commission Directorate-General Information Society (February 2002) at 207.
- Ollila, M., et al, *Mobile Entertainment Business*, MGAIN Deliverable D5.4.2 to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (September 29, 2003) at 41.
- Burt, Tim, "Singing a Happy Tune: Why the Music Industry is Upbeat about Online Sales", *Financial Times* (June 30, 2004).
- "Music Firms Warned Over Ringtones", *BBC News* (July 8, 2004).
- Kharif, Olga, "America, Get Ready for 'Ringbacks'", *Business Week Online* (June 28, 2004).
- PriceWaterhouseCoopers, *Global Entertainment and Media Outlook: 2004-2008* (2004) at 210.
- "Music Firms Warned Over Ringtones", *BBC News* (July 8, 2004).
- Burt, Tim, "Singing a Happy Tune: Why the Music Industry is Upbeat about Online Sales", *Financial Times* (June 30, 2004).
- Ollila, M., et al, "Mobile Entertainment Business", MGAIN Deliverable D5.4.2 to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (September 29, 2003) at 41.
- Burt, Tim, "EMI Savours Growing Global Digital Pie", *Financial Times* (July 3, 2004).
- Budden, Rob, "Mobile Music Moves on to the Next Stage", *FT.Com* (October 6, 2003).
- Ibid.*
- Ollila, M., et al, "Mobile Entertainment Business", MGAIN Deliverable D5.4.2 to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (September 29, 2003) at 41.
- Ibid.*
- "Wireless Deals Focus on Tunes", *Wired News* (Mar 27, 2004) www.wired.com/news/wireless/0,1382,62837,00.html
- "Orange Strikes Pan-European Truetones Music Deal", Orange Press Release (June 25, 2004).
- Nokia, "Musiwave Case Study", *forum.Nokia.com* (May 31, 2004) at 9.
- Adegoke, Yinka, "Record Labels Bank on a Ring Tone Boom", *Financial Times* (December 16, 2003).

-
- 121 Ibid.
- 122 Ibid.
- 123 Nokia, *Musiwave Case Study*, forum.Nokia.com (May 31, 2004) at 5.
- 124 Nokia, *Musiwave Case Study*, forum.Nokia.com (May 31, 2004) at 6.
- 125 Ibid at 7.
- 126 Ibid at 9.
- 127 Ibid at 8.
- 128 Kharif, Olga, "America, Get Ready for 'Ringbacks'", Business Week Online (June 28, 2004).
- 129 Barrack, Craig, "Exchanging Ring-Ring for a Ringback Tone", New mediazero.com (July 26, 2004).
- 130 Kharif, Olga, "America, Get Ready for 'Ringbacks'", Business Week Online (June 28, 2004).
- 131 Ibid.
- 132 Ibid.
- 133 InStatMDR, "More Wireless Consumers Would Like to Tune in to Mobile Music Services", Press Release (July 14, 2004).
- 134 McCartney, Neil, "O2: Video Service Starts at a Good Clip", FT.com (November 26, 2003).
- 135 Budden, Rob, "Mobile Music Moves on to the Next Stage", FT.com (October 6, 2003).
- 136 Dwango, "Dwango North America and Rolling Stone Announce the Launch of Rolling Stone Ringtones through AT&T Wireless, Cingular and Nextel", Press Release (June 24, 2004).
- 137 "Chaoticom and Telenor Mobil Launch Mobile Music Service", Press Release (July 13, 2004) www.chaoticom.com/webdata/press%20release/TelenorNorwayLaunch.PDF. Chaoticom Offers Solution for Mobile Music Downloads, The Online Reporter (February 7, 2004); "Major European Carriers Elect Chaoticom For Mobile Music Download Services", Press Release (July 13, 2004) www.chaoticom.com/webdata/press%20release/3Carrier.PDF.
- 138 Malkani, Gautam, "Chrysalis to Unveil Mobile Song Service", FT.com (March 15, 2004).
- 139 Dean, Katie, "The House that Music Fans Built" (July 7, 2004) www.wired.com/news/print/0,1294,64033,00.html.
- 140 Malkani, Gautam, "T-Mobile Urges Mobile Music Standard", *Financial Times* (June 29, 2004).
- 141 "T-Mobile Sells Music", *International Herald Tribune* Online (June 29, 2004).
- 142 "T-Mobile enables Customers to Download Music", Telecom Paper (June 29, 2004).
- 143 Budden, Rob, "Mobile Music Moves on to the Next Stage", FT.Com (October 6, 2003).
- 144 Ollila, M., *et al*, "Mobile Entertainment Business", MGAIN Deliverable D5.4.2 to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (September 29, 2003) at 41.
- 145 "Wireless Deals Focus on Tunes", *Wired News* (Mar 27, 2004) www.wired.com/news/wireless/0,1382,62837,00.html
- 146 "Mobile Music Video Downloads Take Shape", Digital Music Daily Snapshot (July 3, 2004).
- 147 Budden, Rob, "Mobile Music Moves on to the Next Stage", FT.com (October 6, 2003).
- 148 Sexton, Paul, "Save Money by Putting a Bar on Your Phone", *Financial Times* (May 27, 2004).

- Ollila, M., *et al*, "Mobile Entertainment Business", MGAIN Deliverable D5.4.2 to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (September 29, 2003) at 41.
- Kharif, Olga, "America, Get Ready for 'Ringbacks'", Business Week Online (June 28, 2004).
- Ofcom, *The Communications Market 2004: Radio Chapter* (August 2004) at 87.
- Ofcom, *The Communications Market 2004: Overview Chapter* (August 2004) at 4.
- "Wireless Deals Focus on Tunes", *Wired News* (Mar 27, 2004) www.wired.com/news/wireless/0,1382,62837,00.html; Antikainen, H., Kanga, S. Vainikainen, S., *Three Views on Mobile Cross Media Entertainment*, MGAIN Research Report TTE4-2204-17 (March 22, 2004).
- OECD (2004), *Digital Broadband Content: The online computer and video game industry* DSTI/ICCP/IE(2004)13/FINAL. Available under www.oecd.org/sti/digitalcontent (forthcoming).
- Pelkonen, Tommi, C Melakoski, T Rissanen, "Challenges and Opportunities in the Emerging Mobile Games Markets", ACTeN Business Roundtable 11 (Nov. 12, 2003).
- Kangas, Sonja, "Benchmarking Report", MGAIN Deliverable D6.2.2 to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (December 31, 2003) at 49.
- Deloitte, *Moore's Law and Electronic Games: How Technology Advances Will Take Electronic Games Everywhere* (2004) at 6.
- Pelkonen, Tommi, C Melakoski, T Rissanen, "Challenges and Opportunities in the Emerging Mobile Games Markets", ACTeN Business Roundtable 11 (Nov. 12, 2003).
- Ibid.*
- Pelkonen, Tommi, *Mobile Games*, ACTeN E-Content Report 3 (February 2004) at 14.
- Nokia, "Introduction to Mobile Game Development", forum.Nokia.com (January 2003).
- Spectrum Strategy Consultants, "From Exuberant Youth to Sustainable Maturity: Competitiveness Analysis of the UK Games Software Sector", prepared for UK Department of Trade & Industry (DTI), www.dti.gov.uk/cii/services/contentindustry/computer_games_leisure_software.shtml.
- Pelkonen, Tommi, C Melakoski, T Rissanen, "Challenges and Opportunities in the Emerging Mobile Games Markets", ACTeN Business Roundtable 11 (Nov. 12, 2003).
- Ibid.*
- Nokia, *Multiplayer Mobile Games: Business Challenges and Opportunities*, forum.Nokia.com (April 16, 2004).
- Nokia, *Introduction to Mobile Game Development*, forum.Nokia.com (January 2003).
- Nokia, *Introduction to the Mobile Games Business*, forum.Nokia.com (March 2003).
- Nokia, *Multiplayer Mobile Games: Business Challenges and Opportunities*, forum.Nokia.com (April 16, 2004).
- Ibid.*
- Ibid.*
- Nokia, *Introduction to the Mobile Games Business*, forum.Nokia.com (March 2003).
- Nokia, *Introduction to Mobile Game Development*, forum.Nokia.com (January 2003).
- Nokia, *Introduction to the Mobile Games Business*, forum.Nokia.com (March 2003).
- Nokia, *Multiplayer Mobile Games: Business Challenges and Opportunities*, forum.Nokia.com (April 16, 2004).

-
- 175 Ibid.
- 176 Ibid.
- 177 Ibid.
- 178 Ibid.
- 179 Ylianttila, Mika, "Existing and Imminent Mobile Entertainment Technologies", MGAIN Deliverable D4.1.1, to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (April 30, 2003) at 50.
- 180 Pelkonen, Tommi, "Mobile Games", ACTeN E-Content Report 3 (February 2004) at 15-16.
- 181 Ylianttila, Mika, "Existing and Imminent Mobile Entertainment Technologies", MGAIN Deliverable D4.1.1, to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (April 30, 2003) at 50.
- 182 Antikainen, H., Kangas, S. Vainikainen, S., "Three Views on Mobile Cross Media Entertainment", MGAIN Research Report TTE4-2204-17 (March 22, 2004).
- 183 Ylianttila, Mika, "Existing and Imminent Mobile Entertainment Technologies", MGAIN Deliverable D4.1.1, to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (April 30, 2003) at 50.
- 184 Antikainen, H., Kangas, S. Vainikainen, S., "Three Views on Mobile Cross Media Entertainment", MGAIN Research Report TTE4-2204-17 (March 22, 2004).
- 185 Ibid at 34-35.
- 186 Pelkonen, Tommi, "Mobile Games", ACTeN E-Content Report 3 (February 2004) at 13.
- 187 Pelkonen, Tommi, C Melakoski, T Rissanen, "Challenges and Opportunities in the Emerging Mobile Games Markets", ACTeN, Business Roundtable 11 (Nov. 12, 2003) at 12.
- 188 PriceWaterhouseCoopers, *Global Entertainment and Media Outlook: 2004-2008 – Video Games Chapter* (2004) at 338.
- 189 Ollila, M., *et al*, "Mobile Entertainment Business", MGAIN Deliverable D5.4.2 to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (September 29, 2003) at 41.
- 190 Nokia, *Introduction to the Mobile Games Business*, forum.Nokia.com (March 2003).
- 191 Ibid.
- 192 Ibid.
- 193 Ibid.
- 194 Pelkonen, Tommi, "Mobile Games", ACTeN E-Content Report 3 (February 2004) at 6.
- 195 PriceWaterhouseCoopers, *Global Entertainment and Media Outlook: 2004-2008 – Video Games Chapter* (2004) at 328.
- 196 Pelkonen, Tommi, "Mobile Games", ACTeN E-Content Report 3 (February 2004) at 10.
- 197 Pelkonen, Tommi, C Melakoski, T Rissanen, "Challenges and Opportunities in the Emerging Mobile Games Markets", ACTeN, Business Roundtable 11 (Nov. 12, 2003).
- 198 Pelkonen, Tommi, "Mobile Games", ACTeN E-Content Report 3 (February 2004) at 10.
- 199 PriceWaterhouseCoopers, *Global Entertainment and Media Outlook: 2004-2008 – Video Games Chapter* (2004) at 328.
- 200 Pelkonen, Tommi, "Mobile Games", ACTeN E-Content Report 3 (February 2004) at 12-13.

-
- 201 Nokia, *Multiplayer Mobile Games: Business Challenges and Opportunities*, forum.Nokia.com (April 16, 2004).
- 202 Ibid.
- 203 Nokia, *Introduction to the Mobile Games Business*, forum.Nokia.com (March 2003).
- 204 Ibid.
- 205 Ibid.
- 206 Ibid.
- 207 Nokia, *Multiplayer Mobile Games: Business Challenges and Opportunities*, forum.Nokia.com (April 16, 2004).
- 208 Ibid.
- 209 Ibid.
- 210 Ibid.
- 211 Nokia, *Multiplayer Mobile Games: Business Challenges and Opportunities*, forum.Nokia.com (April 16, 2004) at 10.
- 212 Lussanet, Michelle, "Mobilizing Content for 3G Delivery", Forrester (March 24, 2004) at 3.
- 213 Carless, Simon, "Lost in Translation: Japanese and American Gaming's Culture Clash", Gamasutra (Jan. 21, 2004) www.gamasutra.com/features/20040121/carless_pfv.htm.
- 214 Ollila, M., *et al*, "Mobile Entertainment Business", MGAIN Deliverable D5.4.2 to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (September 29, 2003) at 41.
- 215 Szymanski, Stefan, Valletti, Tommaso, "The Economics of Access to Content for New Media: The Case of Sports Rights", Paper prepared for the workshop on "Availability of Content for New Media", Brussels (8 July 2004) at 1-2.
- 216 Schenker, Jennifer L., "Athens Poses a Test for the Wireless World", *International Herald Tribune* (July 19, 2004).
- 217 Szymanski, Stefan, Valletti, Tommaso, "The Economics of Access to Content for New Media: The Case of Sports Rights", Paper prepared for the workshop on "Availability of Content for New Media", Brussels (8 July 2004) at 1-2.
- 218 Ollila, M., *et al*, "Mobile Entertainment Business", MGAIN Deliverable D5.4.2 to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (September 29, 2003) at 41.
- 219 Ibid.
- 220 McCartney, Neil, "O2: Video Service Starts at a Good Clip", FT.com (November 26, 2003).
- 221 Ebner, Dave, "Custom Phone Tones: The Medium is the Message", Globeandmail.com (July 5, 2004).
- 222 Verizon Wireless Press Release, "Verizon Wireless Vaults over the Bar with V CAST", <http://news/vzw.com/2005/03/pr2005-03-14b.html> (March 14, 2005); Weller, Dennis, "Creating Value from Thin Air", *presentation to OECD CCP Mobile Commerce Forum* (March 7, 2004).
- 223 OMA, "White Paper from the Broadcast Services BOF" (Mar. 30 2004) at 9.
- 224 Ibid.
- 225 Hildebrand, Carole, "Enterprise Connectivity in a Mobile World", Network World Special Report (2003).
- 226 Maliranta, Mikka and Rouvinen, Petri (2004), *Informational mobility and productivity – Finnish evidence*, ETLA discussion papers, No. 919.

-
- 227 Raiskinen, Ilkka, "Mobile Lifestyles", FT.Com (June 28, 2004).
- 228 Deloitte, *Mobile and Wireless Predictions 2004* (2004) at 3.
- 229 Nokia, *Mermit MISP Speeds Business Processes with SMS Applications*, forum.Nokia.com (June 30, 2004).
- 230 Bohlin, Erik, *et al.*, "Prospects for Third Generation Mobile Systems", An ESTO Project Report, IPTS Technical Report prepared for the European Commission Joint Research Center (June 2003) at 48.
- 231 Nokia, *Celesta mBusiness Platform Links Enterprise Applications to Mobile Devices*, forum.Nokia.com (March 31, 2004).
- 232 Nokia, *Issy Mobile – A Wireless Payment Solution for Parking Authorities*, forum.Nokia.com (May 7, 2004).
- 233 Schenker, Jennifer L., "Athens Poses a Test for the Wireless World", *International Herald Tribune* (July 19, 2004).
- 234 "PRIMEDIA Partners with MFORMA to Expand Publishing Strategy to Wireless Devices", Yahoo!Finance, biz.yahoo.com (August 4, 2004).
- 235 Masnick, Mike, "Time for Newspapers to Embrace the Mobile Opportunity", www.thefeature.com (July 9, 2004); Grenville, Mike, "Mobile Offers a Renaissance for Newspapers", www.160characters.org (July 9, 2004).
- 236 "LexisNexis Launches New Search Capabilities for BlackBerry", www.tmsnet.com (July 21, 2004).
- 237 Nicolai, T, Beherens, N. and Thielemann, H, "Be a Freeporter!': Enabling a Mobile News Publishing Community", Center for Computing Technologies (TZI), Universitat Bremen, Bremen, Germany.
- 238 Antikainen, H., Kanga, S. Vainikainen, S., "Three Views on Mobile Cross Media Entertainment", MGAIN Research Report TTE4-2204-17 (March 22, 2004).
- 239 Rush, Susan, "QUICPay Serves DoCoMo's M-Wallet", *Wireless Week* (July 20, 2004).
- 240 "The Virtues of Being Virtual: New Brands of Mobile Phone Services are Suddenly All the Rage", *The Economist* (July 10, 2004).
- 241 Ebner, Dave, "Custom Phone Tones: The Medium is the Message", Globeandmail.com (July 5, 2004).
- 242 Ollila, M., *et al.*, "Mobile Entertainment Business", MGAIN Deliverable D5.4.2 to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (September 29, 2003).
- 243 Nextel News Release, "National Center for Missing & Exploited Children Joins Forces with Nextel, ComLabs and the Pennsylvania State Police to Develop New Wireless AMBER Alert Service", www.nextel.com (July 12, 2004).
- 244 Bryce, Jo, *Chapter 10: "Regulatory Issues, Mobile Entertainment Concepts and Cultures"*, MGAIN Deliverable D3.2.1 to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (September 10, 2003) at 112-113.
- 245 OECD (2004), *Recommendation of the Council on Broadband Development*, C(2003)259/FINAL, www.oecd.org/dataoecd/31/38/29892925.pdf.
- 246 OECD, *The Implications of Convergence for Regulation of Electronic Communications*, [DSTI/ICCP/TISP (2003)5/FINAL (2004)], www.oecd.org/dataoecd/56/24/32983964.pdf.
- 247 Directive 2002/21/EC (2002).
- 248 Nihoul, Paul, P. Rodford, *EU Electronic Communications Law*, (Oxford 2004) at para. 1.166 at 56-67.
- 249 Available from www.oecd.org/sti/telecom.
- 250 Ofcom, *A Statement on Spectrum Trading: Implementation in 2004 and Beyond* (August 6, 2004).

- Andersen, "Digital Content for Global Mobile Services", Final Report to the European Commission Directorate-General Information Society (2002) at 234.
- Report and Order and Notice of Proposed Rulemaking, 18 F.C.C.R 13, 620 (FCC 2003); "Prometheus Radio Project v. FCC", No 03-3388, et al., Slip Op. (3d Cir., June 24, 2004).
- OECD (2004), *Recommendation of the Council on Broadband Development*, C(2003)259/FINAL, www.oecd.org/dataoecd/31/38/29892925.pdf.
- www.cordis.lu/ist/so/mobile-wireless/home.html.
- www.cordis.lu/ist/so/audiovisual/home.html.
- www.cordis.lu/ist/workprogramme/en/2_3_2_7.htm.
- www.cordis.lu/ist/workprogramme/en/2_3_2_6.htm.
- www.mobilmedia.de.
- Kangas, Sonja, "Benchmarking Literature Review", MGAIN Deliverable D6.2.1 to the European Commission User-Friendly Information Society (IST) Accompanying Measures Project IST-2001-38846 (August 31, 2003) at 30.
- European Commission, "eContent Work Programme: 2003-2004" (ftp://ftp.cordis.lu/pub/econtent/docs/work_programme_2003_2004_en.pdf) at 7.
- OECD (2004), *Recommendation of the Council on Broadband Development*, C(2003)259/FINAL, www.oecd.org/dataoecd/31/38/29892925.pdf.
- Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions on *Mobile Broadband Services*, COM(2004)447 at 7.
- Ibid.
- OECD (2004), *Recommendation of the Council on Broadband Development*, C(2003)259/FINAL, www.oecd.org/dataoecd/31/38/29892925.pdf.
- See www.wipo.int/enforcement/en/faq/technological/faq04.html for more information and Art. 11 WCT specifies that "[c]ontracting Parties shall provide adequate legal protection and effective legal remedies against the circumvention of effective technological measures that are used by authors in connection with the exercise of their rights under this Treaty or the Berne Convention and that restrict acts, in respect of their works, which are not authorized by the authors concerned or permitted by law."
- Szymanski, Stefan, Valletti, Tommaso, "The Economics of Access to Content for New Media: The Case of Sports Rights", Paper prepared for the workshop on "Availability of Content for New Media", Brussels (8 July 2004) at 1-2.
- Ibid.
- Bohlin, Erik, *et al.*, "Prospects for Third Generation Mobile Systems", An ESTO Project Report, IPTS Technical Report prepared for the European Commission Joint Research Center (June 2003) at 64-65.
- Ibid at 57.
- Geradin, Damien, "Access to Content by New Media Platforms: A Review of the Competition Law Problems", Paper prepared for the workshop on "Availability of Content for New Media", Brussels (8 July 2004) at 11.
- See Article 2(3) of the Council Regulation 139/2004 of 20 January 2004 on the control of concentrations between undertakings, OJ L 24 of 29 January 2004 at 1-22.
- Geradin, Damien, "Access to Content by New Media Platforms: A Review of the Competition Law Problems", Paper prepared for the workshop on "Availability of Content for New Media", Brussels (8 July 2004) at 5.

-
- 273 For relevant work in this area from the OECD consult www.oecd.org/sti/security-privacy.
- 274 OECD (2004), *Recommendation of the Council on Broadband Development*, C(2003)259/FINAL, www.oecd.org/dataoecd/31/38/29892925.pdf.
- 275 Ibid.
- 276 Bohlin, Erik, *et al.*, "Prospects for Third Generation Mobile Systems", An ESTO Project Report, IPTS Technical Report prepared for the European Commission Joint Research Center (June 2003) at 63-4.
- 277 Ibid at 63/64.
- 278 Ibid.
- 279 See europa.eu.int/comm/internal_market/bank/e-money/index_en.htm for information.
- 280 IGDA, *IGDA Online Games White Paper*, 2d ed. (March 2003) at 41-2.
- 281 Ibid.
- 282 OECD, (2001), *Taxation and Electronic Commerce - Implementing the Ottawa Taxation Framework Conditions - 2001 Report*, France; OECD, (2003), *Taxation and Electronic Commerce - Implementing the Ottawa Taxation Framework Conditions - 2003 Report*, available at: www.oecd.org/dataoecd/45/19/20499630.pdf.