

Report No. 13
Report from the UMTS Forum

***The UMTS Third Generation Market
– Phase II: Structuring the Service
Revenue Opportunities***

***Including Worldwide and Regional Forecasts for Mobile Internet Access,
Multimedia Messaging Service for Business, Location-Based Services, Rich
Voice and Simple Voice***

This report has been produced by the UMTS Forum, an association of telecommunications operators, manufacturers and regulators who are active both in Europe and other parts of the world and who share the vision of UMTS (Universal Mobile Telecommunications System). UMTS is a modular concept, which takes full regard of the trend of convergence of existing and future information networks, devices and services, and the potential synergies that can be derived from such convergence. UMTS will move mobile communications forward from where we are today into the Information Society of third generation (3G) services, and will deliver speech, data, pictures, graphics, video communication and other wideband information direct to people on the move.

A key objective of this report is to study worldwide service forecasts for 3G mobile networks as well as present a framework for future market studies and forecasts. The study was carried out by the consulting company Telecompetition, Inc. under the guidance of and with contributions from the Market Aspects Group (MAG) of the UMTS Forum.

Revenue data is reported in current US dollars. Totals may not always add up due to rounding. Unless otherwise credited, the source of all diagrams and exhibits is Telecompetition, Inc.

This report follows on from other outputs which have dealt with: a regulatory framework and spectrum aspects for UMTS (Report #1), technical aspects (#2), impact of licence cost levels (#3), licensing conditions (#4), minimum spectrum requirements (#5), UMTS/IMT-2000 spectrum (#6), extensions to core band spectrum (#7), and the future market for mobile multimedia services, as well as mobile voice and data services (#8) and UMTS Report No. 9. These reports can be found on the UMTS Forum Web site, www.umts-forum.org/reports.html.

Many statements in this report represent the views of the original author, Telecompetition, Inc., and have not necessarily been subject to formal approval in the UMTS Forum. However, the main conclusions and key findings in the report are supported by all operators and manufacturers within the UMTS Forum. The National Administrations that are members of the Forum have actively supported the development of the report. However, the views and conclusions expressed in this report do not necessarily represent the views of the National Administrations. Therefore the Administrations cannot be bound by the detailed recommendations contained in the report.

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TABLE OF CONTENTS

1. EXECUTIVE SUMMARY	1
2. BACKGROUND	5
2.1 INTRODUCTION	5
2.2 STUDY METHODOLOGY	7
2.3 SERVICES AND APPLICATIONS	8
2.4 SERVICE CATEGORIES	8
2.4.1 <i>Service Diagrams</i>	11
2.4.2 <i>Mapping Services to Business Models</i>	12
2.5 BUSINESS MODELS AND SERVICE CATEGORIES	16
3. PERSPECTIVES ON INDUSTRY STRUCTURE	18
3.1 EVOLVING INDUSTRY STRUCTURE	18
3.1.1 <i>Voice-only Service – An Historic Perspective</i>	18
3.1.2 <i>Today's Environment</i>	19
3.1.3 <i>Tomorrow's Environment</i>	20
3.1.4 <i>Access and Portal Focused Approaches</i>	23
3.2 MAPPING THE SERVICES UNIVERSE	24
3.3 SUMMARY OF KEY FINDINGS	28
4. SERVICE DEFINITIONS AND ANALYSIS	29
4.1 MOBILE INTERNET ACCESS (CONSUMER)	29
4.1.1 <i>Enabling Factors</i>	30
4.1.2 <i>Implications</i>	31
4.2 MULTIMEDIA MESSAGING SERVICE (BUSINESS)	32
4.2.1 <i>Enabling Factors</i>	34
4.2.2 <i>Implications</i>	34
4.3 LOCATION-BASED SERVICES (COMBINED CONSUMER AND BUSINESS)	35
4.3.1 <i>Enabling Factors</i>	40
4.3.2 <i>Implications</i>	40
4.4 RICH VOICE AND SIMPLE VOICE (COMBINED CONSUMER AND BUSINESS)	41
4.4.1 <i>Enabling Factors</i>	43
4.4.2 <i>Implications</i>	44
5. ADDITIONAL 3G SERVICE FORECASTS	45
5.1 WORLDWIDE MARKET SIZE	45
5.2 MOBILE INTERNET ACCESS (CONSUMER)	47
5.2.1 <i>Regional Forecasts</i>	48
5.3 MULTIMEDIA MESSAGING SERVICE (BUSINESS)	49
5.3.1 <i>Regional Forecasts</i>	51
5.4 LOCATION-BASED SERVICES	51
5.4.1 <i>Regional Forecasts</i>	53
5.5 RICH AND SIMPLE VOICE	54
5.5.1 <i>Regional Forecasts</i>	55
5.6 SUMMARY OF KEY FINDINGS	57
6. TOTAL 3G SERVICE REVENUES	58
6.1 WORLDWIDE FORECASTS FOR ALL 3G SERVICES – 2001-2010	58
6.1.1 <i>Analysis by Incremental Revenues and ARPU</i>	64
6.1.2 <i>Analysis of Consumer and Business Segments</i>	66
6.1.3 <i>Analysis by Consumer and Business Subscribers</i>	67
6.1.4 <i>Analysis for the Portal Focused Approach</i>	68
6.1.5 <i>Analysis for an Access Focused Approach</i>	69
6.1.6 <i>Analysis of Voice and Data</i>	70
6.1.7 <i>Analysis by Revenue Type</i>	71
6.1.8 <i>3G Penetration Scenario Analysis</i>	72
6.2 REGIONAL FORECASTS FOR ALL 3G SERVICES – 2001-2010	74
6.2.1 <i>Asia Pacific Demand</i>	77
6.2.2 <i>European Demand</i>	80
6.2.3 <i>North American Demand</i>	82
6.2.4 <i>Rest of World Demand</i>	84
6.2.5 <i>Latin American Demand</i>	86

6.2.6	<i>Developing and Emerging Economies Demand</i>	88
6.3	SUMMARY OF KEY FINDINGS.....	89
6.4	IMPLICATIONS.....	90
7.	CONCLUSIONS	91
8.	UMTS FORUM RECOMMENDATIONS	92
9.	LIST OF ACRONYMS	93
10.	BIBLIOGRAPHY	94
11.	INDEX	96
12.	APPENDIX A – INTERVIEWS	98
13.	APPENDIX B – MARKET STUDY PROJECT TEAM CONTRIBUTORS	99
14.	APPENDIX C – REMAINING SERVICES COUNTRY-LEVEL REGIONAL REVENUE CONTRIBUTIONS	100

LIST OF FIGURES

Figure 1. 3G services total revenue – 2001 – 2010.	1
Figure 2. Total worldwide 3G subscribers.	6
Figure 3. 3G mobility services framework.	9
Figure 4. Service diagram template.	12
Figure 5. Business model framework and relationship of business models to service categories.	13
Figure 6. Value chain elements provided in different business models.	14
Figure 7. Traditional voice-only scenario (illustrative).	19
Figure 8. The introduction of Wireless Application Services Providers (illustrative).	20
Figure 9. An example of new 3G revenue streams through partnerships (illustrative).	21
Figure 10. New services providers in the 3G environment (illustrative).	22
Figure 11. Multiple roles for 3G network operators (illustrative).	22
Figure 12. M-commerce adds complexity (illustrative).	23
Figure 13. Critical value chain functions provided by 3G industry players.	24
Figure 14. Service diagram for Mobile Internet Access.	30
Figure 15. Service diagram for Multimedia Messaging Service.	33
Figure 16. Service diagram for Multimedia Messaging Service – machine-to-machine.	34
Figure 17. Service diagram for Location-Based Services – consumer navigation and information services.	37
Figure 18. Service diagram for Location-Based Services – consumer tracking and telematics services.	37
Figure 19. Service diagram for Location-Based Services – mobile advertising.	38
Figure 20. Service diagram for Location-Based Services – business tracking services.	39
Figure 21. Location-Based Services – revenues generated from third parties.	40
Figure 22. Service diagram for Rich Voice.	43
Figure 23. Worldwide revenue – additional 3G services.	45
Figure 24. Mobile Internet Access subscriptions by region in 2005 and 2010.	48
Figure 25. Mobile Internet Access revenues by region in 2005 and 2010.	49
Figure 26. Business Multimedia Messaging Service worldwide revenue composition – 2010.	50
Figure 27. Multimedia Messaging Service (Business) revenues by region in 2005 and 2010.	51
Figure 28. Location-Based Services – worldwide revenue composition – 2010.	52
Figure 29. Location-Based Service revenues by region in 2005 and 2010.	53
Figure 30. Rich Voice and Simple Voice – worldwide revenue composition – 2010.	55
Figure 31. Rich Voice revenues by region in 2005 and 2010.	56
Figure 32. Simple Voice service subscriptions by region in 2005 and 2010.	56
Figure 33. Simple Voice revenues by region in 2005 and 2010.	57
Figure 34. Worldwide market subscriptions for selected services – 2001-2010.	60
Figure 35. Worldwide market revenue for all services – 2001-2010.	61
Figure 36. Worldwide mobile revenue: 2G, 2.5G and 3G.	61
Figure 37. Cumulative market revenue for all services – 2001-2010.	62
Figure 38. Regional market demand for all services by service subscriptions – 2010.	62
Figure 39. Regional market demand for all services by service revenue – 2010.	63
Figure 40. Total 3G revenue by region – 2010.	64

Figure 41. Worldwide incremental revenue per 3G subscriber – 2001-2010.	65
Figure 42. Incremental ARPU from 3G services per worldwide mobile subscriber – 2001-2010.	66
Figure 43. Worldwide revenues in consumer and business segments (excluding Simple Voice – 2001-2010.	67
Figure 44. 3G subscribers by consumer and business segments.	68
Figure 45. Worldwide revenues in consumer and business segments for a Portal Focused Approach (excluding Simple Voice) – 2001-2010.	69
Figure 46. Worldwide revenues in consumer and business segments for an Access Focused Approach (excluding Simple Voice – 2001-2010.	70
Figure 47. Worldwide revenues for voice and data – 2001-2010.	71
Figure 48. Worldwide revenues by revenue source – 2001-2010.	72
Figure 49. 3G deployment scenarios: total worldwide cellular revenue – 2001-2010.	73
Figure 50. 3G deployment scenarios: ARPU per worldwide cellular subscriber – 2001-2010.	74
Figure 51. 3G service revenue composition, by region 2010.	76
Figure 52. Worldwide population by region – 2010.	76
Figure 53. Annual 3G revenue for all services per population by region 2001 – 2010.	77
Figure 54. Asia Pacific 3G revenue composition – 2010.	78
Figure 55. Asia Pacific demand for 3G services by subscriptions – 2001-2010.	79
Figure 56. Asia Pacific demand for 3G services by revenue – 2001-2010.	79
Figure 57. European 3G revenue composition – 2010.	80
Figure 58. European demand for 3G services by subscriptions – 2001-2010.	81
Figure 59. European demand for 3G services by revenue – 2001-2010.	81
Figure 60. North American 3G revenue composition – 2010.	82
Figure 61. North American demand for 3G services by subscriptions – 2001-2010.	83
Figure 62. North American demand for 3G services by revenue – 2001-2010.	83
Figure 63. Rest of World 3G revenue composition – 2010.	84
Figure 64. Rest of World demand for 3G services by subscriptions – 2001-2010.	85
Figure 65. Rest of World demand for 3G services by revenue – 2001-2010.	85
Figure 66. Latin American 3G revenue composition 2010.	86
Figure 67. Latin American demand for 3G services by subscriptions – 2001-2010.	87
Figure 68. Latin American demand for 3G services by revenue – 2001-2010.	87
Figure 69. Developing and emerging economies demand for 3G services by revenue – 2005 and 2010.	88
Figure 70. Developing and emerging economies demand for 3G services by subscriptions – 2005 and 2010.	89

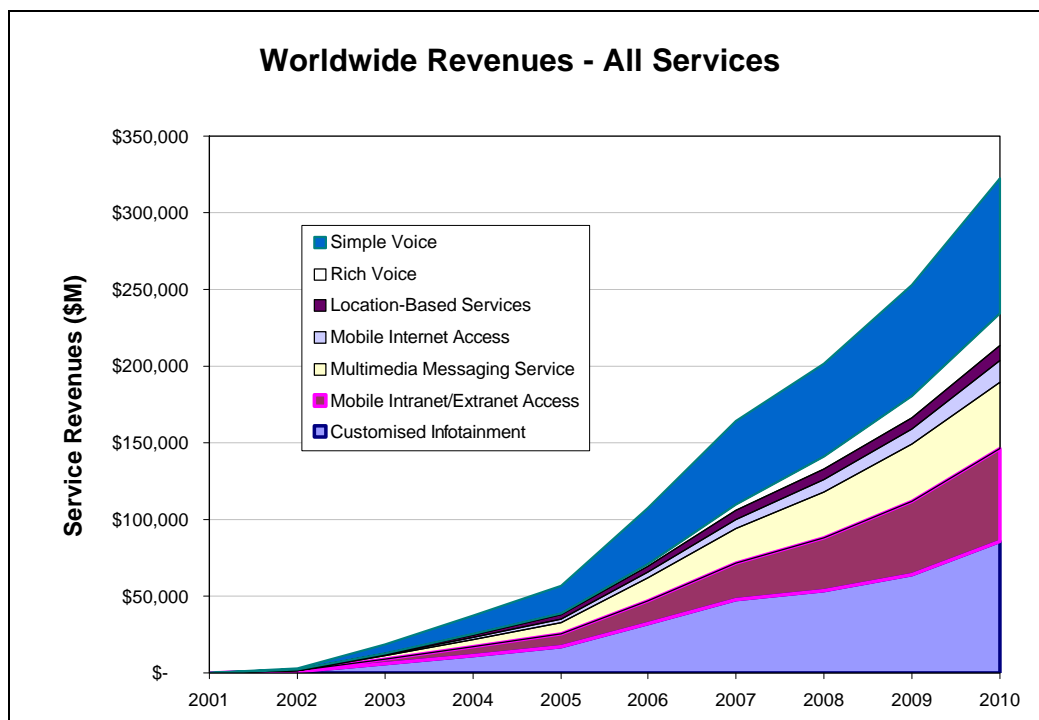
List of Tables

Table 1. Services that represent the majority of the near-term 3G demand.	11
Table 2. Mapping of subscriber categories to business models.	14
Table 3. Revenue sources by 3G mobile service category.....	16
Table 4a. Applications and service concept mapping to Report No. 9 service categories.	26
Table 4b. Applications and service concept mapping to Report No. 9 service categories (continued).	27
Table 5. Major service forecast pricing and penetration assumptions.	46
Table 6. Worldwide revenue assumption analysis – by service.	47
Table 7. Business Multimedia Messaging Service – component assumptions.....	50
Table 8. Location-Based Services – component assumptions.	53
Table 9. Rich Voice and Simple Voice – component assumptions.	55
Table 10. Summary of worldwide revenue and subscriptions for 3G services – 2001-2010.	59
Table 11. Countries and administrative regions considered in 3G forecast.....	75

1. Executive Summary

Total operator-retained revenue of over *300 billion* dollars for 3G services in 2010 is identified in this report as shown below. By 2010, 66% of these revenues will be coming from 3G-enabled data services.

Figure 1. 3G services total revenue – 2001 – 2010.



Source: Telecompetition, Inc., February 2001.

By 2010, this represents a cumulative revenue stream of one *trillion* dollars. The forecasts in this report are the result of thorough analysis, using rigorous quantitative methodology with a conservative approach, to isolate the revenue that services providers can realistically retain on a service-by-service basis.

Speculation about revenue from unknown new services has been avoided. The revenue forecasts in this study represent a readily achievable goal, based on today's experiences. Unlike previous forecasts, they represent a floor rather than a ceiling.

Examining the entire cellular subscriber base, it is clear that 3G services can compensate for the loss of income resulting from the downward pressure on voice revenues. Co-ordinating the deployment of 3G networks to support roaming will accelerate this compensating effect.

By examining the 3G market from a user perspective, in Report No. 9 the UMTS Forum defined a service framework that includes six comprehensive service categories. This service framework encompasses services and service concepts identified in other 3G reports and provides a useful way for the

industry to structure dialogue about next generation mobile services. It also allows detailed market demand forecasts to be made for 3G service revenues without double counting, otherwise distorting the revenue picture. The service categories are Mobile Internet Access, Mobile Intranet/Extranet Access, Customised Infotainment, Multimedia Messaging, Location-Based Services and Rich Voice.

Using these service categories, a comprehensive picture of the operators' 3G service revenue opportunity is presented and analysed. It demonstrates significant potential for 3G services over the forecast period even after consideration of competitive market pressures and service alternatives offered by 2.5G networks. Sixty-eight per cent of the revenues will come from Asia Pacific and Europe in 2010. Business services represent approximately 36% of this market with the remainder coming from consumer sectors.

Consistent with UMTS Report No. 9, the revenue forecasts in this report are for 3G mobile services provider retained revenues only. They do not include the market revenue that will be attributed to other players such as wireless application service providers (W-ASPs), content providers, device manufacturers and mobile e-commerce (m-commerce) partners.

Key findings from the different sections of this report are:

- By 2010, total 3G services provider-retained worldwide revenues from all 3G services are forecast to reach \$322 billion. This represents cumulative revenues of over one *trillion* dollars from now to 2010. (See Section 6.1).
- By 2010, the average 3G subscriber will spend around \$30 per month on 3G data services. (See Section 6.1).
- By 2010, with only 28% penetration into the worldwide mobile base, the additional revenue from 3G data services, will add \$9 per month to total worldwide cellular average revenue per user (ARPU). (See Section 6.1).
- Revenue streams to 3G services providers are highly dependent upon the business models adopted by themselves and their partners. The industry structure is still evolving, so no clear business models are yet established. It is clear, however, that the role of the 3G services providers will change from a simple voice-only, direct relationship with the user to one that involves multiple partners, revenue sharing, with third parties also targeting the end-user. (See Section 3.2).
- The Access Focused Approach and the Portal Focused Approach business models adopted in this report correspond to different positions on the value chain and provide a distinct way to model service revenues. Specialised Mobile Services can be offered by 3G services providers using either approach and can be positioned at any point on the value chain. (See Section 3.2).
- The Portal Focused and Access Focused Approaches provide roughly equivalent annual revenues in 2010 (\$140 – \$160 billion). The optimal strategy to target the consumer market is to adopt a Portal Focused

Approach. An Access Focused Approach might be an appropriate strategy for addressing the corporate market. (See Section 6.1).

- Asia Pacific represents the single largest total revenue opportunity (\$120 billion in 2010), while Europe and North America provide the highest annual revenue per POP (\$150 – \$200 per year). (See Section 6.1 and 6.2).
- Individual service market opportunities vary by region. Europe and Asia Pacific provide the largest market opportunity for Multimedia Messaging Service (MMS) and Customised Infotainment. North America provides the greatest revenue opportunity for Mobile Internet Access, Location-Based Services, and Rich Voice. (See Section 5).
- With the exception of some Latin American countries, most countries in the Rest of World region will still be in the first few years of service penetration by 2010. Therefore, revenues from all services for this region are small, contributing only 10% (\$33 billion) of worldwide 3G revenues in 2010, with significant potential beyond the forecast period. (See Section 6.2).
- Advertising and transaction revenues are a new source of income for the 3G operator, representing almost 20% of revenue (\$60 billion). In addition, these new revenue sources provide an opportunity to strengthen relationships with users, which could decrease churn. (See Section 6.1).
- Both business and consumer market segments are forecast to have significant revenue potential, with the consumer segment contributing about 65% of the revenue on a worldwide basis. (See Section 6.1).
- Throughout the forecast period, Customised Infotainment is the earliest and single largest revenue opportunity among the forecast services, contributing \$86 billion annually in 2010. (See Section 6.1).
- While revenue from Location-Based Services, retained by the 3G services provider, may appear modest at only \$10 billion by 2010, Location-Based Services also represent an exciting opportunity to forge strategic partnerships with content providers, W-ASPs, and other third parties. Such partnerships may open up entirely new revenue opportunities not yet envisioned by the market. (See Sections 5.4 and 4.3).
- Non-voice service revenues will overtake voice revenues in the 3G environment by 2004 and comprise 66% of 3G service revenues in 2010. (See Section 6.1).
- Simple Voice services will remain a vital component of an operator's service portfolio, contributing 34% of annual 3G revenue in 2010. (See Sections 5.1, 5.5 and 6.1).
- Rich Voice services such as consumer videophone and multimedia conferencing, contribute around 7% (\$21 billion) of total annual 3G revenue in 2010, but are expected to increase significantly in the years beyond the forecast period. (See Section 6.1).
- Many services and applications such as email, Web browsing, unified messaging, and location information are treated as having little or no direct

revenue potential in this study as users will expect them to be included as part of their service package at no additional charge. Much of the additional revenue generated by such services and applications will come through increased usage rather than through new sources of revenue. (See Section 3.2).

Implications of the forecast analysis can also be found in this report.

- Clearly, higher data rates will be achieved in the long term over 3G networks. Over time, user expectations for the superior connection speeds will be even higher than they are today. (See Section 6).
- Ultimately, only 3G can deliver the all-important global roaming capability and economies of scale necessary to satisfy the expectations of users. (See Section 6).
- 3G services present a very significant revenue opportunity for new players such as W-ASPs and content providers. (See Section 4.3).
- Establishing and maintaining customer profiles will be an important activity for 3G operators. (See Section 4.3).
- 3G will be a powerful driver for the development of terminals capable of full Web browsing. (See Section 4.1).
- MMS will allow relevant content to be broadcast to distribution lists with specific profiles. Use of such a feature in a “push” mode should be treated with caution. In general, it is advisable to ensure subscribers opt in to push services. (See Section 4.2).
- Service portability between operators will be necessary for Location-Based Services to be offered in a location-independent fashion. (See Section 4.3.2).
- Implementation of the multimedia call model will be a major enabler for Rich Voice services. (See Section 4.4).

2. Background

UMTS Forum Report No. 9 presented the first results from a market study investigating 3G service revenue opportunities. This current report completes that study.

2.1 Introduction

The objective of both phases of this market study is to add clarity to thinking by identifying and analysing issues critical to developing market demand and quantifying the revenue opportunities in light of that analysis. This has been accomplished by creating analytical frameworks for evaluating services and by using a structured, rigorous methodology for quantifying opportunity into regional service revenue forecasts.

Report No. 9 introduced a clear distinction between the definitions of “services” and “applications” and proposed a 3G services framework that characterises the market opportunity from the user’s perspective. The reader is directed to Report No. 9 for much of the background for the study. For readability, summaries of the study methodology, the service definitions and the 3G-service framework contained in Report No. 9 are provided below in Sections 2.2 through 2.4.

Revenues from three of the service categories were previously forecast in Report No. 9. This current report contains revenue forecasts for all the remaining service categories to produce a complete picture of the global 3G-service revenue opportunity. The earlier forecasts found in Report No. 9 have not changed.

When examining the revenue forecasts contained in this report, the following points should be considered.

- The revenue forecasts in this report refer specifically to services delivered to subscribers on 3G networks. 3G networks in this study are defined as those conforming to the IMT-2000 family of systems specifications.¹ Revenue forecasts do not include revenues from the same or equivalent services offered over alternative delivery mechanisms including 2.5G

¹ Study Group 11 of the ITU Telecommunication Standardisation Sector agreed upon five radio interface standards for the terrestrial component of IMT-2000. These are:

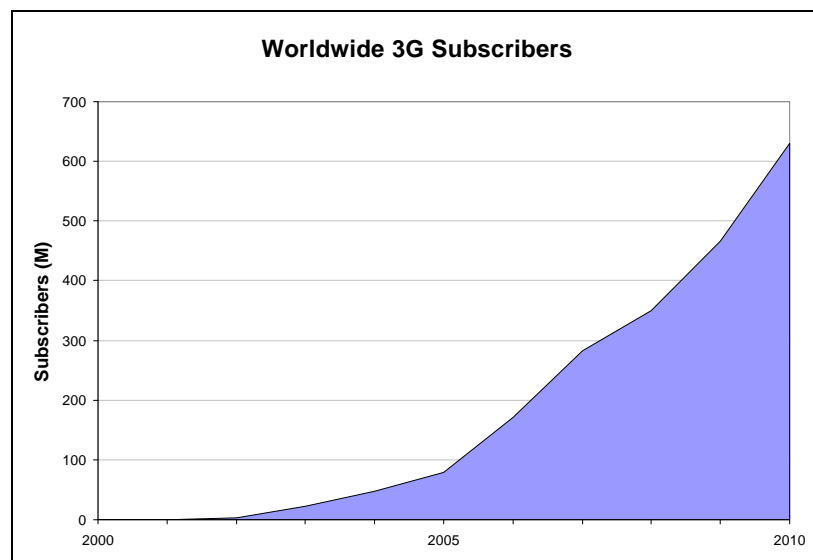
- IMT-DS Direct Sequence (UMTS Terrestrial Radio Access - Frequency Division Duplex (UTRA-FDD), Wideband CDMA (W-CDMA) or UMTS-FDD using paired spectrum
- IMT-MC Multi-Carrier (cdma2000 3X) using paired spectrum
- IMT-TC Time Code (UTRA-TDD (Time Division Duplex) and TD-SCDMA (exact specification still to be finalised) using unpaired spectrum
- IMT-SC Single Carrier (UWC-136 (US TDMA)) using paired spectrum
- IMT-FT Frequency Time (Digital Enhanced Cordless Telecommunications (DECT)) using both paired and unpaired spectrum

1xRTT is not considered to be a 3G technology in this study.

networks. All revenues in this study refer to the amounts retained by the mobile operator or services provider.² In addition to these services provider-retained revenues, 3G services present a very significant revenue opportunity for new players such as wireless application service providers (W-ASPs) and content providers.

- A key input for the forecasts is an estimate of the total number of worldwide 3G subscribers. This estimate was derived from an analysis of 3G forecasts from a wide variety of sources as described in Report No. 9 and shown in Figure 2. The 3G-subscriber estimate is used to calculate the addressable market for all the 3G services forecast. It was estimated that 28% of the total worldwide mobile subscribers will be served over a 3G network by 2010³. Section 6 provides an analysis of other 3G penetration scenarios.

Figure 2. Total worldwide 3G subscribers.



Source: UMTS Forum Report No. 9, August 2000.

- The service revenue forecasts in this report refer to the **market demand** at a regional level. Those revenues will be shared between the different services providers operating in that region. The study makes no attempt to forecast revenues at a services provider level. The market share achieved by individual services providers will depend on the success of their individual commercial and technical strategies and is outside the scope of this study.
- Market demand forecasts are based on “willingness to pay” as demonstrated by price levels and growth rates of analogous services

² The term “services provider” is introduced to indicate the changed role of the mobile operator in the 3G world. Services providers include mobile network operators, mobile service providers and mobile virtual network operators.

³ By 2010, total cellular worldwide subscribers is estimated at 2.25B, with most developed countries reaching or exceeding 100% penetration. Subscription levels of only 28% for 3G is due to slower network build-out and service commercialisation in emerging and developing countries, estimated between 2005 – 2008.

available today amongst relevant market and demographic sectors. Revenue forecasts should therefore be regarded as conservative. They are based on price levels acceptable today, assume a significant decline in price between now and 2010,⁴ and, in general, assume that no “mobility premium” can be charged.

- Revenue forecasts do not prescribe a specific pricing regime or billing mechanism. Forecasts are based on estimates of the dollar amount users are prepared to pay for a service. This dollar amount may be collected through any combination of subscription fees and usage charges, based on either time or volume, and may or may not be subsidised through a share of additional revenue streams such as advertising.
- In the 3G environment, it is important to appreciate the distinction between subscribers and subscriptions. Not all subscribers will take a subscription to all services. Service revenue forecasts include an estimate of the proportion of the subscriber base that takes a subscription to that service. Therefore, the traditional interpretation of the Average Revenue per User (ARPU) indicator, which is total revenue averaged across the entire subscriber base, has to be treated with caution. The traditional ARPU indicator does not accurately reflect the higher value provided by 3G subscribers over traditional voice subscribers. Therefore, this report provides both incremental revenue per 3G subscriber as well as the traditional ARPU metric.

Sections 2.2 to 2.4 below are background material summarised from Report No. 9, with definitions and figures updated where necessary.

2.2 Study Methodology

The forecasts developed by Telecompetition are conservative, using realistic adoption rates and price points. The end result is a snapshot of potential services with achievable 3G services provider revenue streams. The study did not attempt to quantify revenue for players other than mobile services providers or to recommend specific pricing strategies. The study considers demand served via 3G technologies, including satellite technology that may be used to serve remote or rural areas.

Most previous forecasts of 3G subscribers and revenues have been built around technological criteria. Subscriber number and revenue forecasts have been grouped into categories according to the data rates required, or other essentially technical criteria such as the degree of asymmetry involved in data delivery.

This study takes a different approach, acknowledging the fact that market growth is driven by services and user demand rather than by technology.

⁴ A decline in price of 80% by 2010 has been assumed for some services. All prices and revenues in this report are quoted in current (2001) US dollars.

2.3 Services and Applications

Numerous articles, reports and documents are available that discuss 3G mobile services and applications. Yet, in all this literature, we have found no clear definition of the two terms. The labels “service” and “application” often seem to be interchangeable—even within the same document. A concept such as m-commerce will be classified as a service in one report and an application in the next. The terminology serves to confuse rather than clarify.

Report No. 9 introduced a clear distinction between services and applications.

Services are the portfolio of choices offered by services providers to a user.
<p>Services are entities that services providers may choose to charge for separately. They will be key differentiators between services providers in the 3G environment. Users are likely to select their preferred 3G services providers based on the options available in that product portfolio.</p> <p>Different users will choose different service options. They may elect to subscribe to a personalised mobile portal offering banking facilities. They may later decide to add unified messaging. Such service options will affect the user's bill.</p>

Applications are service enablers—deployed by services providers, manufacturers or users.
<p>Applications are invisible to the user. They do not appear on a user's bill. A banking service, for example, would require a secure transaction application to be implemented by the services provider. A unified messaging service would require voice recognition and text-to-speech applications, deployed on the network or in the terminal device. Individual applications will often be enablers for a wide range of services.</p>

Under these definitions, m-commerce will most commonly be an application rather than a service. More strictly, it will be the combination of a large number of applications (e.g., security, certification, transaction recording and interchange, application execution environments, etc.) that a services provider deploys to enable a range of services.

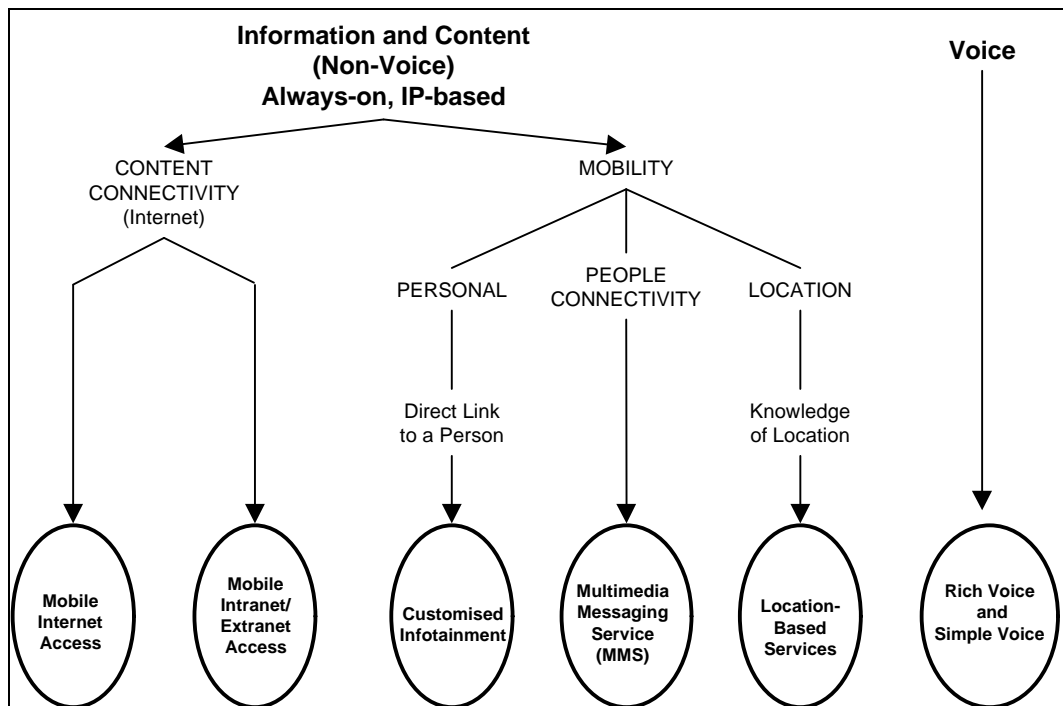
Defining the universe of services used to be trivial. A simple distinction between voice services and data services was often sufficient. In the 3G world, defining a unique set of distinct categories of services is a challenging task. The service categories defined in Report No. 9 and highlighted below are such a unique set.

2.4 Service Categories

UMTS Report No. 9 identified six service categories that we believe represent the majority of the demand for 3G services over the next ten years. The six service categories are defined determinedly from a user perspective and are intended to reflect the perception of the market. Technological distinctions

have been deliberately ignored in the service definitions.⁵ There is a compelling logic behind the six service categories that are illustrated in Figure 3.

Figure 3. 3G mobility services framework.



Source: UMTS Forum Report No. 9, September 2000.

Rather than the voice-centric environment that has dominated the mobile world to date, 3G will be an always-on data environment. Enabling anytime, any place connectivity to content on the Internet will clearly be an important role for 3G. Users will be able to add mobility to their fixed Internet experience giving rise to what could be termed “untethered desktop” services—**Mobile Internet Access** for the residential market segment and **Mobile Intranet/Extranet Access** for the business segment.

But mobility is not the only benefit provided by cellular networks. Mobile cellular networks have two distinctive features that distinguish them from the fixed networks. The mobile terminal is associated with a person rather than a place, and the network knows the current location of that terminal. These are powerful features, particularly in the multimedia environment of 3G.

Association of a terminal with a person allows the provision of a whole range of Internet-based content services tailored to the needs of the user and delivered through mobile portals. NTT DoCoMo’s i-mode service is an early indicator of the potential of such **Customised Infotainment** services. These

⁵ Technology constraints have, of course, been taken into account in the service demand forecasts.

services based on mobile portals are a major opportunity for 3G services providers. Mobile portals encourage loyalty through the ability to personalise the selection of available content and commerce capabilities.

Association of a terminal with a person also creates the opportunity for messaging services amongst closed user groups or specific communities of interest. The dramatic growth in short message service (SMS) traffic in GSM networks illustrates the demand for such messaging capabilities. The always-on characteristic of 3G networks will enable instant messaging capability, and the high data rates available will add image and video capability to create a **Multimedia Messaging Service**.

Knowledge of the current location of a mobile terminal (which may be associated with a person or a machine) is already generating a rich portfolio of **Location-Based Services**. Again, the combination of always-on connectivity and multimedia capability available with 3G adds a new dimension to this service category. Location technology not only enables specific Location-Based Services but also enhances other service offerings such as Customised Infotainment and will be a major driver for the creation of new applications.

Voice will inevitably continue to be an important service offering in the 3G environment. High data rates will allow the addition of videophone capabilities to traditional voice services. The IP environment of 3G will allow the delivery of multimedia communications within the **Rich Voice** service.

Inevitably, the boundaries between these service categories are somewhat artificial, and there is overlap between the categories. Whether an individual service offering falls into one category or another could be the source of protracted (and ultimately fruitless) debate.

The service category definitions provide a framework for analysis of market demand and discussion of industry trends. They encapsulate the essential differences between the mobile and fixed environments—differences that create enormous opportunities. They incorporate the major learnings that have already emerged from the introduction of data services in the 2G environment.

A summary of the service categories indicating the market segments analysed is presented in Table 1.

Table 1. Services that represent the majority of the near-term 3G demand.

Service Name	Service Description	Market Segment Analysed
Mobile Intranet/Extranet Access*	A business 3G service that provides secure mobile access to corporate Local Area Networks (LANs), Virtual Private Networks (VPNs), and the Internet.	Business
Customised Infotainment*	A consumer 3G service that provides device-independent access to personalised content anywhere, anytime via structured-access mechanisms based on mobile portals.	Consumer
Multimedia Messaging Service*	A consumer 3G service, that offers non-real-time, multimedia messaging with always-on capabilities allowing the provision of instant messaging. Targeted at closed user groups that can be services provider- or user-defined.	Consumer
Mobile Internet Access	A 3G service that offers mobile access to full fixed ISP services with near-wireline transmission quality and functionality. It includes full Web access to the Internet as well as file transfer, email, and streaming video/audio capability.	Consumer
Multimedia Messaging Service (Business)	A business 3G service, that offers non-real-time, multimedia messaging with always-on capabilities, personalisation, and user-to-user networking and allows the provision of instant messaging. Targeted at closed business communities that can be services provider or customer defined.	Business
Location-Based Services	A business and consumer 3G service that enables users to find other people, vehicles, resources, services or machines. It also enables others to find users, as well as enabling users to identify their own location via terminal or vehicle identification.	Consumer and Business
Rich Voice and Simple Voice	A 3G service that is real-time and two-way. It provides advanced voice capabilities (such as voice over IP (VoIP), voice-activated net access, and Web-initiated voice calls), while still offering traditional mobile voice features (such as operator services, directory assistance and roaming). As the service matures, it will include mobile videophone and multimedia communications.	Consumer and Business

Sources: UMTS Forum Report No. 9 and Telecompetition Inc., March 2001.

Service categories with an asterisk (*) were analysed and forecast in Report No. 9. Shaded service categories (in bold) are forecast in this report.

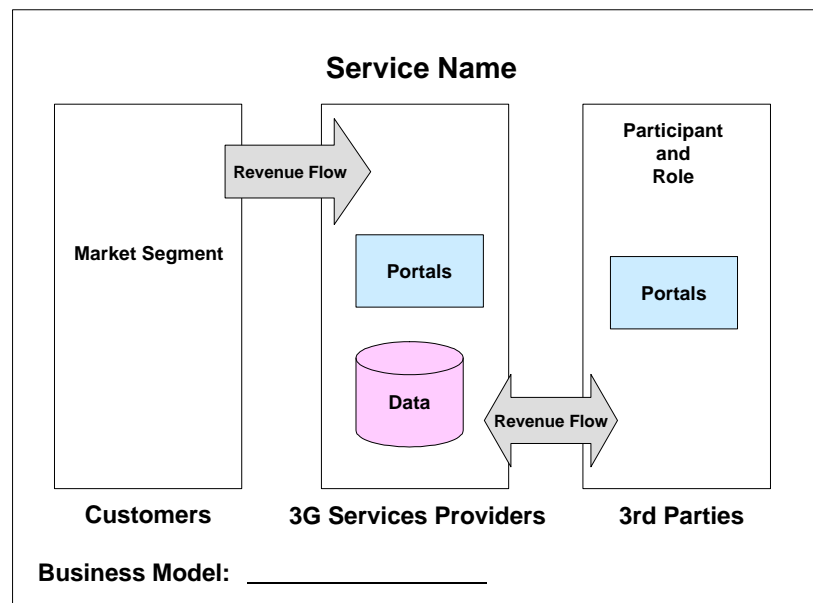
2.4.1 Service Diagrams

For each service category described in the framework, an illustrative service diagram was developed in Report No. 9 to better understand the business relationships involved in service delivery. The following information is embedded in the service diagrams:

- The market segment addressed
- Who controls key data such as portals, subscriber profiles, location data, etc.
- Type of participants and the value they provide
- Illustrative revenue flows
- Business model

Figure 4 shows the service diagram template.

Figure 4. Service diagram template.



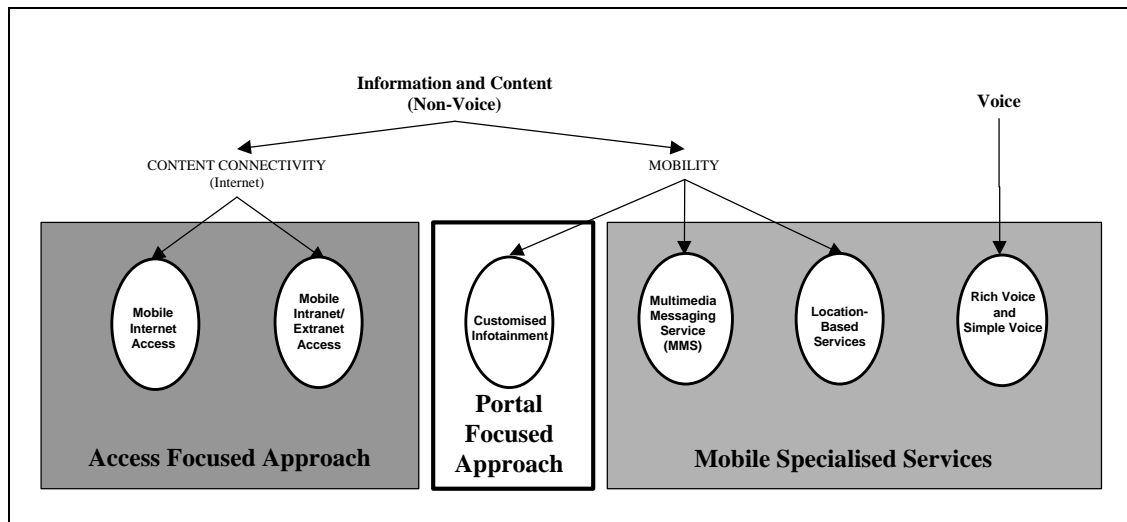
Source: UMTS Forum Report No. 9, September 2000.

The service diagrams are meant as tools for continued analysis and are not intended to be comprehensive.

2.4.2 Mapping Services to Business Models.

The final aspect of the 3G services framework introduced in Report No. 9 is the mapping of service categories to business models. Report No. 9 identified three business models for mobile services providers that will evolve with 3G mobility. The relationship between the six service categories identified in this study and the three basic business models is illustrated in Figure 4.

Figure 5. Business model framework and relationship of business models to service categories.



Source: UMTS Forum Report No. 9, September, 2000.

The three business models indicated in Figure 5 merely illustrate different approaches to the market that may be adopted by 3G services providers. They reflect the characteristics of the market segment served by the specific service category as well as the partnering strategy of the services provider. Defining business models in this way allows for a rational and consistent approach to modelling and forecasting the service revenue potential.

Other reports have assigned specific attributes to particular business models. For example, UMTS Forum Report No. 10 defines a Mobile ISP as extending the normal ISP functionality⁶ to deal with roaming users and characterises a true Mobile ISP as one that offers its own mobile Internet services to users on a wireless portal platform. This is a much more specific definition than the Mobile ISP business model introduced in Part I of this market study.⁷ That business model has therefore been renamed the Access Focused Approach in Part II of this study to avoid any confusion caused by terminology. Similarly the Mobile Portal business model introduced in Report No. 9 has been renamed the Portal Focused Approach.

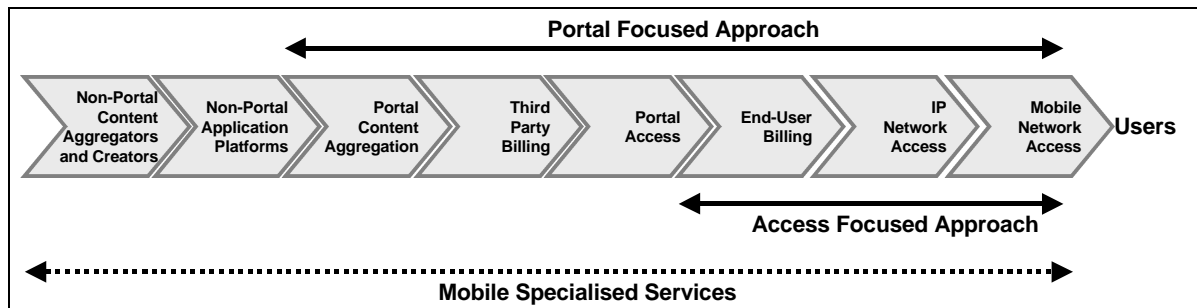
The three business models can be characterised by their positioning along the 3G services value chain shown in Figure 6. As illustrated, 3G services provider using a Portal Focused Approach aggregates and customises portal content, providing third-party billing as well as mobile and IP network access with end-user billing. A 3G services provider using an Access Focused Approach only provides the mobile and IP network access with end-user billing. Mobile Specialised Services can be offered by any type of services provider at any point in the value chain. These business models are

⁶ Normal ISP functionality is defined as providing access to the Internet together with responsibility for the end-user's account. In an all-IP UMTS network the ISP function will be an integral part of UMTS access and transport.

⁷ UMTS Forum Report No. 9.

frameworks to enable cleaner revenue forecasting. In actual practice, a services provider can provide any combination of elements, and provide as much breadth within any element as desired.

Figure 6. Value chain elements provided in different business models.



Source: Telecompetition, Inc., February 2001.

There are three major categories of 3G mobile subscribers that correspond to these business models. While in the real world, these categories are not distinct; modelling them separately provides a cleaner picture of the market potential. The profiles of these subscriber categories are illustrated in Table 2.

Table 2. Mapping of subscriber categories to business models.

Targeted Category	User	Business Model	Profile Description
Internet-centric		Access Focused Approach	More "Internet experienced" user. Values high quality, high-speed access. Prefers to go directly to preferred content provider sites, bypassing portal services. Subscribes to either Mobile Internet Access (consumer) or Mobile Intranet/Extranet Access (business).
Mobility-centric		Portal Focused Approach	Less Internet experienced user. More tolerant of lower speed access. Appreciates easy accessibility of content provided on portal. Consumer subscriber to Customised Infotainment service.
Either Internet or Mobility focused		Specialised Services	User-to-user, user-generated content, contextual data, etc. Provides additional functionality to main subscription service, or could be offered as stand-alone services

Source: Telecompetition, Inc., February 2001.

Access Focused Approach

The 3G services provider adopting an Access Focused Approach provides

mobile and IP network access and other services. This type of services provider has a direct relationship with the end user, but does not provide third-party billing or content aggregation services. Therefore, it is unable to command a share in additional revenue opportunities such as advertising, premium subscription or transaction fees. The Access Focused services provider can be an existing mobile network operator or a new entrant (e.g., Mobile Virtual Network Operator) from either the mobile or fixed Internet industry.

Subscribers to the Mobile Internet Access or Mobile Intranet/Extranet Access services offered by Access Focused providers are “Internet-centric”, currently using fixed Internet services and expecting comparable functionality and speed from their mobile Internet services. These subscribers know what content they want and where to get it. They prefer to bypass the aggregated content offered by portals and browse directly to the sites they want. As these subscribers already have a fixed Internet service provider, they may prefer to retain that relationship, keeping the same email address. Consequently subscription fees that 3G services providers receive for mobile IP access may need to be shared with the fixed services provider.

Portal Focused Approach

Like the Access Focused 3G services provider, the Portal Focused 3G services provider provides access to the mobile network and the IP network, as well as direct end-user billing. Unlike Access Focused services provider, the Portal Focused services provider includes access to selected partner content. The 3G services providers adopting a Portal Focused Approach have invested in the necessary applications platforms and business partnerships to provide content aggregation and third-party billing. Therefore, they are able to command a share of new revenue streams from m-commerce transactions, advertising fees and content based subscription fees.

The subscribers to the Customised Infotainment services offered by these types of services providers appreciate the added value of content that is aggregated and customised to their preferences and interests. These subscribers are “mobility-centric”, more likely to be users of voice mobile services, and are relatively less adept or non-users of fixed Internet services. As a result, their requirements for access speed and full Web access are less than the “Internet-centric” users. They will, however, expect to be able to access any Internet content outside the portal, when desired.

Specialised Services

In the Mobile Specialised Services business model, the 3G services provider can offer user-to-user services that are not necessarily Internet-centric. Mobile Specialised Services are modelled separately for clarity, but can be offered by themselves or as part of a service bundle that could also include Customised Infotainment, Mobile Internet Access or Mobile Intranet/Extranet Access. Mobile Specialised Services can be offered by either Access Focused or Portal Focused 3G services providers. They can also be offered by other content aggregators and application service providers. Consequently, Mobile Specialised Services can be applicable at any area of the value chain. The

services are quite varied, and revenue sources for 3G services providers can include airtime, messages, subscription, advertising, and transaction fees.

The business model determines what revenue streams the mobile services provider will retain from each service, either from its partners or subscribers as shown in Table 3.

Table 3. Revenue sources by 3G mobile service category.

Business Model	Access Focused Approach		Portal Focused Approach	Mobile Specialised Services		
	Mobile Internet Access	Mobile Intranet/ Extranet Access	Customised Infotainment	Multimedia Messaging Service	Location-Based Services	Rich Voice and Simple Voice
Airtime	✓	✓	✓		✓	✓
Message				✓		
Subscription	✓	✓	✓	✓	✓	
Advertising			✓		✓	
Transaction			✓		✓	

Source: Telecompetition, Inc., February 2001.

2.5 Business Models and Service Categories

The business models and service categories proposed in this report are intended to provide a convenient and consistent framework for analysing the market. While the business models reflect examples of different approaches to the market place, they are not mutually exclusive. The service categories, however, encompass the whole universe of 3G services although many specific individual service offerings could be considered as belonging to more than one service category. This is discussed in more detail later in this report (See Section 3.3).

The Access Focused and Portal Focused approaches represent different positioning of services providers along the value chain. The Access Focused model is close to the traditional role of an operator as an access and transport provider.

The Portal Focused business model, on the other hand, involves the services provider in the provisioning and distribution of content. The extent of this involvement and the associated revenue sharing arrangements are currently just beginning to be explored. The future market position and business relationships between fixed Internet ISPs, mobile portals, and other third parties are highly uncertain. This is a critical factor when assigning services provider-retained revenues.

The crux of this issue is whether subscribers will favour the value-added services created and owned by mobile portals or prefer to buy mobility-

enhanced access services only, possibly retaining their fixed ISP as their mobile services provider. It is clear that both scenarios have strengths and are capable of capturing significant market share.

3. Perspectives on Industry Structure

The 3G environment represents both a major challenge and a major opportunity for the mobile industry. The radical shift in emphasis from voice to non-voice services will have significant impact and repercussions on the fundamental structure of the industry itself.

3.1 *Evolving Industry Structure*

The mobile industry was built on the premise of providing anytime, anywhere connectivity for voice communications. It has been phenomenally successful in providing mobile voice services. But the introduction of mobile data services within the traditional industry structure and the 2G circuit switched environment has not met with equal success.

The always-on, packet switched, high data rate capabilities delivered by 3G provide the technical capability for the deployment of compelling non-voice services. Such services, however, change the ground rules for mobile services providers. The new industry structure has to accommodate a shift from transport to content provision, new relationships between services providers and users, and a plethora of new players and partnerships.

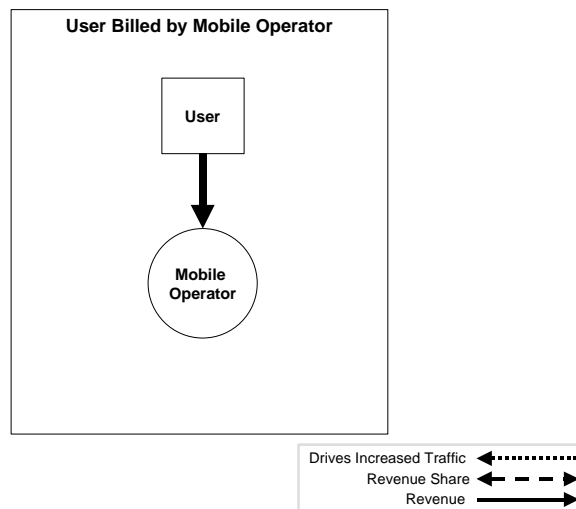
The significance of this new industry structure is reflected in the methodology used to forecast service revenues in this market study. The shift to content provision enables new revenue streams which will be shared in a variety of ways between the new players in the market. But much of the additional revenue generated by 3G services will come through increased usage rather than through new sources of revenue.

This section (3.1) illustrates how the new industry structure is evolving with the introduction of new players, new revenue streams, revenue sharing relationships and usage drivers. The description maps the chronological development of the industry in simplified terms. It is intended to be illustrative rather than comprehensive. The purpose is to provide insight into both the revenue forecast methodology used in this market study and the apparent complexity of the new world of 3G service provision.

3.1.1 *Voice-only Service – An Historic Perspective*

The traditional service offered by mobile operators delivers voice connectivity between users. It involves a simple and direct relationship between users and the mobile operator as illustrated in Figure 7.

Figure 7. Traditional voice-only scenario (illustrative).



Source: Telecompetition Inc., February 2001.

In general, the user is billed directly by the mobile operator, and the mobile operator retains “ownership” of its subscriber base. Mobile operators in this context can be either network operators or airtime resellers.⁸ In either case, there is effectively a one-to-one relationship between the user and the operator and essentially only a single service is provided.

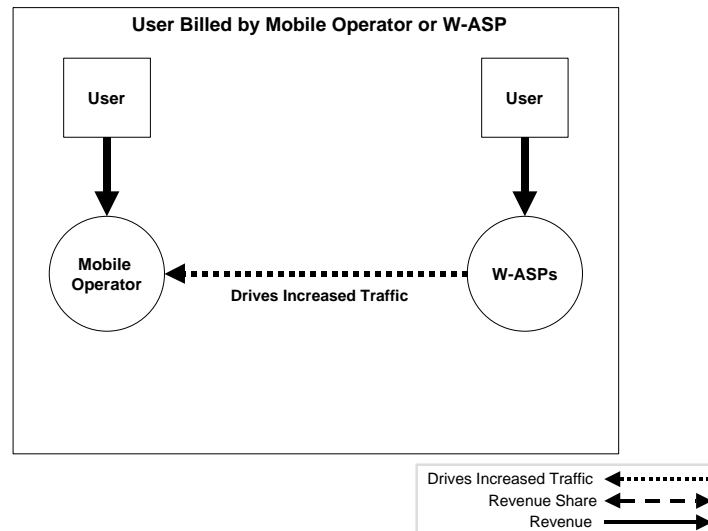
3.1.2 Today's Environment

Cellular users today may have relationships with entities other than the mobile network operator. This is illustrated by considering the example of vertical mobile data applications in 2G systems. Although mobile data services have not been particularly successful in the 2G environment, they have encouraged the entry of a new player in the market – the Wireless Application Services Provider (W-ASP).

W-ASPs can be considered a variant of airtime resellers in the voice-only scenario in that they have a direct relationship with their own subscriber base. W-ASPs bring an additional dimension to the marketplace and the structure of the industry. As illustrated in Figure 8, W-ASPs can offer services directly to users, building up their own subscriber base and obtaining revenues from subscription fees. They do not necessarily have revenue-sharing arrangements with mobile network operators.

⁸ Airtime resellers are sometimes called Wireless Service Providers in this context.

Figure 8. The introduction of Wireless Application Services Providers (illustrative).



Source: Telecompetition Inc., February 2001.

The mobile network operators benefit indirectly through increased traffic on their networks. The emergence of new players with their own direct relationship with users is an important feature of the evolving industry structure. Such players do not always represent a direct revenue stream for mobile network operators, but they can contribute significantly to operator-retained service revenues by driving up usage.

A significant proportion of the service revenues forecast in this study is generated by new players in the market, increasing traffic on 3G networks.

3.1.3 Tomorrow's Environment

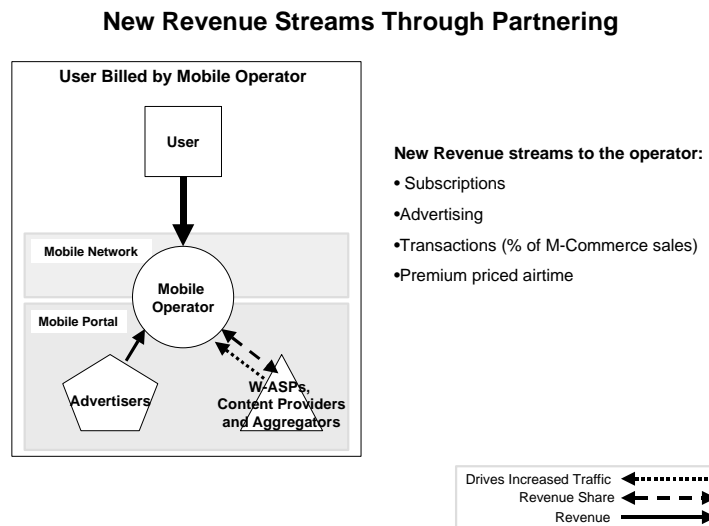
The introduction of 3G not only further increases the variety of players involved in the provision of services but also provides many more options for mobile services providers. UMTS Report 10, for example, uses the relationships between the players to characterise some fundamental business models.⁹ In Report 10, the Fragmented model describes a relationship where the different players essentially act independently of each other. In the Partnership model, players such as mobile network operators and content providers enter into well-defined relationships. In the Ownership model, the mobile services provider extends its traditional network operator role to encompass other functions within the value chain.

Relationships between partners have to be considered when forecasting the revenue retained by mobile services providers. That requires an understanding of the revenue sources, revenue sharing arrangements and usage drivers involved in each scenario.

⁹ UMTS Forum Report No. 10 can be found on the UMTS Web site. (www.umts-forum.org)

In the largely Internet-driven 3G environment, there will be a strong focus on content provision as well as access and transport services. Content provision is a new role for mobile network operators which makes new services and revenues possible. Content may be provided by mobile network operators through acquisition, alliances or partnerships with new players such as W-ASPs, content providers or aggregators. One example of such a partnership relationship is illustrated in Figure 9.

Figure 9. An example of new 3G revenue streams through partnerships (illustrative).



Source: Telecompetition Inc., February 2001.

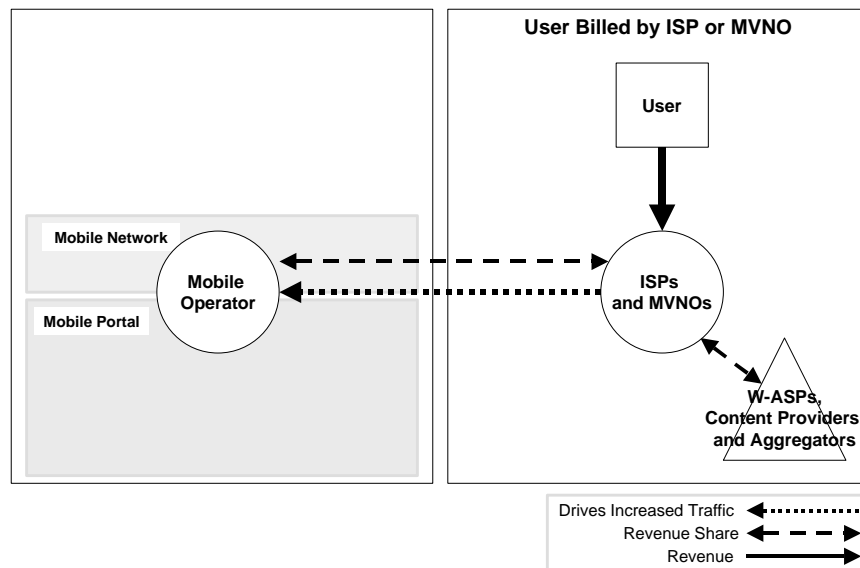
This scenario opens up the possibility of new revenue streams for the mobile network operator. Operators may be able to charge users subscription fees or premium-priced airtime for access to certain services and could retain a proportion of m-commerce transaction charges. Service-related advertising represents an entirely new revenue source.

No clear business model for such partnerships has yet emerged although many variations are being tested. Revenue-sharing arrangements with partners will undoubtedly feature in this scenario, but these are still largely undefined. In most cases, the primary benefit for mobile network operators will be the increased traffic, reduced churn, and user stickiness engendered by the new service offerings.

The example illustrated in Figure 9 is not the only scenario. The new services can introduce new players who also have a direct relationship with the customer. In this scenario, illustrated in Figure 10, the mobile network operator is providing connectivity but has no direct contact or relationship with the user. The new players, who are services providers such as ISPs or Mobile Virtual Network Operators (MVNOs), have their own partnership arrangements with ASPs and content providers and their own customer base. The mobile network operator is essentially operating in a wholesale capacity and may or may not share in the revenues received by the MVNO. The mobile network operator benefits from increased traffic and may or may not share these

benefits with the MVNO. Again, clear business models have yet to emerge.

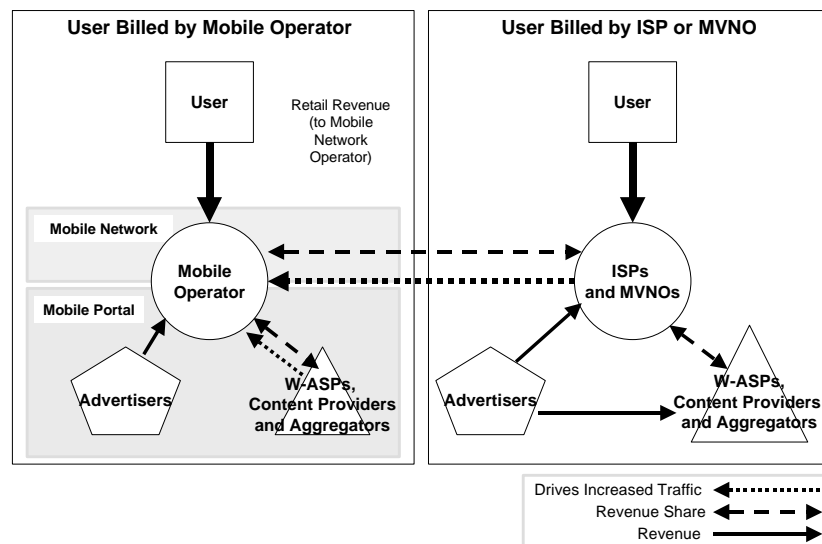
Figure 10. New services providers in the 3G environment (illustrative).



Source: Telecompetition Inc., February 2001.

In practice, the scenarios illustrated in Figures 9 and 10 will co-exist. This creates a very complex industry structure where the mobile network operator can function as both a retail provider and a wholesale provider, depending upon the services offered and market segment targeted (Figure 11).

Figure 11. Multiple roles for 3G network operators (illustrative).



Source: Telecompetition Inc., February 2001.

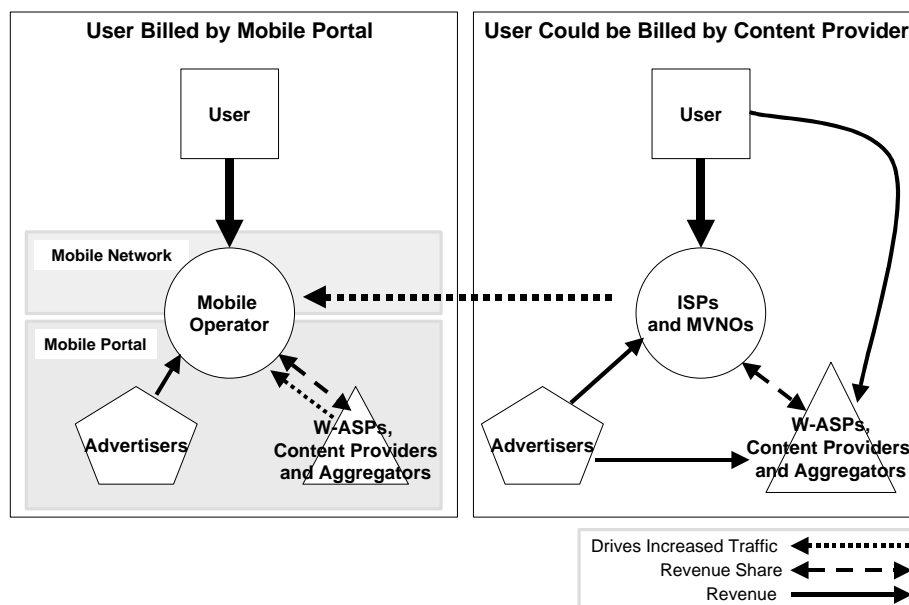
Although this structure is complex, there are only two ultimate sources of revenue – users and advertisers. These revenue sources have to feed all the players involved. Advertising is effectively a new revenue source for the

mobile industry. But the bulk of the revenue will still come from users – either from new subscribers to the mobile network operators' services, from increased spending by existing subscribers on new services, or from new user communities contained within the customer base of ISPs and MVNOs.

The proportion of the revenues retained by mobile network operators and services providers will depend on their revenue sharing arrangements with their partners. Such revenue-sharing arrangements are still being negotiated on a case-by-case basis.

Transaction-based services enabled by some m-commerce applications introduce additional complexity to the required revenue-sharing arrangements as they can involve a direct revenue link between the user and the content provider (See Figure 12).

Figure 12. M-commerce adds complexity (illustrative).

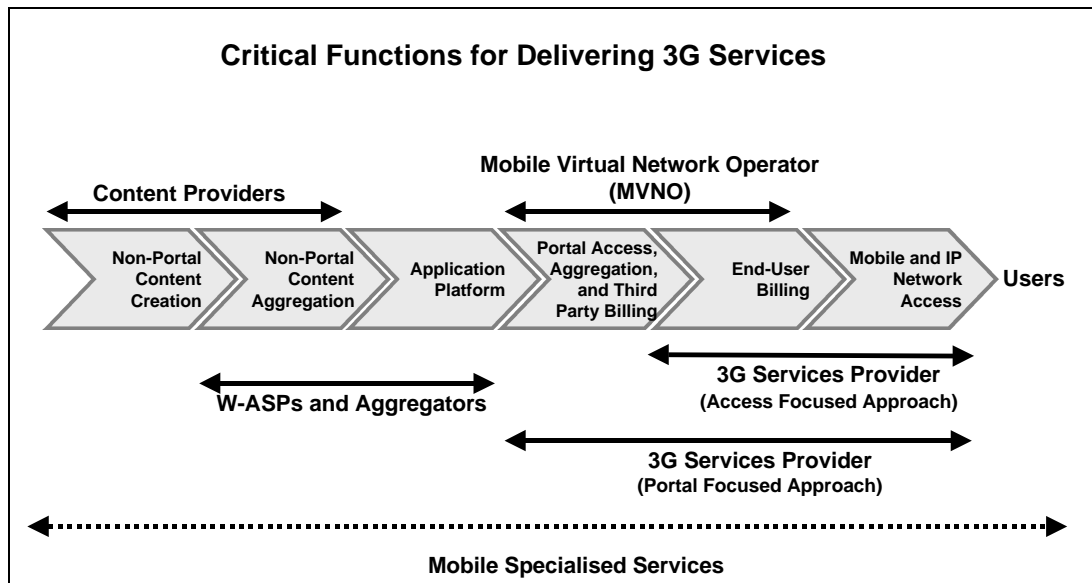


Source: Telecompetition Inc., February 2001.

3.1.4 Access and Portal Focused Approaches

The Access Focused and Portal Focused approaches introduced earlier in Figure 5 represent examples of different positioning of the services provider along the 3G value chain. These business approaches and the roles of other types of players in the industry are shown in Figure 13.

Figure 13. Critical value chain functions provided by 3G industry players.



Source: Telecompetition Inc., February 2001.

In the Access Focused Approach, the services provider is effectively acting as a pipe, providing access and transport services together with the ISP function. Revenue streams correspond to the historic relationship illustrated in Figure 7. The service-revenue forecasts presented later in this report indicate that this approach could be appropriate for certain market sectors.

The Portal Focused Approach involves investment by services providers to enable the provision of content-based services. But this model contains the potential for significant additional revenue through the provision of Customised Infotainment services to a services provider's subscriber base. Customised Infotainment services rely heavily on subscriber profile data, which will require particular attention when there is a high proportion of prepaid subscribers. The revenue streams correspond to those shown in Figure 9. Services providers have the option to seek additional revenue through the "wholesale" arrangements shown in Figure 10, depending on their capacity constraints and commercial priorities.

Mobile Specialised Services could be offered by 3G services providers adopting either the Access Focused or Portal Focused Approaches. Services providers will have to invest in appropriate additional functionality depending on the specific service being offered.

3.2 Mapping the Services Universe

Many reports have been produced which discuss the potential of 3G services.¹⁰ But there is very little consistency between service definitions, and each report seems to contain a different set of "services" within its proposed

¹⁰ See Bibliography for a partial list of recent reports.

portfolio. This inconsistency makes interpretation of the results and predictions difficult and comparison of any subscriber and revenue forecasts all but impossible.

Services proposed in the literature range from the very specific (e.g., downloadable ring tones) to the ultra-broad (e.g., m-commerce). Some “services” relate to revenue streams (e.g., advertising) whilst others refer to enabling applications (e.g., voice-activation).

The definitions that distinguish services from applications, together with the service framework introduced in Report No. 9¹¹ are an attempt to bring some order to this confusion. They provide a logical and consistent basis for discussion, analysis and comparison.

To support this process, we have sampled a selection of recent research reports to compile a comprehensive list of proposed services including applications.

These service concepts and applications have been mapped onto the service categories of Report No. 9 as shown in Table 4 (a-b). The mapping indicates where there could be a revenue-generating mechanism associated with the proposed services—either through direct charging or increased traffic. The mapping should help in relating the service-revenue forecasts in this report to predictions from other sources.

¹¹ See Section 2.3 of this report.

Table 4a. Applications and service concept mapping to Report No. 9 service categories.¹²

Service Concepts and Applications ¹³		UMTS Forum Report No. 9 Service Categories					
		Access Focus		Portal Focus	Specialised Service		
		Mobile Internet Access	Mobile Intranet/ Extranet Access	Customised Infotainment	Multimedia Messaging Service (MMS)	Location-Based Service	Rich Voice and Simple Voice
Conferencing	Mobile Video (Streaming)						
	Mobile Videotelephony						
	Simple Voice						
	Teen Video Chat (Non Real Time)						
	Video Conferencing						
	Voice Over IP						
	Voice Portal						
	Voice-Activation						
Messaging	E-mail / Messaging						
	E-mail Receipt (100 letters)						
	E-mail Transfer (100 letters)						
	Instant Messaging/ Message Aggregation						
	Machine-to-Machine						
	Mobile Chat (Non-Real Time)						
	Mobile Instant Messaging (MIM)						
	Mobile Postcard						
	Multimedia Messaging						
	Short Message Service (SMS)						
	Streaming Audio/Video (Non-Real Time)						
	Unified Messaging						
Internet Access / Networking	Application Synchronization						
	FTP Transfers						
	Internet						
	Intranet						
	Mobile VPN						
Location-Based Services	Web Browsing						
	Car Navigation						
	Localised Info (Current User Location)						
	Localised Info (Future / Planned Location)						
	Location Sensitive (Billing/Routing)						
	Location-Based M-Commerce						
	Navigation/Location						
	Telematics						
	Tracking / Personal Security						
	Virtual Mouse /Directional Wand						

Legend Driver of Traffic (airtime or messages)	
Revenue source in UMTS Forum Forecast	



Source: Telecompetition Inc., February 2001.

¹² Tables 4a and 4b are examples of services concepts as described in a wide number of research reports and industry papers. They are illustrative and are not intended to represent every possible service variation that may be developed. The intention of these two tables is to demonstrate that all identified service concepts can be grouped into one of the six UMTS service categories, and that only a few actually drive direct revenue. Most service concepts benefit mobile services providers by increasing traffic.

¹³ Sources: ARC, CIBC, Dain Rauscher Wessels, Durlacher Research, Frost & Sullivan, JP Morgan, Merrill Lynch, Mobile Lifestreams, Motorola, Nokia, NTT DoCoMo, Ovum, Robertson Stephens, UBS Warburg.

Table 4b. Applications and service concept mapping to Report No. 9 service categories (continued).

Service Concepts and Applications ¹⁴		UMTS Forum Report No. 9 Service Categories					
		Access Focus		Portal Focus	Specialised Service		
		Mobile Internet Access	Mobile Intranet/ Extranet Access	Customised Infotainment	Multimedia Messaging Service (MMS)	Location-Based Service	Rich Voice and Simple Voice
Entertainment	Downloadable Ring Tones / Graphics						
	Entertainment						
	Internet Games						
	Mobile Music						
	Online Dating						
	Online Gambling						
Financial Services	Financial Services						
	Financial/Banking (E-cash)						
	Mobile Cash						
	Mobile E-Bill						
	Mobile E-Salary						
	Stock Trading						
Information Services	Alerts						
	Dictionary Research						
	Directories						
	Emergency Services (E911)						
	Flight Reservation						
	Info Services						
	Instant Weather Forecast						
	M-information (user statistics)						
	Multimedia (video / audio real time)						
	Personal Information Management (PIM)						
	Restaurant Guide						
	Town Page (Yellow Page)						
	Virtual Home Environment (VHE)						
Mobile Commerce	Advertising						
	B2B Business Data Applications						
	eWallets & Shopping Enhancements						
	Just The Ticket						
	M-Commerce Transactions						
	ME Commerce						
	Micro-Payments						
	Mobile Retailing						
	Transaction Processing						

Legend Driver of Traffic (airtime or messages) 
Revenue source in UMTS Forum Forecast 

Source: Telecompetition Inc., February 2001.

Some proposed services have no revenue stream attached to them, even though they have been assigned revenues in some analysts' reports. An example is "Location-Sensitive Billing", which typically enables a lower tariff to

¹⁴ Sources: ARC, CIBC, Dain Rauscher Wessels, Durlacher Research, Frost & Sullivan, JP Morgan, Merrill Lynch, Mobile Lifestreams, Motorola, Nokia, NTT DoCoMo, Ovum, Robertson Stephens, UBS Warburg.

be applied in specific “home zones”. The provision of location-sensitive billing could be a competitive differentiator for a services provider, allowing them to retain their user base and attract customers from other services providers. That creates additional revenue for one services provider but does not represent additional revenue in the market as a whole. As this study is concerned with total market demand, such revenues have been omitted from the forecasts.¹⁵

Generic service concepts such as m-commerce can be related to many service categories, either as drivers of increased traffic or as direct generators of revenue through transaction charges.

Many services are treated as having no direct revenue potential in this study as users will expect them to be included as part of their service package and will be unwilling to sustain additional charges for them. Financial services, Web browsing and email belong to this category. Their benefit comes from their role as drivers of traffic.

3.3 Summary of Key Findings

- Revenue streams to 3G services providers are highly dependent upon the business models adopted by themselves and their partners. The industry structure is still evolving, so no clear business models are yet established. It is clear, however, that the role of the 3G services providers will change from a simple voice-only, direct relationship with the user to one that involves multiple partners, revenue sharing, with third parties also targeting the end-user.
- The Access Focused Approach and the Portal Focused Approach business models adopted in this report correspond to different positions on the value chain and provide a distinct way to model service revenues. Specialised Mobile Services can be offered by 3G services providers using either approach and can be positioned at any point on the value chain.
- Many services and applications such as email, Web browsing, unified messaging, and location information are treated as having little or no direct revenue potential as users will expect them to be included as part of their service package at no additional charge. Much of the additional revenue generated by such services and applications will come through increased usage rather than through new sources of revenue.

¹⁵ Location-sensitive billing revenues could be included in the service revenue forecasts if they resulted from subscribers migrating from 2G to 3G networks. Such second-order effects have not been modelled in this study.

4. Service Definitions and Analysis

An analysis of each of the six service categories is contained in Report No. 9. Service revenue forecasts for some of the service categories were presented in Report No. 9.¹⁶ This report presents service revenue forecasts for the remaining services: Mobile Internet Access (Consumer), Multimedia Messaging Service (Business), Location-Based Services (Combined Consumer and Business), Simple Voice and Rich Voice (Combined Consumer and Business). This section contains supplemental information and analysis relating to those remaining services.

4.1 Mobile Internet Access (Consumer)

Mobile Internet Access	A 3G service that offers mobile access to full fixed ISP services with near-wireline transmission quality and functionality. It includes full Web access to the Internet as well as file transfer, electronic mail (email), and streaming video/audio capability.
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A discussion of the Mobile Internet Access service is presented in Report No. 9, Section 4.4. Part of that discussion is repeated here for completeness.

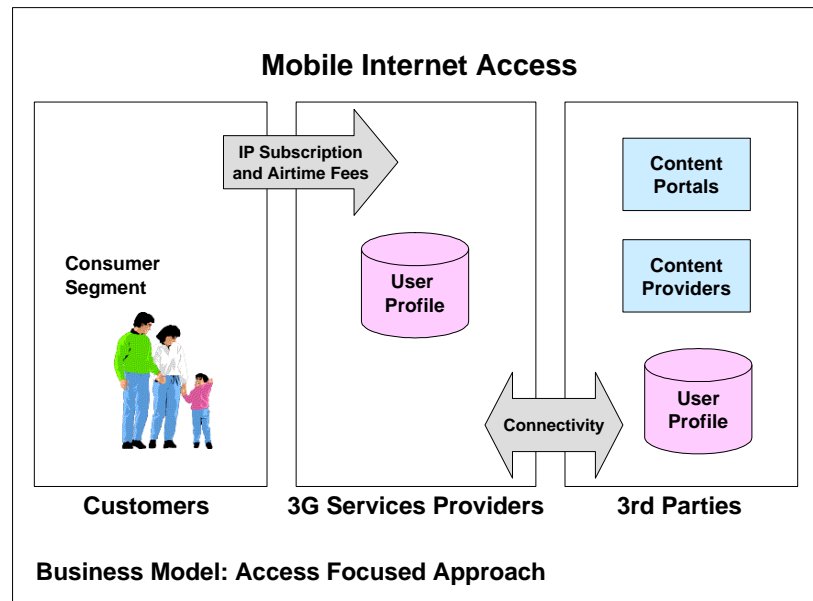
The Mobile Internet Access service essentially extends the consumer's fixed Internet experience into the mobile environment, providing an alternative access mechanism to existing content. Mobile access to existing email accounts with fixed ISPs is predicted by many analysts to be the major initial driver for such a service. The prime target market for Mobile Internet Access is the existing customer base of fixed Internet users.

When offering Mobile Internet Access, 3G services providers are adopting an Access Focused Approach. In addition to enabling mobile Web browsing, they provide their customers access to other fixed-line and mobile portal operators and content partners.

Figure 14 illustrates the possible business relationships amongst 3G services providers, customers and third parties for Mobile Internet Access.

¹⁶ The service categories forecast in Report No. 9 are: Mobile Intranet/Extranet Access (Business), Customised Infotainment (Consumer) and Multimedia Messaging Service (Consumer).

Figure 14. Service diagram for Mobile Internet Access.



Sources: The UMTS Forum and Telecompetition Inc., March 2001.

Within this study, Mobile Internet Access is defined as:

- Mobile access to the Internet,
- Paid for by an individual,
- Used primarily for home, personal business, or recreational purposes.

Individual use of mobile access to the Internet that is paid for by a business is included in the Mobile Intranet/Extranet Access forecast in Report No. 9. Within the demographic data used in this study, SoHo¹⁷ workers are included in the business segment and, therefore, are part of the Mobile Intranet/Extranet Access forecasts even though some of their mobile Internet access activity may be for personal use.

4.1.1 Enabling Factors

Mobile Internet Access targets a substantial and growing customer base of fixed Internet users who already have relationships with fixed ISPs. The Internet itself provides the ultimate source of rich content.

But fixed world pricing trends (e.g., flat rate or "free") will restrict any premium pricing for mobility. Consumers will expect comparable service and price to the fixed world.

While mobile access to the Internet today cannot compete with fixed access because of the limitations of current mobile devices and access bandwidth, acceptable Web browsing in a mobile environment is expected to become

¹⁷ Small office, Home office.

possible with the advent of “handheld Internet” devices around 2005. Web browsing using laptops or PDAs in a portable environment is possible today. The implementation of rich graphics, html and fully-featured operating systems in the mobile environment is expected to drive the terminals market.

Few fixed Internet users will be prepared to accept a reduced quality Internet experience in a portable or even a mobile environment. The Internet is already evolving rapidly with increasing use of sound, multimedia and plug-ins and with the advent of user-to-user networking. The Internet in 2005 could be very different from the Internet today. Mobile devices will need to handle all current and future functionality to deliver the full Internet experience. Otherwise, they will not be acceptable to the user.

The ability to provide Internet access and other ISP functionality over 3G networks opens up the possibility of providing in-building services such as home networking in the consumer environment. Mobile Intranet/Extranet Access services in the business environment could provide coverage in ‘hot spots’ such as airport lounges. Such services are targeted at Internet users who require portability rather than full mobility for their game machines or laptops. They can be provided by alternative technologies such as wireless LANs and so will be a very competitive market niche.

4.1.2 Implications

A frequent prediction is that there will be more mobile devices accessing the Internet than PCs by 2004. Most people agree that the popularity of wireless Internet access will even accelerate the growth of the Internet itself. But there is an important distinction to be made here between broadband wireless access, or wireless devices in a local area network, and mobile devices in the wide area network. The emphasis on “mobile Web browsing” within the US community reflects the US perspective of 3G as a high data-rate wireless system. Mobile Web browsing is envisaged mainly in a cordless or personal area network environment rather than in a truly mobile environment.

Mobile Internet Access, in any environment, is unlikely ever to dominate Internet usage. Wireline access with high bandwidth will always be an important feature of the Internet. 3G will replace some high-speed access, but will never be a complete substitute. **3G will, however, be a powerful driver for the development of terminals capable of full Web browsing.**

Simple Mobile Internet Access will not drive the overall development of the Internet. But user addiction to email and Web sites is a powerful driver for mobility, and 3G services providers who do not provide Mobile Internet Access service may well find themselves at a competitive disadvantage. The service will enhance customer loyalty and shareholder value, but just as in the fixed environment, an ISP service alone is unlikely to be a sustainable business model in the long term.

Mobile Internet Access by itself allows very little opportunity to upsell services to the consumer. It effectively caps the revenue stream for the mobile services

provider. This is a low margin business and requires economies of scale (e.g., an efficient pipe) to make it viable.

4.2 Multimedia Messaging Service (Business)

Multimedia Messaging Service	A business 3G service, that offers non-real-time, multimedia messaging with always-on capabilities, personalisation, and user-to-user networking and allows the provision of instant messaging. Targeted at closed business communities that can be services provider or customer-defined.
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Revenue forecasts for the Multimedia Messaging Service in the consumer market were presented in Report No. 9. This section discusses the Multimedia Messaging Service (MMS) in the business market. Revenue forecasts for this service category are presented later in this report.

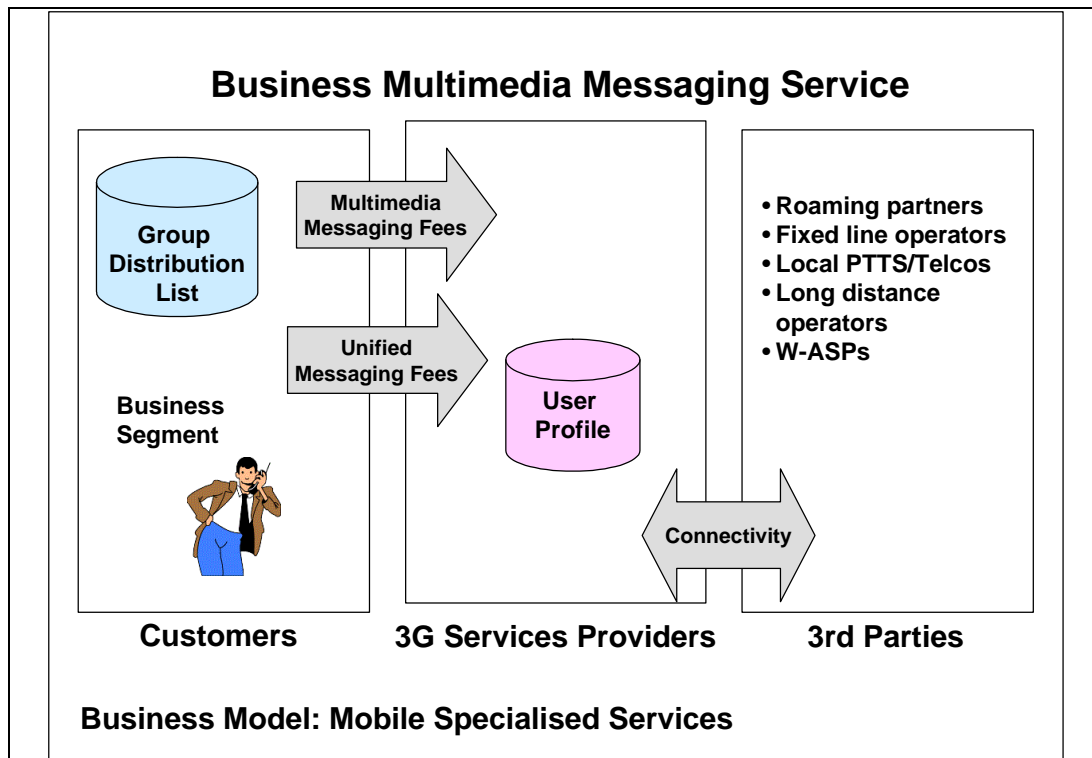
MMS in the business sector includes those messaging services, either person-to-person or machine-to-machine that contain at least one multimedia component (video, graphics/photo, audio, animation), other than just text or voice. These services are used for business purposes, can be paid for by either individuals or businesses, and are carried over the 3G network.

The bulk of the messaging traffic for business will be text, simple graphics or voice, equivalent to email, which is also available through Mobile Intranet/Extranet. Text-based messages will not sustain an additional separate revenue stream. It is, therefore, substantially excluded in the revenue forecasts for Business MMS.

Unified messaging is a personal communications management service which enables all forms of call and media messages (e.g. email, fax, voice mail, and SMS) to be stored and accessed from a central location in the media or format desired by the user. Unified messaging service is controlled by an individual user and can be used for both business and/or social purposes. Unified messaging is included within business MMS but will generate separate revenues (subscription and airtime/message fees) for only 4-5 years. After that time, unified messaging will become part of the basic service and will not generate a separate revenue source.

As shown in Figure 15 the business relationship amongst 3G services providers and customers is primarily a traditional one, with the user directly paying the services provider for the MMS service.

Figure 15. Service diagram for Multimedia Messaging Service.

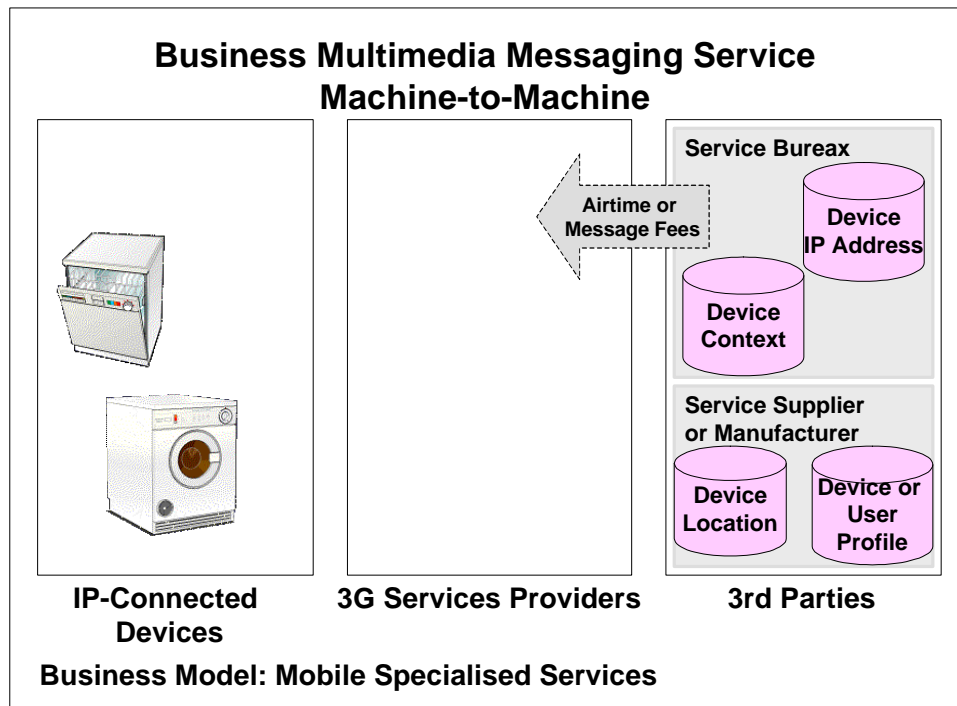


Source: Telecompetition Inc., February 2001.

Machine-to-machine communications is regarded as a special category of business MMS with a service diagram illustrated in Figure 16. It includes telemetry that contains a multimedia component. This service is typically provided as a business-to-business service, providing value to the end-user, but not directly involving him in the transaction. An example would be remote monitoring of large appliances for potential service failures. Machine-to-machine communications in the 3G environment are not a significant revenue generator compared with other service opportunities.¹⁸

¹⁸ Telematics, which is often considered a machine-to-machine service is classified as a Location-Based Service in this report. Service revenue forecasts for telematics are included in that service category.

Figure 16. Service diagram for Multimedia Messaging Service – machine-to-machine.



Source: Telecompetition Inc., February 2001.

4.2.1 Enabling Factors

The easy creation of group distribution lists will be a compelling feature of multimedia messaging services. Such features enhance customer loyalty and reduce churn.

The always-on capability of 3G networks will allow for the provision of instant messaging services. Business users are accustomed to instant messaging capability with email over the corporate LAN, so the provision of equivalent functionality over 3G networks will be a compelling service. Such a service is likely to be part of a basic business package, its value coming from strengthening customer loyalty and generating messaging traffic.

The need for users to create content could slow the initial uptake of multimedia messaging although this will soon be compensated by the development of libraries of graphic and video material. In the longer term, the introduction of functionality enabling users to create content will be a strong driver for the development of multimedia messaging.

Unified messaging as a separate revenue stream has a limited life. It will very soon become a low revenue service or simply be subsumed as part of the basic package for any messaging service.

4.2.2 Implications

Ease of use will be a key factor in business MMS. User interface will be

critical, particularly for the establishment and manipulation of distribution lists.

Issues that need to be addressed in the business MMS environment include the standardisation of graphics and messages, interoperability between messaging systems and mechanisms for handling non-delivery of messages.

MMS will allow relevant content to be broadcast to distribution lists with specific profiles. Use of such a feature in a “push” mode should be treated with caution. In general it is advisable to ensure subscribers “opt in” to push services.

4.3 Location-Based Services (Combined Consumer and Business)

Location-Based Services	A business and consumer 3G service, that enables users or machines to find other people, vehicles, resources, services or machines. It also enables others to find users, as well as enabling users to identify their own location via terminal or vehicle identification.
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Location services as commonly discussed today consist of a broad range of services that incorporate location information with other data to provide added value to the user. This includes services deriving the proximity details from the network, the device, or even the user. Examples of such services have been described in Report No. 9, Section 4.5.

Research has shown high levels of consumer and business interest in a wide range of services that include location information as a key element. It is precisely this high level of interest and the corresponding technology developments that have spurred the development of the location industry and created a multi-faceted assortment of players, service concepts and business models. Except for some existing telematics services offered within the automotive industry, there are as yet few commercial examples of Location-Based Services. For the most part, services are still in the trial stage, with service definitions, revenue models, pricing, and business relationships largely undefined. The result is an exciting, yet confusing picture that is difficult for mobile services providers to apply to any structured analysis or business case.

In all the excitement of this evolving industry and technical advances, it is important to note that location/proximity information is only one of several elements that are necessary to make the services valuable to users. For example, details on the location of a mobile user who is trying to locate a favourite restaurant are not particularly valuable without the underlying database that can match user location to street maps with names and location of various retail establishments. The direction the user is travelling is also useful contextual information. Mobile advertising that can direct mobile users to a nearby coffee shop with a “50% off coupon” is not particularly valuable unless targeted to user profiles that include information on beverage preferences. Location information provided by mobile services providers, in and of itself, will not be valuable unless combined with other critical information that is typically owned by third parties. It is this need for partnership that makes the business models for Location-Based Services

particularly complex and the role of the mobile services providers less clear.

Over time, customers and third parties will come to view location data as a basic infrastructure element associated with a personalised content package. This content can be provided by a number of third parties that package it with location data. As such, it is likely that much of the mobile services provider revenue will come through the business relationship with a content provider or service bureau and not directly with the end-user. While the end-user may not be billed directly by the mobile services provider for location-enabled functionality, the mobile services provider will still benefit from the increased traffic on the network.

W-ASPs could play a particularly dominant role in Location-Based Services acting as either content providers or service bureaux. It is they who will likely create the real added value by combining location information with user profiles and contextual data relevant to the service being offered. As such, they will expect to retain a significant proportion of the available revenues. Location-Based Services represent a major revenue opportunity for W-ASPs and content providers.

Within this study, Location-Based Services include:

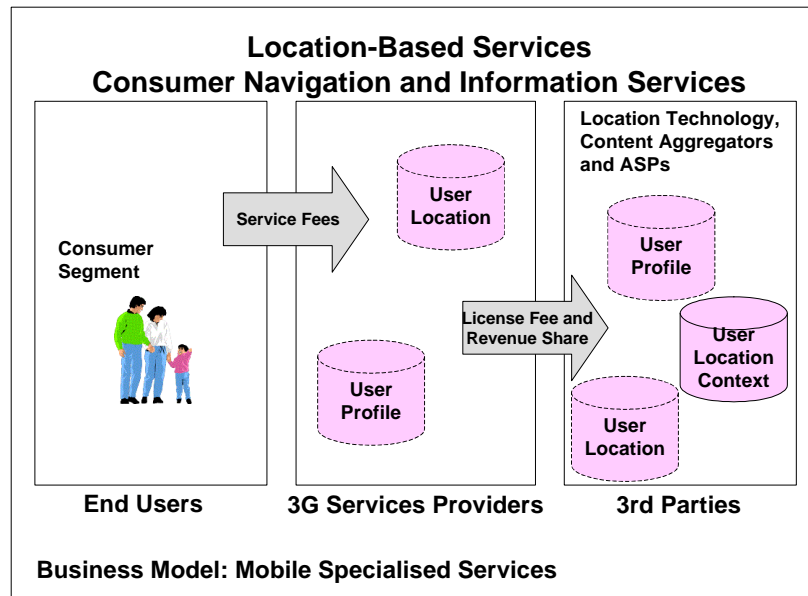
- The incremental revenue component for location information delivered via 3G subscriptions of Portal Focused services providers (Customised Infotainment) and Access Focused services providers (Mobile Internet Access, Mobile Intranet/Extranet Access), and Mobile Specialised Services (MMS).
- Telematics services (fixed in-vehicle location services).
- Location data sold to third parties (as part of tracking, navigation, and other third-party provided services).

Four primary service concepts that have been incorporated in the revenue forecasts are discussed below. The proportion of the revenue retained by the operator varies by service concept and by the business model used.

Consumer Navigation and Information Services

With consumer navigation and information services end-users solicit and pay for information relative to their current location. This could include electronic “yellow pages”, guided tours, weather and traffic information, directions and personal tracking services. Revenue sources could include additional subscription and usage fees as indicated in the service diagram (See Figure 17). The 3G services providers will then compensate involved third parties either through licence fees or sharing of user revenues. Some services could also be supported by advertising or transaction fees (see Sponsored Services below).

Figure 17. Service diagram for Location-Based Services – consumer navigation and information services.

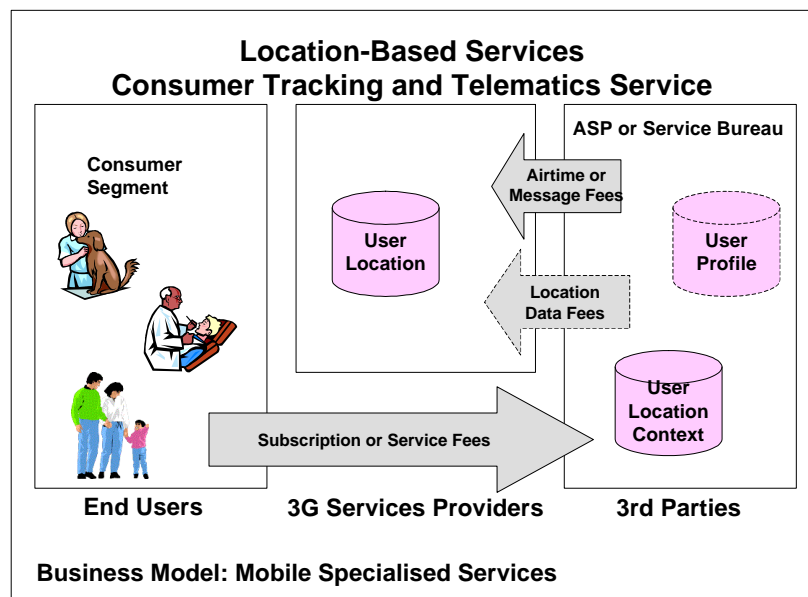


Source: Telecompetition Inc., February 2001.

Tracking Services

Tracking services in the consumer sector allow for continuous tracking of moving humans (e.g., children, elderly, friends) or animals (e.g., pets). Such services will most likely be provided by independent service bureaux dealing directly with the end user, as indicated in Figure 18. Telematics services will produce revenue from location-based information and other services accessed through automotive-based portals via fixed in-vehicle systems.

Figure 18. Service diagram for Location-Based Services – consumer tracking and telematics services.



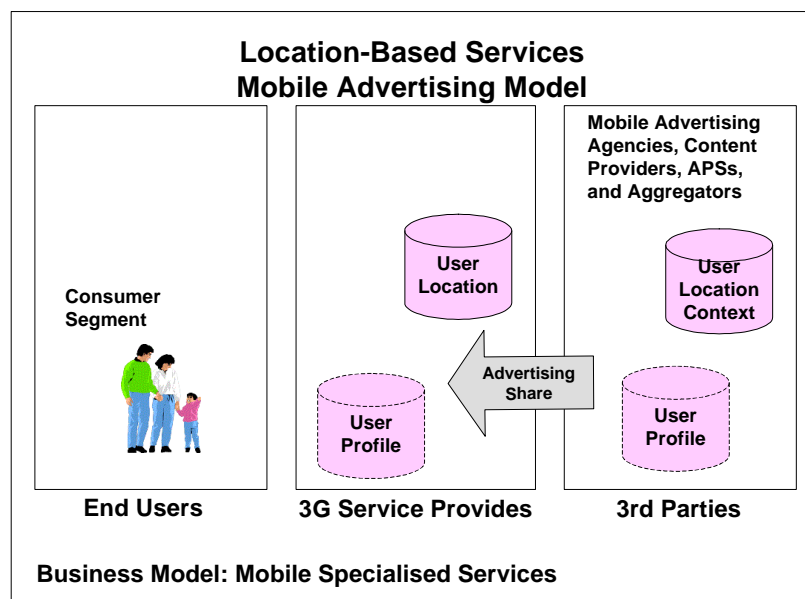
Source: Telecompetition Inc., February 2001.

Sponsored Services

M-commerce advertising services are being tested in trials where the end user does not pay the services provider directly for the location service. “Instant Coupons” is one example where subscribers are sent messages that direct them to a nearby retail outlet to take advantage of special offers. It is generally accepted that users should be required to “opt in” or register to receive such services. Mobile Yellow Pages is another service that could be sponsored, enabling users to “find the nearest” retailer for their needs.

Although the primary revenue source in such services is advertising revenue, as illustrated in Figure 19, the mobile advertising business model is very complex and still evolving. While mobile location advertising trials have claimed CPM (cost per thousand) rates 5-10 times that of traditional advertising, it is not yet clear how much location-based advertising will be worth longer term and what proportion of that revenue could accrue to mobile services providers. As discussed earlier, W-ASPs acting as service bureaux could control the vital value creation function of combining location information with user profiles and contextual data and would therefore expect to retain the bulk of any advertising revenue.

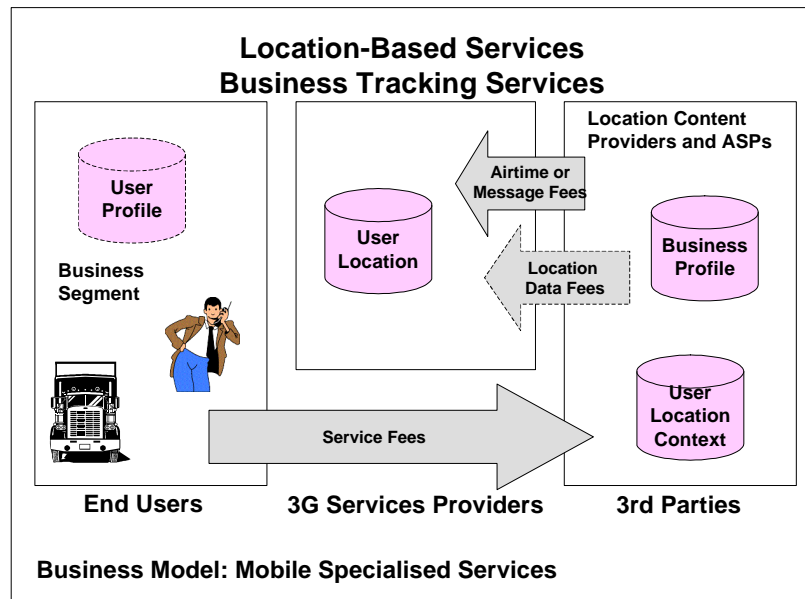
Figure 19. Service diagram for Location-Based Services – mobile advertising.



Source: Telecompetition Inc., February 2001.

Asset Tracking In the business environment tracking services will most often be used for tracking inanimate objects rather than people. As in the consumer case, services will be provided via independent service bureaux (See Figure 20).

Figure 20. Service diagram for Location-Based Services – business tracking services.



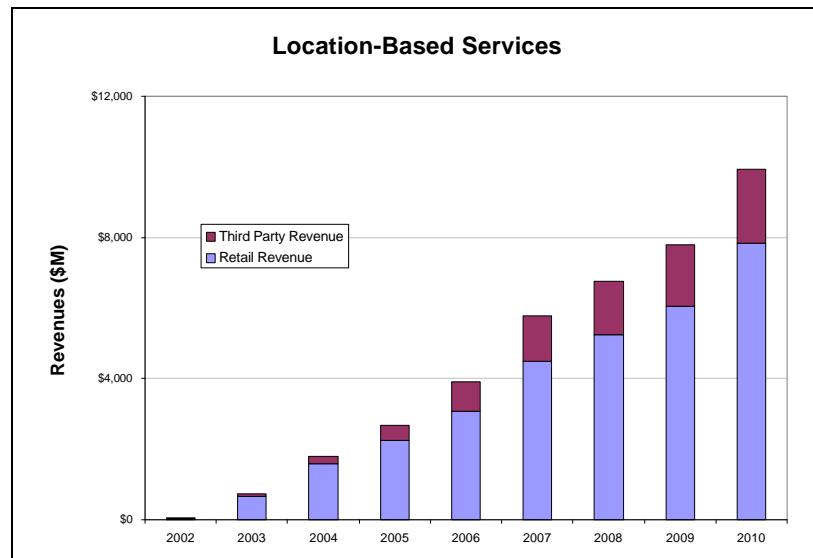
Source: Telecompetition Inc., February 2001.

Location technology can also be incorporated into the network infrastructure to enable call routing and a geography-sensitive billing structure. While there is competitive value in these capabilities, they are not considered as services in this report as they do not drive an incremental, direct revenue stream.

Although business models for Location-Based Services are still being tested and developed, it is clear that a proportion of the revenues for mobile services providers will come from third parties rather than directly from the end users. Figure 21 illustrates this split for the Location-Based Service revenues forecast in this report.

Mobile services providers will be able to sell location data to third-party ASPs providing Location-Based Services to end-users. ASPs who combine this location data with relevant contextual data will gain access to a very significant revenue opportunity.

The services provider retained revenues for location-based services forecast in this report are relatively low compared with the other service categories. This reflects the assumption in this study that much of the value chain functions required for Location-Based Services will be provided by third-party ASPs. Mobile services providers will, therefore, only retain a small proportion of the available revenue.

Figure 21. Location-Based Services – revenues generated from third parties.¹⁹

Source: Telecompetition Inc., February 2001.

4.3.1 Enabling Factors

Regulatory requirements to provide mobile location data to emergency services are a major driver for the introduction of location technology in the US. Similar regulatory requirements are envisaged for Europe.

Location-based advertising is viewed by most players as a highly valuable service capable of generating substantial revenue. As the advertising industry becomes accustomed to the mobile environment, clear benchmarks will emerge to establish acceptable advertising rates. The current pricing models applied by database providers will evolve to become compatible with the mass-market mobile environment.

4.3.2 Implications

Location-Based Services also represent an exciting opportunity to forge strategic partnerships with content providers, W-ASPs, and other third parties. Such partnerships may open up entirely new revenue opportunities not yet envisioned by the market. Conversely, 3G services also present a very significant revenue opportunity for new players such as W-ASPs and content providers.

While location-based advertising is viewed by most players as a highly valuable service, many intermediary players are also claiming the revenue. In order for the mobile operator to claim any significant portion of the advertising revenue, investments in advertising sales, marketing, and related

¹⁹ Third party revenue includes operator revenue from location data sold to third parties. It does not include service fees acquired by third parties.

infrastructure will be required and appropriate partnerships forged. The number of hits (delivery of location data) can vary significantly depending on the service characteristics. A single hit may be adequate to deliver a simple “find a friend” service but many consecutive hits will be required for user navigation services. Pricing Location-Based Services on a “per hit” basis is therefore only appropriate for certain services.

Location data by itself will probably not provide a sustainable revenue stream. It is likely to be eventually viewed as part of the basic infrastructure requirements for any operator. Contextual data is essential to making location services work for the end-user. Some view such data as being more valuable than the location information itself.

Establishing and maintaining customer profiles will be an important activity for 3G operators.

Location-Based Services are inherently local, but not necessarily local to the user at any given time. Localised services for hotel, restaurant or taxi reservations will be required by users at both the beginning and the end of journeys. Service roaming agreements between operators are essential to the provision of really compelling Location-Based Services.

The real promise of many Location-Based Services will be realised when the services can be offered in a location-independent fashion. **Service portability between operators will be necessary for Location-Based Services to be offered in this way.** Billing and tariffing issues within a roaming environment will need careful attention.

4.4 Rich Voice and Simple Voice (Combined Consumer and Business)

<p>Rich Voice and Simple Voice</p>	<p>A 3G service that is real-time and two-way. It provides advanced voice capabilities (such as voice over IP (VoIP), voice-activated net access, and Web-initiated voice calls), while still offering traditional mobile voice features (such as operator services, directory assistance and roaming). As the service matures, it will include mobile videophone and multimedia communications.</p>
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Voice services are fundamentally different from the other service categories discussed in this study. Those other service categories are mostly person-to-machine (usually person-to-server), non-real-time and inherently asymmetric. Voice services, on the other hand, can be characterised as person-to-person, real-time, symmetric communications.

Basic voice communications as currently delivered in the 2G environment may be called “Simple Voice”. The enhancement of voice services to include advanced voice capabilities such as Voice over IP and multimedia elements is termed “Rich Voice” in this study.

Rich Voice has the same immediacy as Simple Voice for one-to-one or conference calls, but also opens up additional instant information and communication channels that greatly enhance the communication experience.

In this study, a voice call is regarded as being a 3G call if it is made by a 3G subscriber, i.e., from a 3G terminal device. Total 3G revenues therefore include the revenues from Simple Voice calls made by those subscribers who own a 3G terminal.

Some 3G terminal owners will only use the basic simple voice facility and will not be interested in rich voice capabilities such as multimedia communications or videophone. The airtime revenue they generate from Simple Voice over 3G will simply subtract from 2G revenues.

And in a 3G environment, Simple Voice may or may not be carried over the 3G network. Mobile operators may route Simple Voice calls over 2G networks or they may decide to take advantage of the higher capacity of 3G to route traffic over 3G networks in “hot spot” situations.

These are operator and user-dependent factors which have to be taken into account when interpreting the service revenue forecasts. There is some debate over what proportion, if any, of simple voice revenues generated by 3G terminal owners should be included in 3G revenue forecasts.

This study therefore presents separate forecasts for Simple Voice and Rich Voice.

For the purposes of this study, the Simple Voice forecast includes:

- Simple mobile voice, initiated by a 3G terminal device (which may or may not be carried over the 3G network).

The Rich Voice forecast includes:

- Business audio conferencing services (e.g., access and bridging), if offered by mobile operators and carried over the 3G network.
- Voice services involving person-to-person (or n to n) mobile voice, for both consumers and businesses. Such services incorporate a real-time, possibly interactive multimedia component, including simultaneous transmission of graphics or images and Web conferencing (co-operative working on shared files), and are carried over the 3G network.
- Voice services such as videophone (consumer) and video conferencing (business); defined as voice plus real-time video transmission, carried over the 3G network.
 - Telemedicine and tele-education are part of Rich Voice and are essentially a videophone or voice multimedia application for business users.

The Rich Voice forecast does not include:

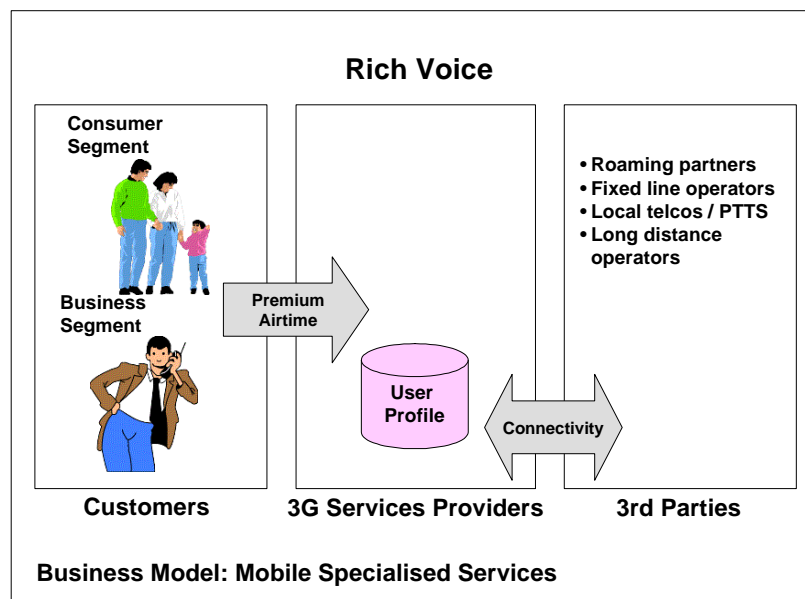
- Enabling technologies and applications such as speech recognition and voice portals that help to maintain or increase traffic for simple voice.
 - The voice portal revenue itself will be included in the basic package for Customised Infotainment and Mobile Internet Access. It will not

have a separate sustainable revenue stream for mobile services providers. Some operators are offering voice portal services at a nominal fee, using them as an entrée to general mobile Internet services.

- Streaming audio, streaming video and online interactive games, as these are included implicitly in Mobile Internet Access and Customised Infotainment.

The major revenue stream for Rich Voice is standard and premium airtime charged to the end user as indicated in Figure 22.

Figure 22. Service diagram for Rich Voice.



Source: Telecompetition Inc., February 2001.

4.4.1 Enabling Factors

Implementation of the multimedia call model will be the major enabler for Rich Voce services.

The introduction of handset subsidies, where permitted, could stimulate the market by ensuring wide availability of terminals.

A wide range of devices that will enable users easily to create and transmit multimedia is currently under development. User willingness to create multimedia has already been demonstrated through the popularity of digital cameras.

4.4.2 Implications

Rich voice service involving multimedia communications is the only service category that requires a multimedia call model.²⁰ The full benefits of such a service will only become available when the multimedia call model is integrated into the mobile terminal as well as the network. This requires IP to be carried in the radio access network, including over the air interface, as well as in the core network.

Entering the conferencing market means competing against an entire new group of competitors, including fixed operators and specialised conference service bureaux. Mobile operators will be entering an entire new business area.

In order to take full advantage of the opportunities presented by emerging Rich Voice services, mobile operators would need to deploy appropriate bridging technologies for audio Web and video conferencing capabilities as a part of the 3G network build out.

Recent trends indicate that on-demand conferencing service has a higher degree of customer acceptance compared with reservation-based operator-assisted service. Mobile operators should factor this continuing trend in developing on-demand user interfaces for conferencing services.

Web multimedia conferencing services have a much higher rate of growth than high-speed video conferencing services. Operators may benefit by promoting the value of Web multimedia conferencing service to kick-start the take up of this service by business users.

Replicating collaborative work or Web conferencing on a mobile device will require innovative approaches to handset design, overcoming integration issues that are currently being addressed in the fixed world.

²⁰ Scheduled for Release 5 in 3GPP.

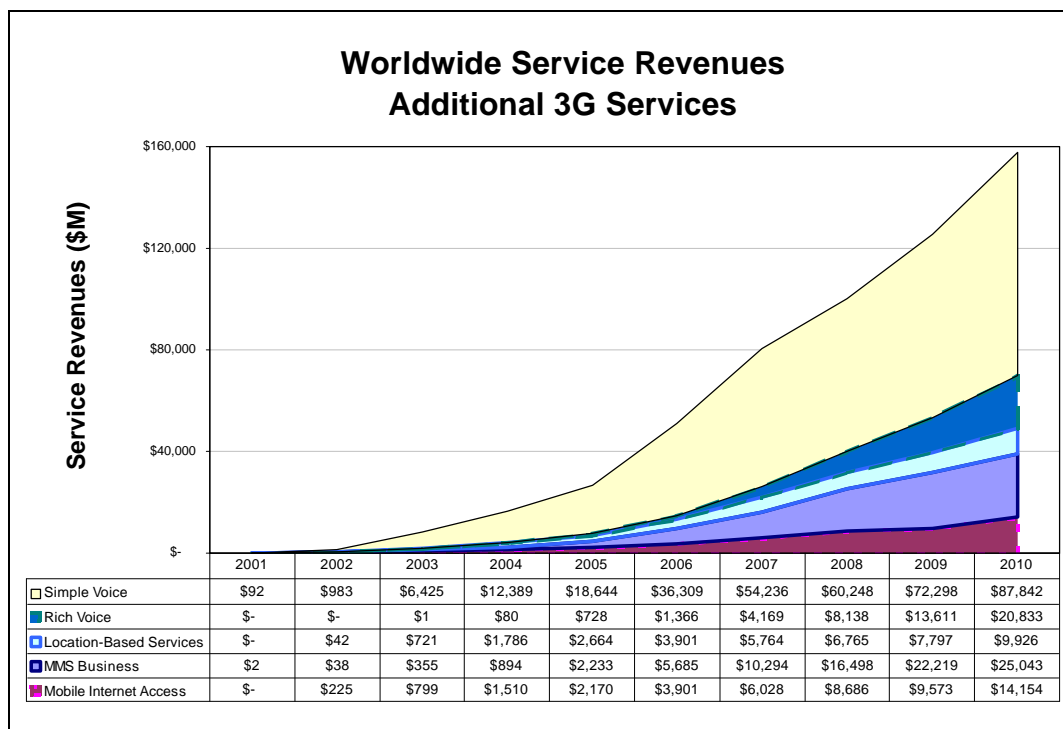
5. Additional 3G Service Forecasts

This section contains the assumptions and forecasts for the remaining 3G services not included in Report No. 9. These additional 3G service forecasts are for Mobile Internet Access, Multimedia Messaging Service (Business), Location-Based Services, Simple Voice and Rich Voice.

5.1 Worldwide Market Size

Worldwide mobile and 3G subscribers are taken from UMTS Report No. 9. In addition, worldwide revenue and units are calculated for each service category. The worldwide mobile and 3G subscriber numbers define the addressable market and serve as the upper bound from which service level forecasts are derived. A more detailed description of the assumptions for each service is contained in the sections following. In the case of Rich Voice, Business MMS, and Location-Based Services, a number of services within each category were quantified and “rolled up” to a total worldwide number. Because of this additive approach, and since revenues from these services are not always derived on a per subscriber or subscription basis, service level subscription forecasts are meaningless numbers and have been omitted from the charts in this section. Figure 23 summarises the worldwide market size assumptions for each service.

Figure 23. Worldwide revenue – additional 3G services.



Source: Telecompetition Inc., February 2001.

Consistent with UMTS Report No. 9, the revenue forecasts in this report are for mobile services provider retained revenues only. They do not

include the market revenue that will be attributed to other players such as W-ASPs, content providers, device manufacturers and m-commerce partners. In all steps of the analysis, plausible prices and numbers have been used that reflect a likely, achievable revenue flow. This is a more conservative approach than may be taken by other analysts.

For example, revenue estimates were developed using known willingness-to-pay for analogous services that meet similar needs and are targeted to similar markets. The underlying assumption in this approach is that users will be willing to pay at least as much for 3G services as they currently pay for existing fixed, mobile or other services. Thus, there is no mobility premium attributed to the service price assumptions. Table 5 summarises the major analogues, service price, and adoption assumptions for each service category and in some cases for services within categories. For example, forecasts for Location-Based Services and Rich Voice shown later in this section are for the combined business and consumer segments; however, the worldwide forecasts for these two services were derived from a summation of several individual service components in both business and consumer segments. Table 5 also shows the individual segment assumptions that were used in deriving the summed total.

Table 5. Major service forecast pricing and penetration assumptions.

Service	Analogues	Average Service Price Per Subscription			% of Total 3G base subscribing to service ²¹	
		2002	2010	CAGR	2005	2010
Mobile Internet Access	Fixed Internet	\$62	\$19.60	(13.4%)	8%	10%
Business MMS	SMS	\$15.90	\$10.10	(5.5%)	15%	33%
Location-Based Services (Business)	Asset and Fleet Tracking	\$13.70	2.80	(18%)	1.5%	1.6%
Location-Based Services (Consumer)	DoKoNavi	\$3.30	\$0.75	(16.9%)	27%	30%
Business Rich Voice	Existing Voice, Web, and Video Conferencing Services	Conferencing services are offered on an "as needed" basis to all subscribers. Revenues are based on 3G services providers gaining 3% worldwide market share by 2010.				
Consumer Rich Voice	Digital Cameras	\$43.00 ²²	\$30.40	(4.2%)	2%	9%
Simple Voice	Mobile Voice	\$27	\$11.60	(10%)	100%	100%

Source: Telecompetition Inc., February 2001.

Each service forecast is derived from a different combination of subscriber base, adoption rates, and/or market share and other assumptions. For

²¹ For Business MMS, calculation is based on business professional subscriptions to MMS only, and excludes telemetry and Unified Messaging use. For Location-Based Services, calculation is based on consumer subscriptions to Guide / Navigation services only, and excludes telematics, business and consumer tracking services, and mobile location-based advertising.

²² Service price for Rich Voice is for service launched in 2004, not 2002.

example, Rich Voice, launched in 2004, grows rapidly to 9% of the 3G subscriber base in 2010, and is still in the early stages of service adoption. Consumer Location-Based Services, begin in 2002, has a slower growth rate by the end of the forecast period. As such differences make per service revenue comparisons difficult, Table 6 shows the average revenue assumed for each service, against a common base of 3G subscribers.

Table 6. Worldwide revenue assumption analysis – by service.

Service	Average Monthly Revenue per 3G Subscriber			
	2003	2005	2008	2010
Mobile Internet Access	\$3.20	\$2.40	\$2.20	\$2.20
Business MMS	\$1.35	\$2.40	\$3.90	\$3.30
Location-Based Services	\$2.75	\$2.80	\$1.60	\$1.30
Rich Voice	\$0	\$0.80	\$1.95	\$2.75 ²³
Simple Voice	\$24.30	\$19.70	\$14.35	\$11.60

Source: Telecompetition Inc., February 2001.

5.2 Mobile Internet Access (Consumer)

Mobile Internet Access is the Access Focused counterpart to the Customised Infotainment service forecast in Report No. 9. The Mobile Internet Access forecast assumes that the mobile services provider is using an Access Focused Approach, similar to the ISP business models used in the fixed Internet industry. In this model, the mobile services provider is offering local mobile access to the Internet as well as connection to all other Internet interexchange points, Web sites, and portals available. Therefore, in this service category, the only revenue streams for the mobile services provider consist of local mobile access (either usage sensitive or flat rate) and Internet access (subscription fee). The user is simply using the mobile services provider as a mechanism to “punch through” to specific sites of interest. The mobile services provider is not providing portal services or third-party billing, or aggregating any content, thus cannot partake in additional revenue opportunities such as advertising, m-commerce transactions, or other revenue sharing.

The typical user is likely a current fixed Internet user who wants similar quality and functionality in a mobile Internet service. This is a more targeted market segment than is found in Customised Infotainment users, comprising only 20% of the consumer 3G base by 2010. Whether or not the mobile services provider chooses to provide service on a flat-rate or usage-sensitive basis, the forecast assumes that the Mobile Internet Access user will be willing to pay no more than he is currently paying for fixed broadband Internet access. If necessary, the user will modify his usage not to exceed that threshold. Service pricing is thus based on worldwide average pricing of Internet subscription

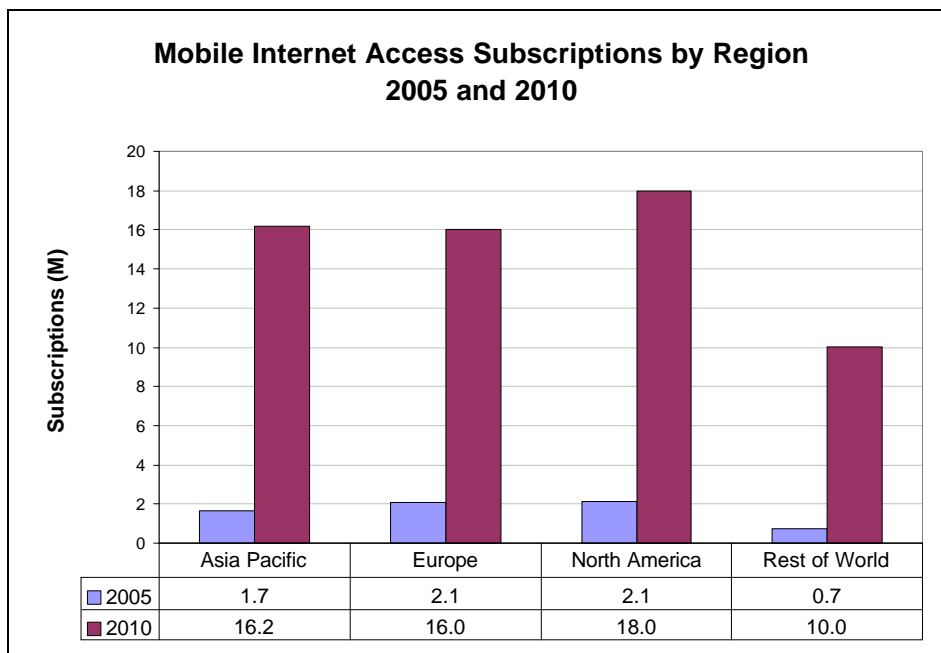
²³ Increase is due to increased use of more expensive high multimedia /video.

fees and broadband access (i.e., xDSL), with both access and subscription fees declining significantly over the forecast period.

5.2.1 Regional Forecasts

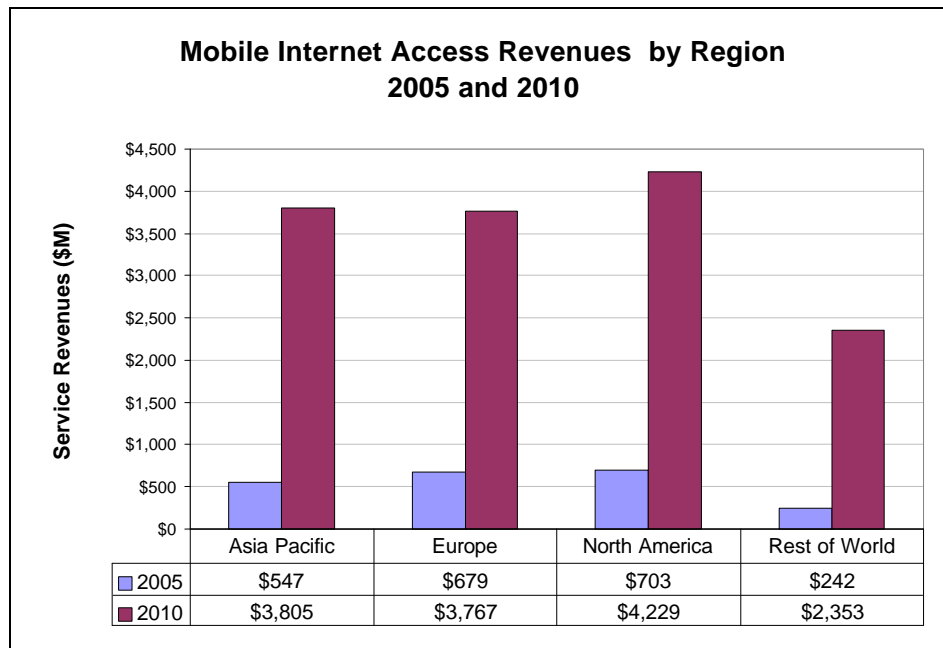
As Mobile Internet Access is targeting a more Internet experienced user, with higher bandwidth expectations, it has been assumed that service commercialisation starts one year later than Customised Infotainment. Country and regional forecasts are allocated based on user demographic profiles similar to the fixed Internet user, and weighted by Internet and PC penetration per country. The results of the analysis are shown in the regional revenue and subscription forecasts in Figures 24 and 25. It should be noted that Mobile Internet Access does not include mobile workers that may physically work out of their homes, and use the service primarily for business purposes. Mobile workers are considered part of the business segment and are included in the Mobile Intranet/Extranet forecasts provided in Report 9. Comparisons of business and consumer subscribers are provided in Section 6.1 of this report.

Figure 24. Mobile Internet Access subscriptions by region in 2005 and 2010.



Source: Telecompetition Inc., February 2001.

Figure 25. Mobile Internet Access revenues by region in 2005 and 2010.



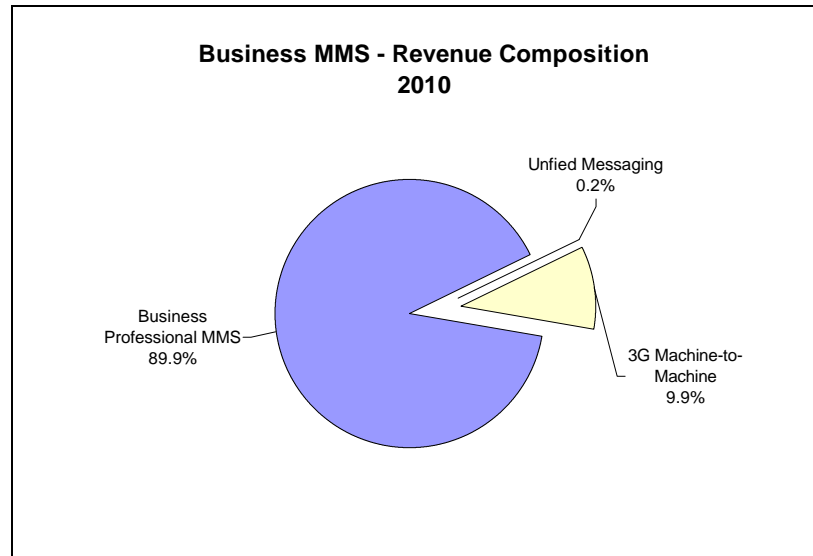
Source: Telecompetition Inc., February 2001.

5.3 Multimedia Messaging Service (Business)

Business use of messaging services includes multimedia messaging by business professionals, messaging between machines (telemetry), and additional revenue provided by unified messaging mailboxes. Worldwide forecasts for the 3G portion of these individual components were calculated, then summed to provide total Multimedia Messaging Service revenues.

As shown in Figure 26, the majority of the revenue comes from mobile professional use of MMS, for sending and receiving graphics, pictures, and video clips. Unified messaging services contributes almost no revenue by 2010 as this service will rapidly become part of the basic package for any messaging service with no discreet fee, and mobile 3G services providers will capture about 7% share of the worldwide mailboxes.

Figure 26. Business Multimedia Messaging Service worldwide revenue composition – 2010.



Source: Telecompetition Inc., February 2001.

Instant messaging has been ranked as the second most important feature for mobile professionals,²⁴ with email as a low-cost (or no-cost) substitute. By 2010, the forecast assumes that although 80% of 3G business subscribers will use MMS, text MMS revenue will erode due to substitution from email, contributing less than 1% of the revenue. The majority of message revenue from 3G business subscribers will come from premium priced multimedia messages. Premium pricing is based upon IP transit premiums for medium and high “burstable” bandwidth services. Table 7 summarises the unit assumptions developed for forecasting the unified messaging, instant messaging, and machine-to-machine components of Business MMS.

Table 7. Business Multimedia Messaging Service – component assumptions.

Business MMS Service Component	Type of Unit	Units	
		2005	2010
Mobile Professionals using Instant Messaging	Business 3G Subscribers	12M	207M
Machine-to-Machine	Subscriptions	105M	184M
Unified Messaging	Mailboxes	13.5M	64M

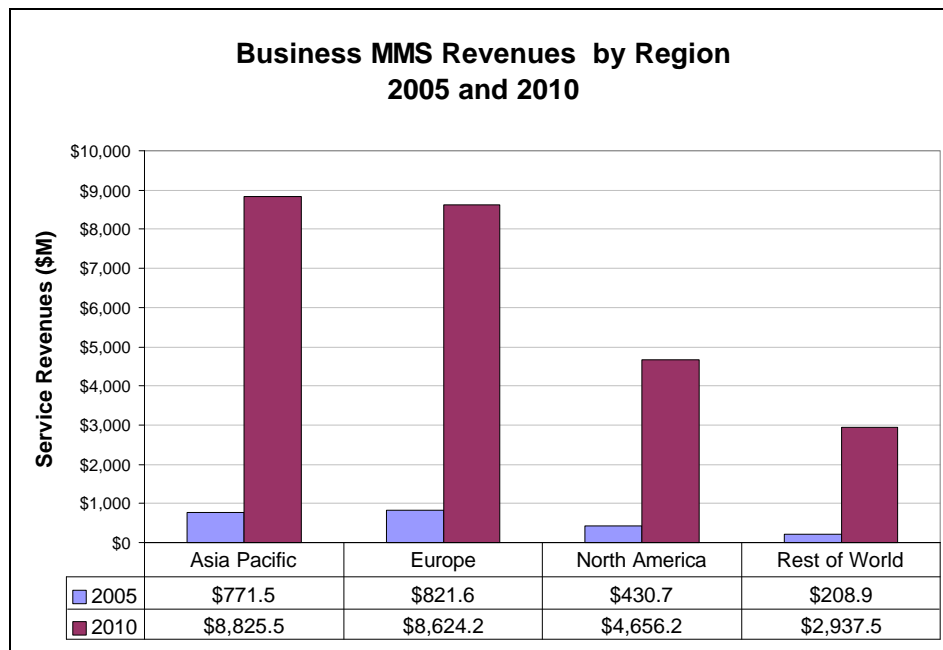
Source: Telecompetition Inc., February 2001.

²⁴ Source: Research Portal.com, “US Mobile Users Opt for Instant Messaging”, www.researchportal.com.

5.3.1 Regional Forecasts

Country and regional forecasts for MMS – Business are allocated based on occupation and industry population profiles for data intensive users. Allocation of worldwide market revenue is also weighted by country-specific factors including PC and mobile penetration and gross domestic product. The results of the analysis are shown in the regional revenue and subscription forecasts in Figure 27. As revenue is derived from a combination of mailboxes, machines and Mobile Intranet/Extranet Access users, total subscriptions are meaningless numbers and are not displayed.

Figure 27. Multimedia Messaging Service (Business) revenues by region in 2005 and 2010.



Source: Telecompetition Inc., February 2001.

5.4 Location-Based Services

The forecast for Location-Based Services is the summation of several forecasts that consider revenue streams from consumer and business segments, both Access Focused and Portal Focused business models, and revenue share between 3G services providers, ASPs, and advertisers. Most of the envisaged services do not yet exist, and the business models between partners are undeveloped. Interviews with players in this field (listed in Appendix A) reveal a wide divergence of opinion on the value of location information and what revenue share can be retained by the mobile services provider. All, however, firmly believe that location information brings substantial value to both the user and the advertiser, with the 3G services provider able to obtain some of this additional value.

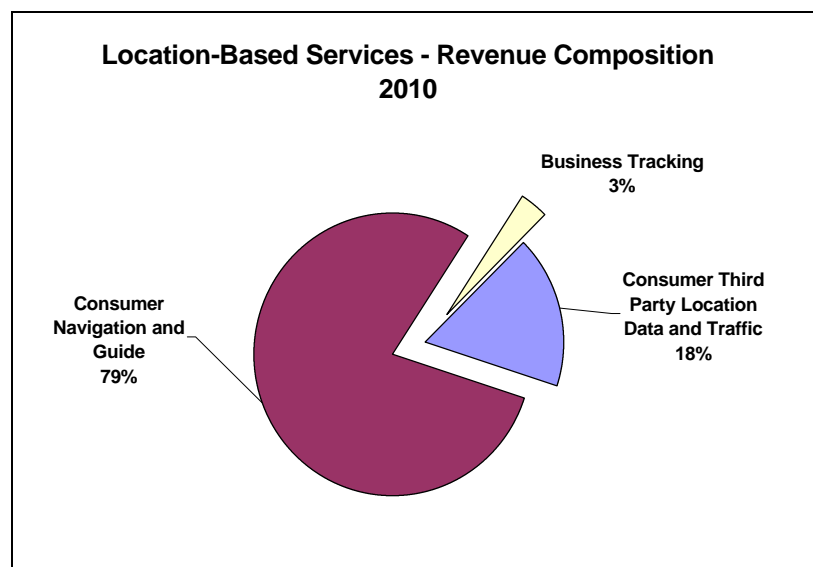
The forecasts include just the additional revenue attributed to adding current location information to a variety of services. They do not include, for example, information services based on a future or planned location (i.e., travel

information obtainable through a Customised Infotainment subscription) or tracking/monitoring of stationary objects (telemetry).

For the consumer segment, DoKoNavi and J-Navi services available in Japan provide pricing analogues for navigation guide services which deliver directory information based on the current location of the subscriber, enabling location-sensitive advertising and mobility-pushed retail transactions. The forecast assumes a subscription fee of \$3.70 per month (same as DoKoNavi), decreasing to \$0.75 per month by 2010. About 60% of Customised Infotainment subscribers will also subscribe to this additional location service. This same subscriber base will also generate additional advertising and transaction revenues to the mobile portal.

The consumer segment also provides a revenue opportunity from providing third-party location providers with location data for tracking and other services. In-vehicle telematics provides additional traffic as well. Figure 28 illustrates the revenue composition of consumer Location-Based Services.

Figure 28. Location-Based Services – worldwide revenue composition – 2010.



Source: Telecompetition Inc., February 2001.

For the business segment, Location-Based Services are limited to asset tracking services for mobile vehicles and are calculated based on the 3G share of worldwide asset tracking estimates.²⁵ Table 8 summarises unit inputs developed to forecasting the business and consumer components of Location-Based Services.

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²⁵Worldwide asset tracking revenues and subscriptions derived from Ovum, "Mobile Location Services: Market Strategies", Ovum Ltd., 2000.

Table 8. Location-Based Services – component assumptions.

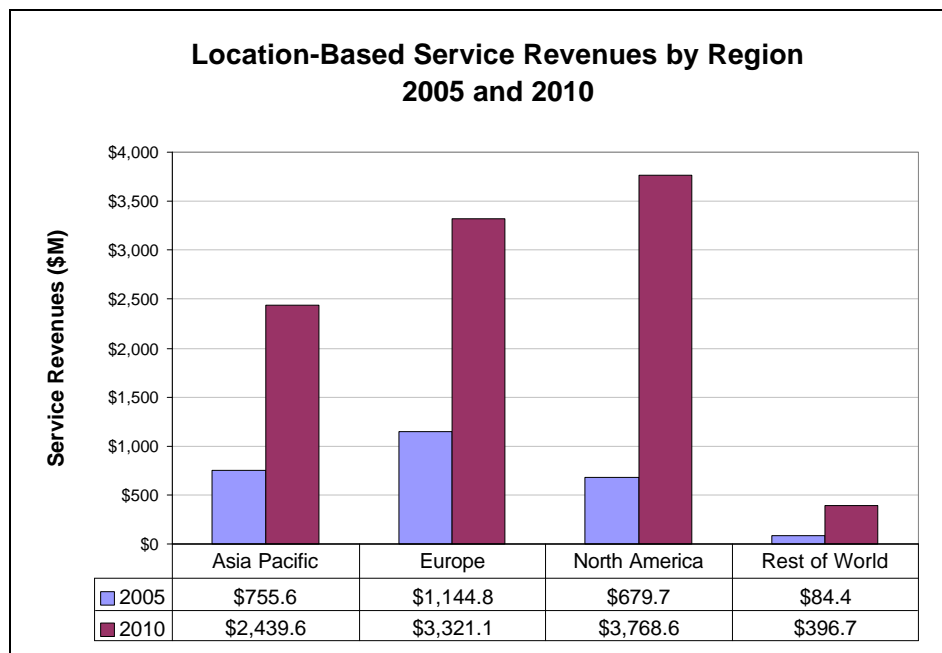
Location-Based Service Component	Type of Unit	Units	
		2005	2010
Consumer Navigation and Guide	3G Subscriptions	22 M	187 M
Location-Based Advertising	3G Subscribers generating Revenue to Portal	39 M	117 M
Location-Based Transactions	3G Subscribers generating Revenue to Portal	4 M	19 M
Consumer Third Party	3G Subscriptions	18 M	180 M
Business Asset Tracking	3G Subscriptions	1 M	10 M

Source: Telecompetition Inc., February 2001.

5.4.1 Regional Forecasts

Country and regional forecasts for consumer and business Location-Based Services are allocated based on age, occupation and industry population profiles for media-intensive users. Allocation of worldwide market revenue is also weighted by country-specific factors including cable TV, PC and mobile penetration, and gross domestic product per capita. The results of the analysis are shown in the regional revenue and subscription forecasts in Figure 29. Meaningful subscription numbers cannot be provided for Location-Based Services and are not displayed.

Figure 29. Location-Based Service revenues by region in 2005 and 2010.



Source: Telecompetition Inc., July 2000.

5.5 Rich and Simple Voice

The worldwide forecast for Rich Voice is a summation of real-time audio, multimedia and video services for the consumer and business segments.

On the consumer side, Rich Voice includes revenue projections from real-time transmission of multimedia images (e.g., digital photos) and videophone. (This is distinct from Consumer MMS that is not real-time.) The forecast assumes Consumer Rich Voice is a premium-priced service, targeted to a more affluent segment that own a multimedia / video 3G handset/camera. As Rich Voice services are dependent upon higher bandwidth availability in 3G networks and devices that are just now emerging or still under development, the forecast assumes that Consumer Rich Voice services will become available around 2004-2005.

Digital camera penetration was used as an analogue to determine consumer Rich Voice service adoption.²⁶ By 2010, multimedia imaging will have penetrated 12% of the 3G consumer base, and videophone penetration levels will have reached 3%. While service price-per-use declines over the forecast period, frequency of use increases, giving an average revenue per consumer Rich Voice subscription of \$30 per month by 2010.

The increased use of mobile services by business professionals and the expanded capabilities of the 3G network offers 3G services providers an opportunity to offer conferencing services for both fixed and mobile users. For the business segment, revenue projections from existing worldwide conferencing services (audio, Web conferencing, video conferencing) were used as analogues, with all mobile services providers capturing 10% of the worldwide market by 2010, and 3G services providers capturing 3% worldwide share.

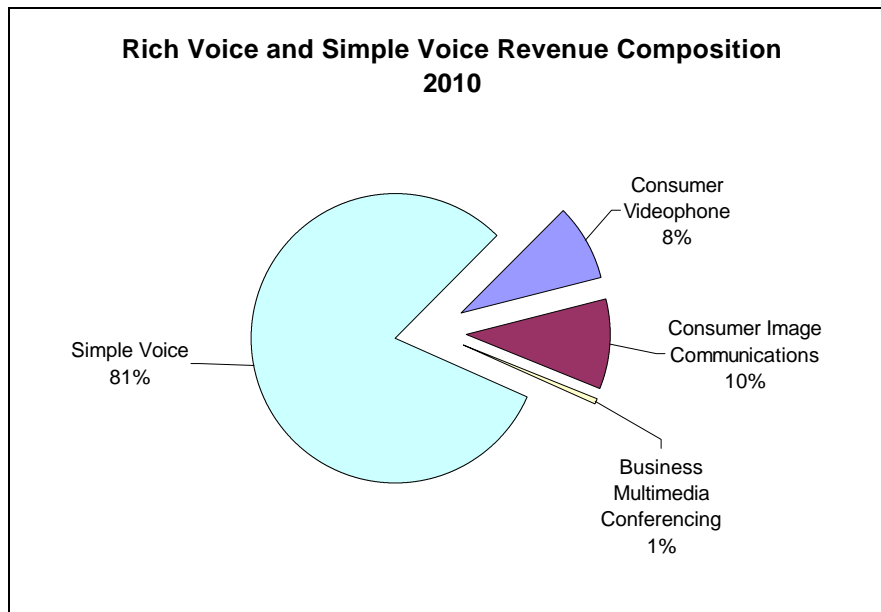
For Simple Voice, revenues were calculated using an average ARPU of \$30 per 3G subscriber, declining 10% per year to \$11.60 by 2010. It was assumed that all simple voice traffic generated by 3G subscribers was carried over the 3G network and that all 3G subscribers generate simple voice traffic.²⁷

Figure 30 compares the revenue composition of the components of voice services. As shown, Simple Voice comprises over 80% of total voice revenues, with consumer videophone and image multimedia comprising 18% of revenues. Business Rich Voice only contributes 1%.

²⁶ IDC, "Worldwide Digital Camera Market", 2000.

²⁷ Scenarios on operator specific decisions regarding load balancing between 2/2.5 and 3G networks were not modelled.

Figure 30. Rich Voice and Simple Voice – worldwide revenue composition – 2010.



Source: Telecompetition Inc., February 2001.

Table 9 summarises unit assumptions developed to forecast the business and consumer components of Rich Voice and Simple Voice.

Table 9. Rich Voice and Simple Voice – component assumptions.

Component	Type of Unit	Units	
		2005	2010
Business Rich Voice	3G Market Share of Worldwide Multimedia and Web Conferencing	0.2%	3%
Consumer Videophone	3G Subscriptions	0	12M
Consumer Multimedia Imaging and Photos	3G Subscriptions	1 M	43M
Simple Voice	Percentage of 3G subscribers using voice	100%	100%

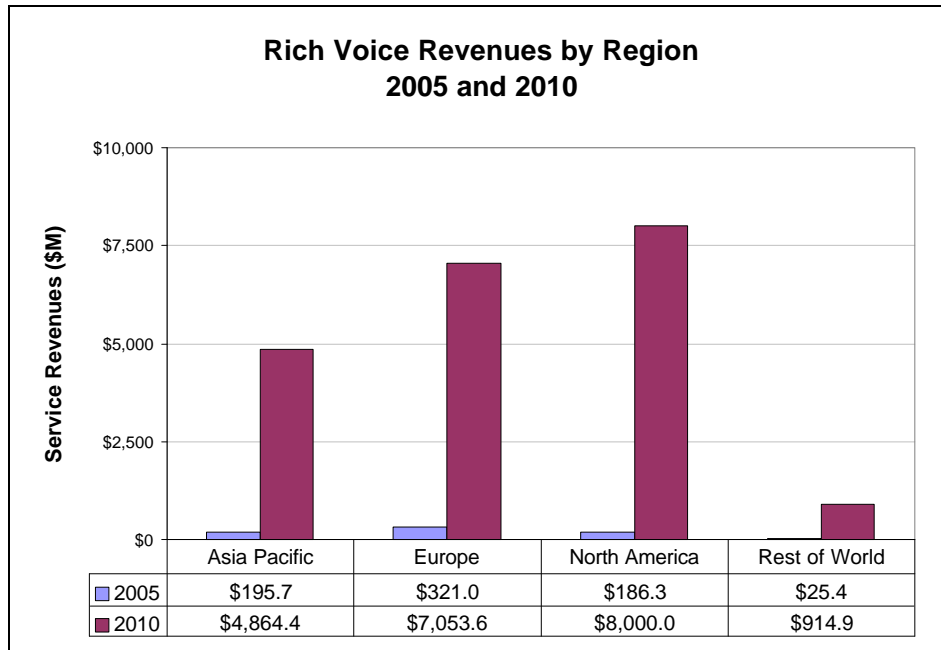
Source: Telecompetition Inc., February 2001.

5.5.1 Regional Forecasts

Country and regional forecasts for consumer and business Rich Voice are allocated based on age, occupation and industry population profiles for media-intensive users. Allocation of worldwide market revenue is also weighted by country-specific factors, including PC and mobile penetration and gross domestic product per capita. The results of the analysis are shown in the regional revenue and subscription forecasts in Figures 31, 32, and 33. As Rich Voice revenue includes business services that are calculated on a market share basis and offered on an as-needed basis to both fixed and mobile subscribers, Rich Voice subscriptions are meaningless numbers and are not

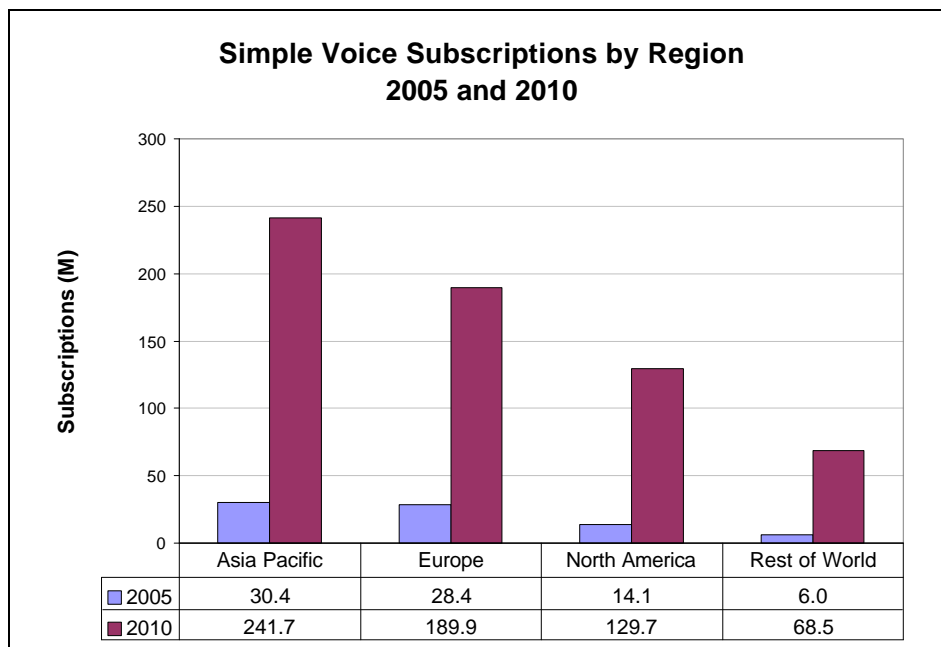
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Figure 31. Rich Voice revenues by region in 2005 and 2010.



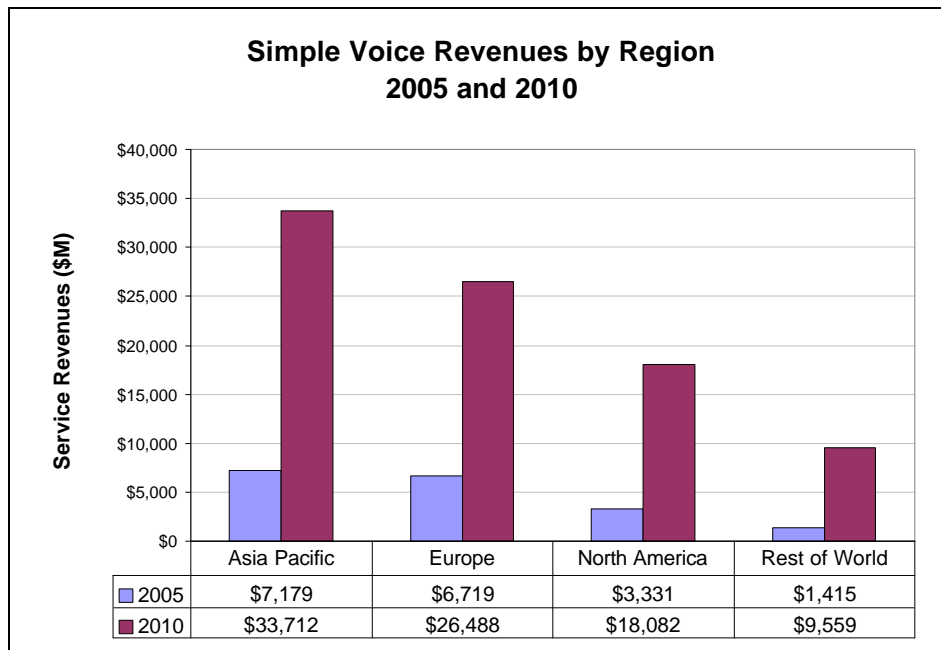
Source: Telecompetition Inc., February 2001.

Figure 32. Simple Voice service subscriptions by region in 2005 and 2010.



Source: Telecompetition Inc., February 2001.

Figure 33. Simple Voice revenues by region in 2005 and 2010.



Source: Telecompetition Inc., February 2001.

5.6 Summary of Key Findings

- Individual service market opportunities vary by region. Europe and Asia Pacific provides the largest market opportunity for Business and Consumer MMS and Customised Infotainment. North America provides the greatest revenue opportunity for Mobile Internet Access, Location-Based Services, and Rich Voice. (See Section 5).
- While revenue from Location-Based Services, retained by the 3G services provider, may appear modest at only \$10 billion by 2010, Location-Based Services also represent an exciting opportunity to forge strategic partnerships with content providers, W-ASPs, and other third parties. Such partnerships may open up entirely new revenue opportunities not yet envisioned by the market. (See Section 5.4).

6. Total 3G Service Revenues

The service revenue forecasts contained in Section 5 of this report together with the forecasts contained in Report No. 9 complete a total picture of 3G service revenues. That total picture is presented and analysed in this section.

A looming question regarding 3G has been why people will move to 3G when similar services can be provided by 2.5G. **Clearly, higher data rates will be achieved in the long term over 3G networks.** Research shows a continuing progression of demand for higher connection speeds from users. For example, use of 14.4 kbit/s modems dropped from 51% of the market to less than 2% as soon as 1 Mbit/s services (xDSL and cable modems) became available.²⁸ While similar to 3G, 2.5G services will only whet the appetite of users for increasingly higher connection speeds. The forecasts represented in this section show a conservative look at the next generation mobile data services that will be carried on 3G networks. **Over time, user expectations for the superior connection speeds will be even higher than they are today.**

6.1 Worldwide Forecasts for All 3G Services – 2001-2010

This study assumes that all 3G subscribers will have a subscription to Simple Voice service. For every other service, the number of subscriptions will be less than the number of 3G subscribers. However, a subscriber may take out multiple subscriptions or access a group of services as part of a bundled package, so the total number of subscriptions across all services will exceed the number of subscribers.

The forecast worldwide subscription numbers for some of the services are presented in Table 10 and Figure 34.

²⁸ Graphics Visualisation and Usability Center, Tenth World Wide Web User Survey, 14 May 1999.

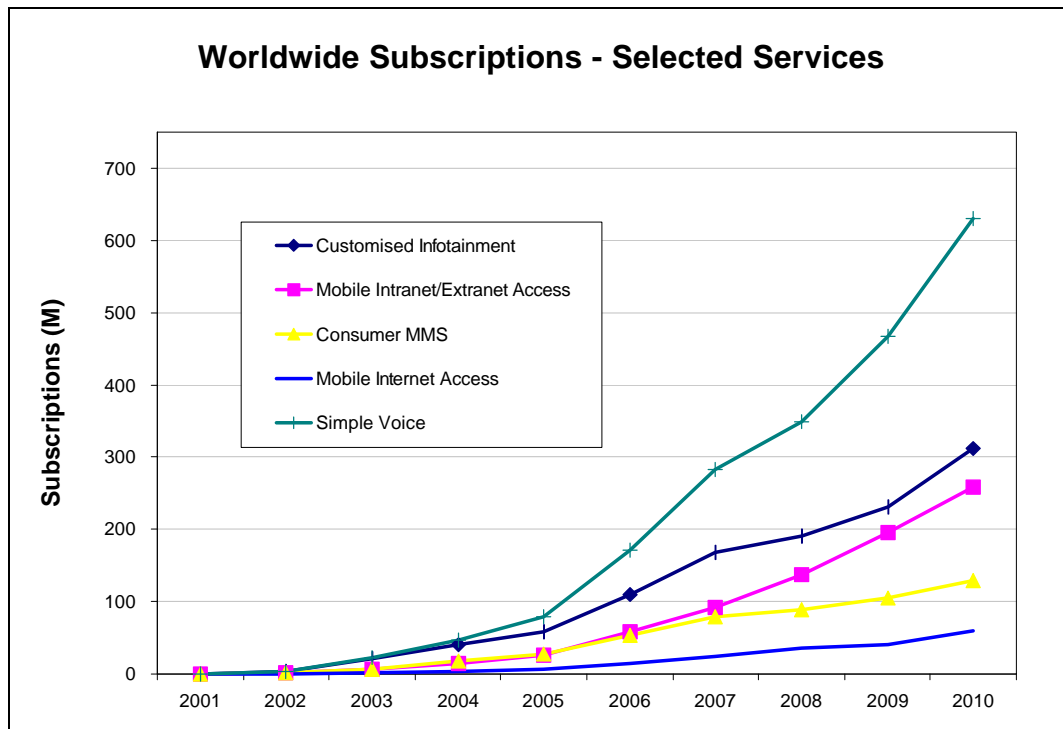
Table 10. Summary of worldwide revenue and subscriptions for 3G services – 2001-2010.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	CAGR 2005- 2010
Revenues (\$B)											
Customised Infotainment	0.0	0.7	5.8	11.2	17.0	31.9	48.1	53.7	64.3	85.8	38.2%
Mobile Intranet/Extranet Access	0.0	0.9	3.1	5.9	8.5	15.3	23.6	34.1	47.4	60.7	48.1%
Multimedia Messaging Service (Consumer)	0.0	0.2	1.6	3.6	5.1	8.8	11.8	13.2	15.4	17.8	28.4%
Mobile Internet Access	0.0	0.2	0.8	1.5	2.2	3.9	6.0	8.7	9.6	14.2	45.5%
Multimedia Messaging Service (Business)	0.0	0.0	0.4	0.9	2.2	5.7	10.3	16.5	22.2	25.0	62.2%
Location-Based Services	0.0	0.0	0.7	1.8	2.7	3.9	5.8	6.8	7.8	9.9	30.1%
Rich Voice	0.0	0.0	0.0	0.1	0.7	1.4	4.2	8.1	13.6	20.8	95.6%
Simple Voice	0.1	1.0	6.4	12.4	18.6	36.3	54.2	60.2	72.3	87.8	36.3%
Total	0.1	3.0	18.8	37.4	57.2	107.1	164.1	201.4	252.6	322.1	41.3%
Subscriptions (M)²⁹											
Customised Infotainment	0.0	2.6	20.7	39.7	58.5	109.8	168.2	190.1	230.4	311.1	39.7%
Mobile Intranet/Extranet Access	0.1	1.2	7.2	14.2	25.8	58.1	92.4	137.1	196.3	258.2	58.6%
Multimedia Messaging Service (Consumer)	0.0	1.0	6.9	17.2	27.3	53.1	79.4	88.2	105.8	128.5	36.3%
Mobile Internet Access	0.0	0.3	1.8	3.6	6.6	14.8	23.6	34.9	39.6	60.3	55.7%
Multimedia Messaging Service (Business)	<p>Generally available to all 3G subscribers.</p> <p>Individual services are comprised of several components, some of which are not calculated on a per-subscription basis.</p> <p>(See Tables 7-9 in Section 5)</p>										
Location-Based Services											
Rich Voice											
Simple Voice	0.3	3.0	22.0	47.2	78.9	170.8	283.5	349.9	466.6	629.9	51.5%

Source: Telecompetition Inc., February 2001.

²⁹ Subscription numbers for MMS (Business), Rich Voice, and Location-Based Services are not meaningful, as these service revenues are a summation of several components, some of which are not calculated on a per-subscription basis.

Figure 34. Worldwide market subscriptions for selected services – 2001-2010.

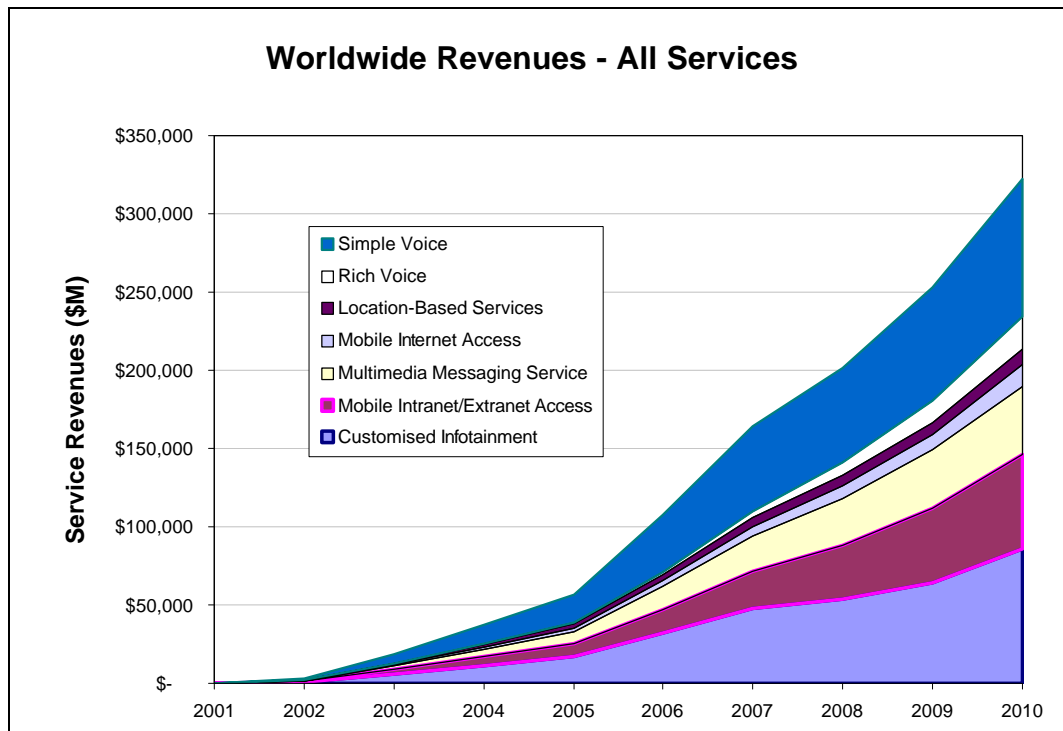


Source: Telecompetition Inc., February 2001.

The forecast worldwide revenues for each service are shown in Figure 35.³⁰ Unlike subscriptions, revenues are additive and can be summed to provide a forecast of the total revenue potential for 3G services. Under the assumptions made in this study, 3G services are forecast to generate \$237 billion per annum in 2010. The forecast revenue generated by 3G subscribers from Simple Voice services is an additional \$88 billion in 2010—although, as discussed earlier, whether or not this should be regarded as 3G revenue is a subject of debate.

³⁰ The change in slope in year 2007 in Figure 35 is a result of two factors: (1) The beginning of a slower growth rate in the countries adopting 3G earlier in the forecast period and (2) the less developed countries commercialising 3G around 2007 are in the early (slower) stages of adoption through 2010.

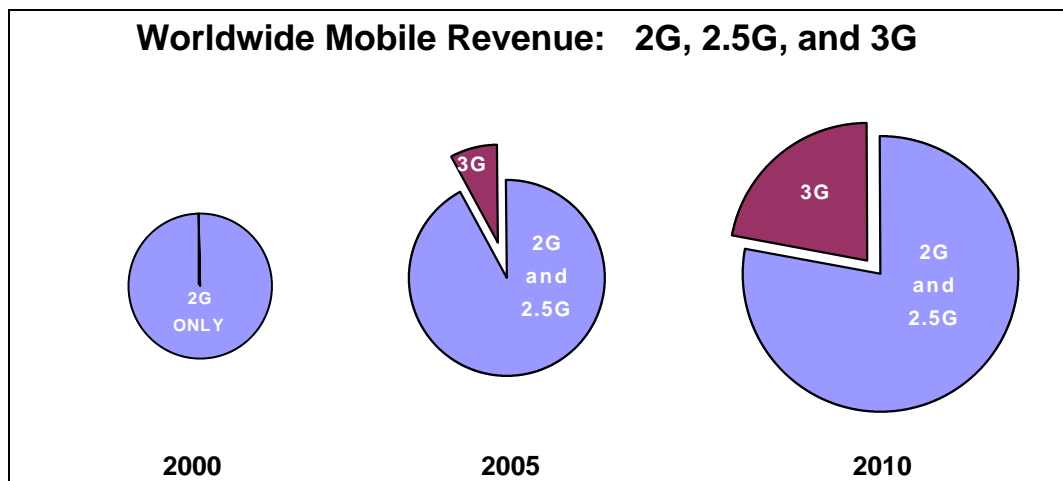
Figure 35. Worldwide market revenue for all services – 2001-2010.



Source: Telecompetition Inc., February 2001.

To put these revenues into perspective, Figure 36 below show these revenues in relation to the total worldwide mobile market.

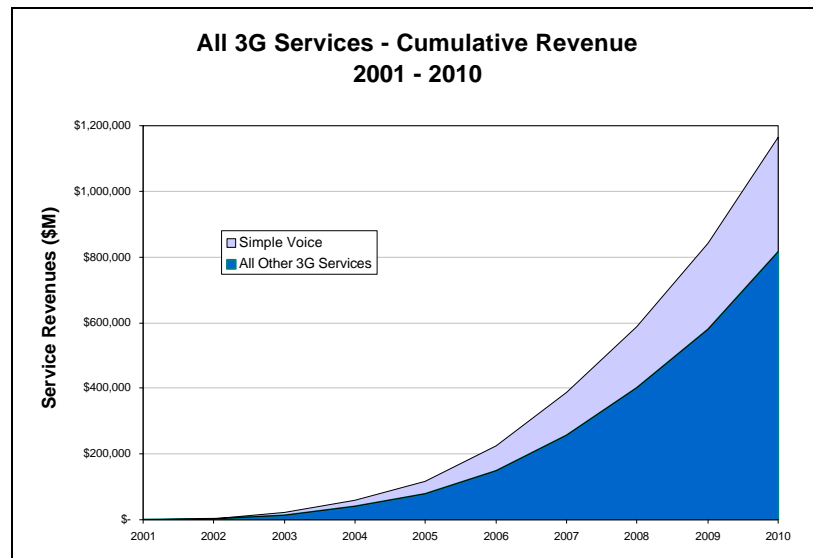
Figure 36. Worldwide mobile revenue: 2G, 2.5G and 3G.



Source: Telecompetition Inc., February 2001.

An indicator of the global market potential of 3G is the accumulated revenue from all services over time. This is illustrated in Figure 37, which shows that **the 3G market is forecast to generate about one *trillion* dollars of additional revenue between 2001 and 2010.**

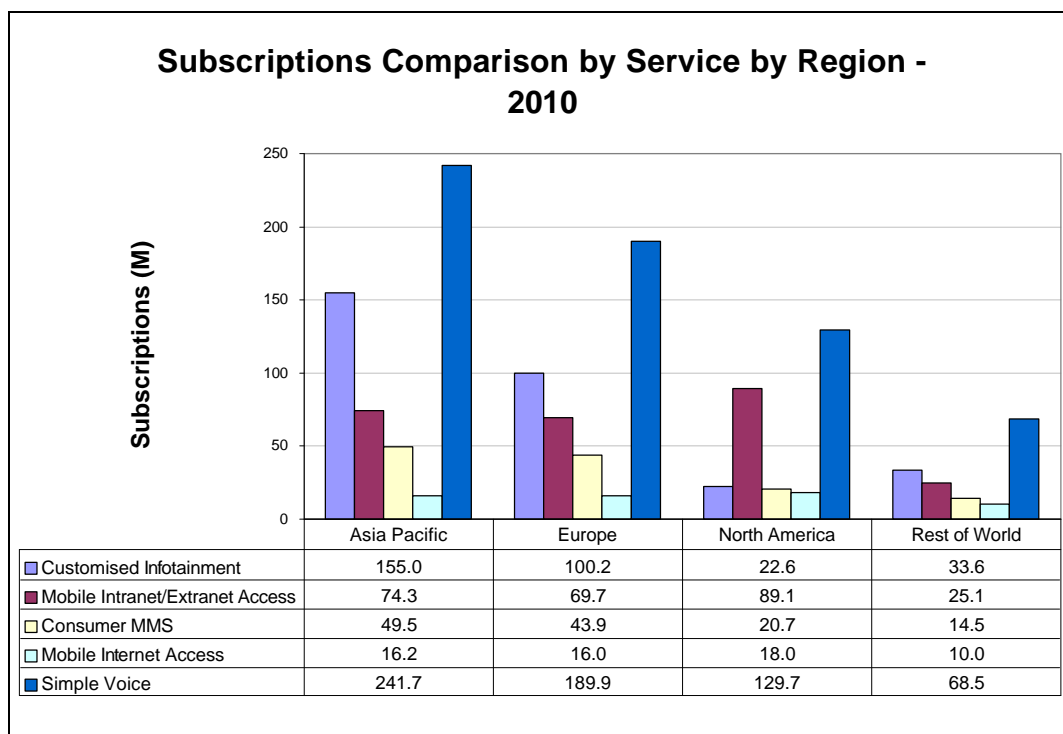
Figure 37. Cumulative market revenue for all services – 2001-2010.



Source: Telecompetition Inc., February 2001.

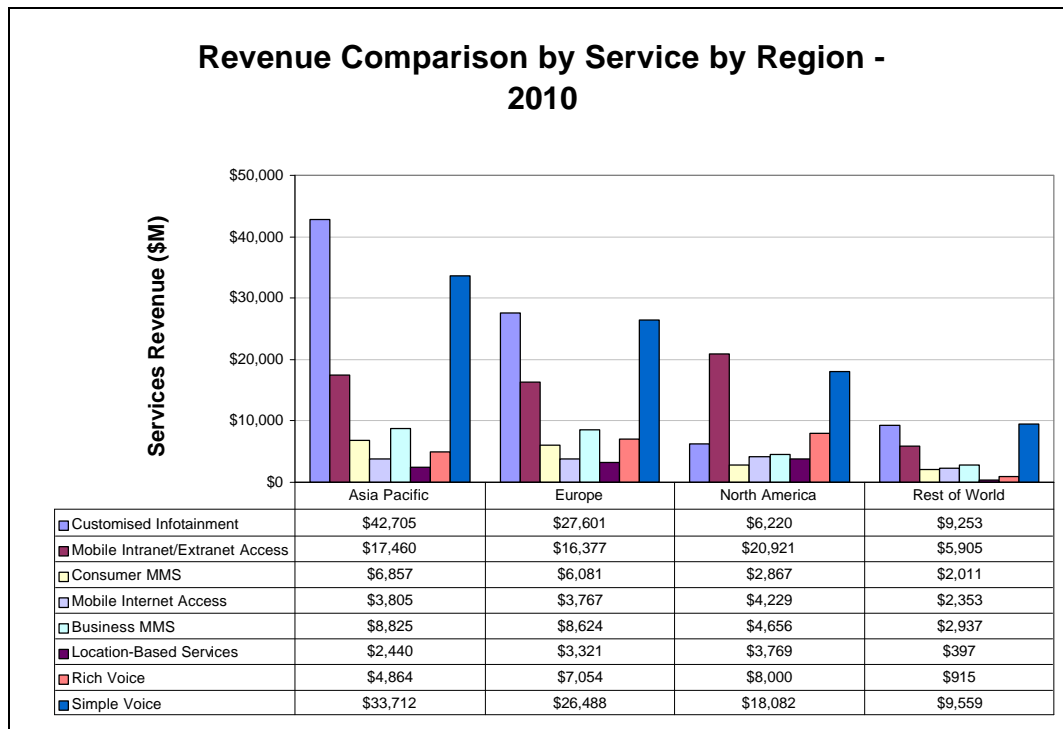
Services will develop differently in the different regions of the world, depending on a variety of factors such as country demographics, mobile and Internet penetration rates and 3G commercialisation schedules. The forecast subscription numbers by region in 2010 are shown in Figure 38 and the resulting revenues are shown in Figure 39.

Figure 38. Regional market demand for all services by service subscriptions – 2010.



Source: Telecompetition Inc., February 2001.

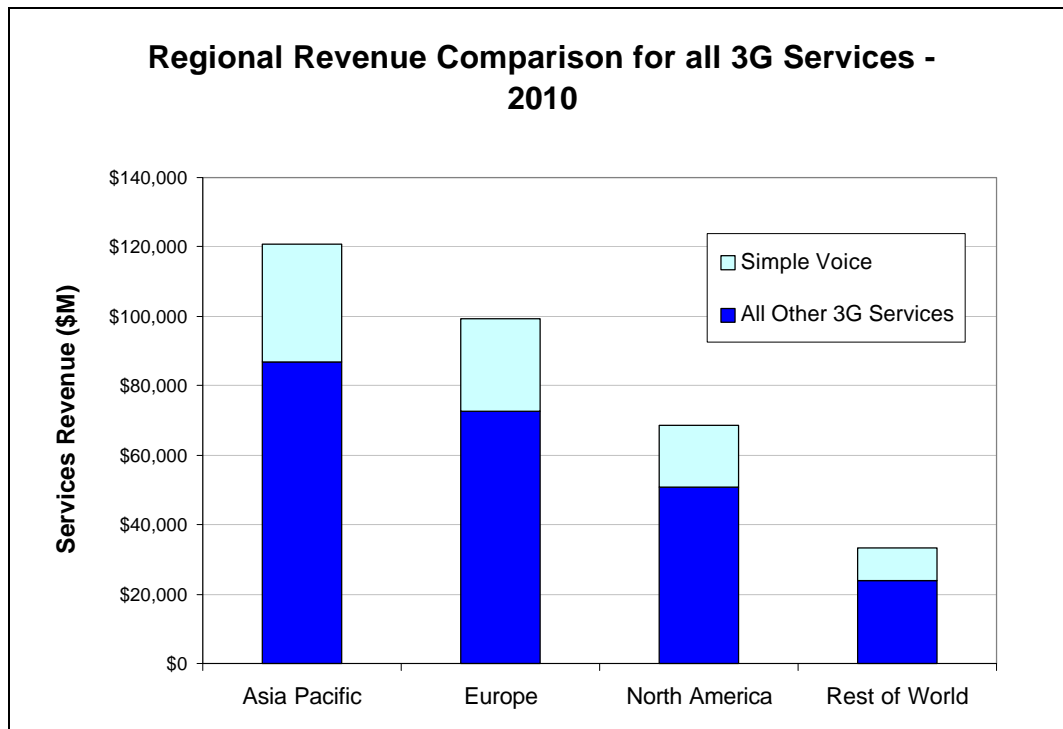
Figure 39. Regional market demand for all services by service revenue – 2010.



Source: Telecompetition Inc., February 2001.

The total market demand in each region in 2010 is shown in Figure 40 which illustrates that the bulk of the revenues will be generated in Asia Pacific and that North America will still be lagging behind both Europe and Asia Pacific.

Figure 40. Total 3G revenue by region – 2010.



Source: Telecompetition Inc., February 2001.

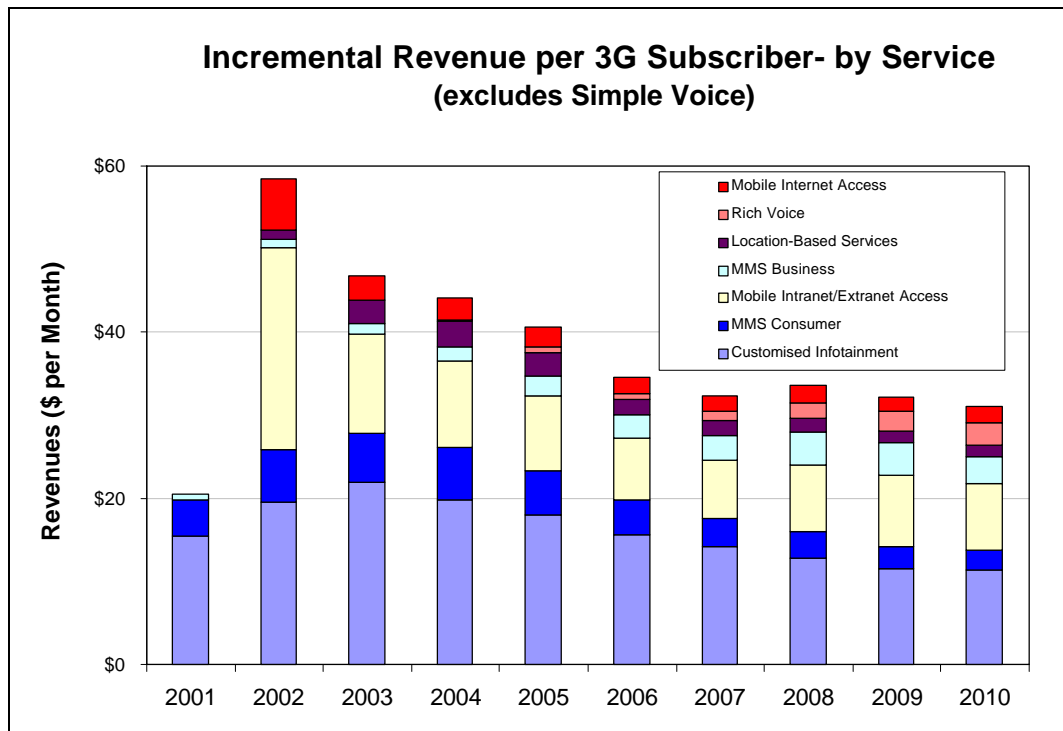
6.1.1 Analysis by Incremental Revenues and ARPU

Revenues from each of the service categories have been averaged over the entire 3G subscriber base to produce an “Incremental Revenue per 3G Subscriber” – an indicator similar to ARPU in the voice world. The incremental revenue numbers indicate the additional revenue provided by each 3G subscriber while the ARPU number is an indication of the revenue increase this provides when averaged over the entire subscriber base.³¹ The results are shown in Figure 41.

The high figure for such incremental revenue shown for 2002 results from the initial deployment of Mobile Internet Access and Mobile Intranet/Extranet Access services predicted for 2002. These are expected to have a rapid take-up rate and initially command high prices from early adopters. But prices will rapidly decline and the incremental revenue per 3G subscriber is forecast to stabilise at around \$40 per month (excluding simple voice revenues) by 2005, declining gracefully to about \$30 per month by 2010.

³¹ While Incremental 3G revenue provides a more meaningful metric for the 3G services provider, traditional ARPU is also provided in this report to enable easier comparison with available analyses.

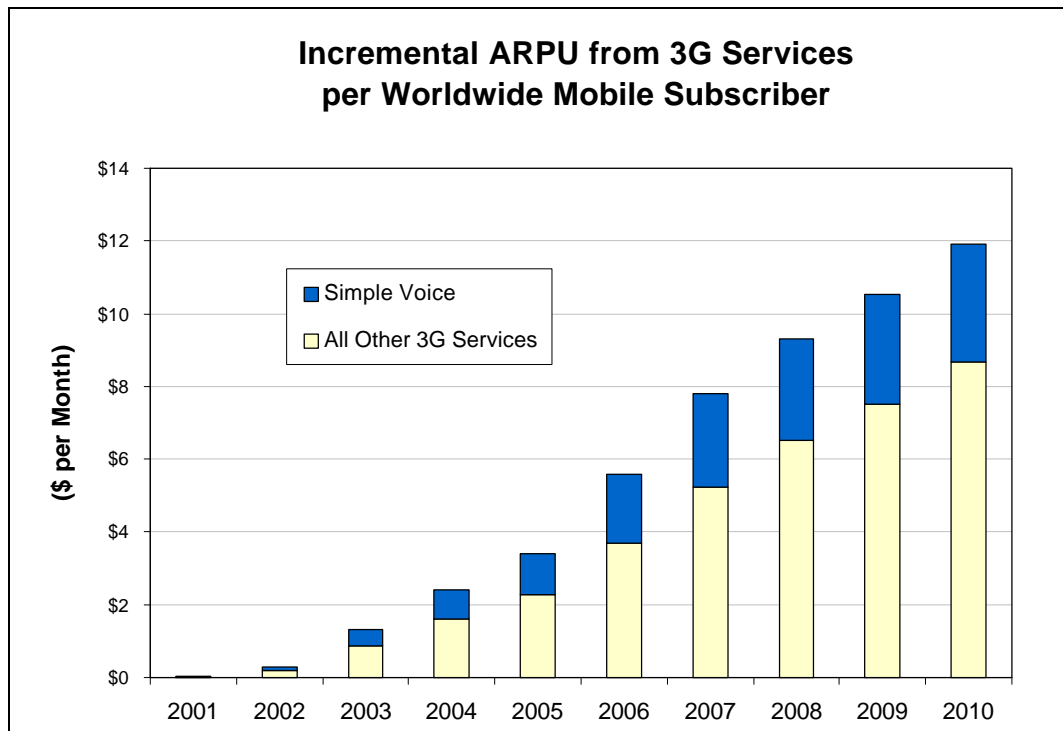
Figure 41. Worldwide incremental revenue per 3G subscriber – 2001-2010.



Source: Telecompetition Inc., February 2001.

The impact of 3G service revenues on the traditional ARPU indicator, which is the revenue increase averaged over the entire cellular subscriber base, is shown in Figure 42.

Figure 42. Incremental ARPU from 3G services per worldwide mobile subscriber – 2001-2010.



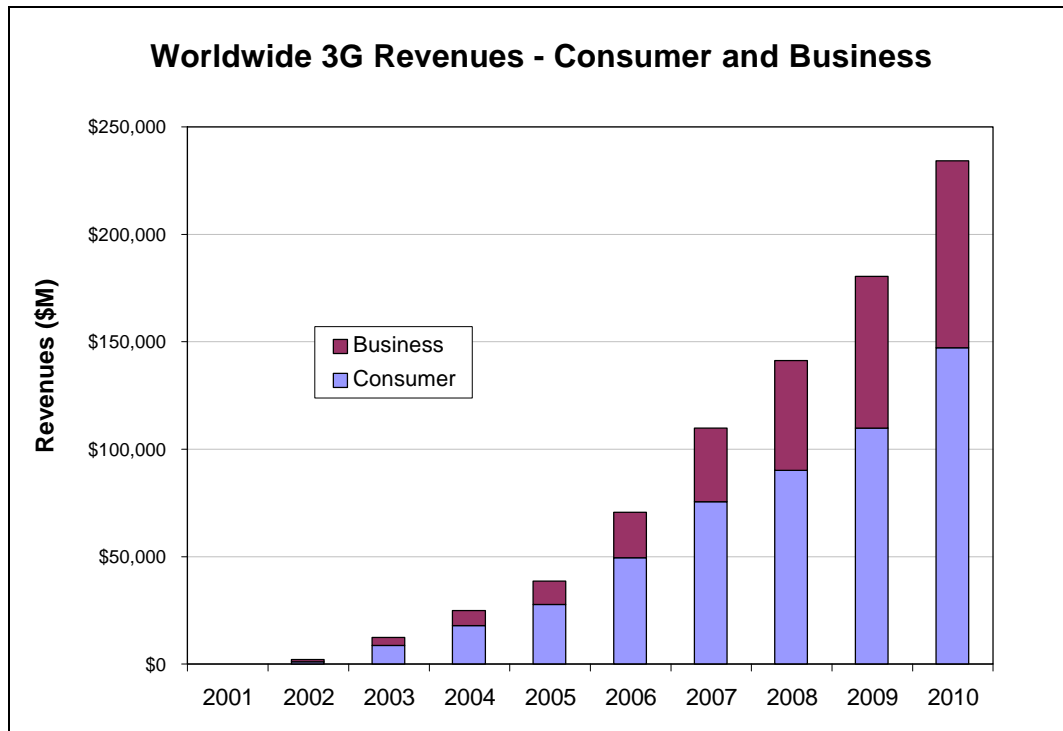
Source: Telecompetition Inc., February 2001.

These are significant numbers. The conservative 3G adoption and penetration rates assumed in this study result in an estimate of 28% of the global cellular subscriber base on 3G by 2010 – a much smaller number than many analyst predictions. Even with these conservative estimates, the predicted incremental ARPU over the entire cellular user base is about \$9 per month in 2010.

6.1.2 Analysis of Consumer and Business Segments

The methodology used in this study modelled services to the consumer or business market segments depending on the characteristics of the service. This enables an estimate to be made of the 3G service revenue potential from each of these market segments (See Figure 43). Both market segments have significant revenue potential, but the consumer segment is forecast to produce the majority of the revenue on a worldwide basis.

Figure 43. Worldwide revenues in consumer and business segments (excluding Simple Voice – 2001-2010).

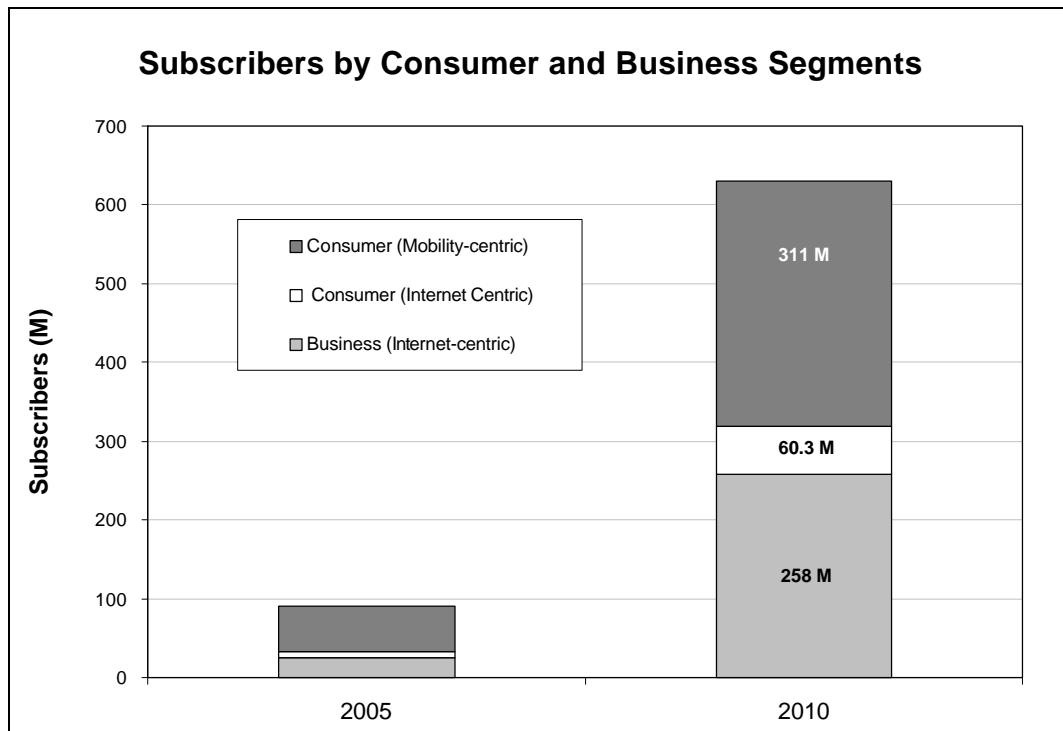


Source: Telecompetition Inc., February 2001.

6.1.3 Analysis by Consumer and Business Subscribers

In order to create forecasts that are clearly differentiated with no “double counting”, this report uses a very structured approach to the definitions and segmentation of users and services. Consequently, 3G subscribers are “forced” into either consumer or business services, even though in practice mobile voice subscribers typically use the same mobile device for both business and personal use. For example, mobile workers who may physically work out of their homes and use the same mobile device for both personal and business purposes are considered to be “more business” than “consumer”, and are therefore included in the forecasts for Mobile Intranet/Extranet Access service. Similarly, consumers that are more experienced with using the Internet (perhaps because they use it at work), are more ‘Internet-centric’ and therefore more likely to subscribe to the Mobile Internet Access service than to Customised Infotainment. These same Mobile Internet Access subscribers may occasionally use their service for work purposes. On the other hand, Customised Infotainment subscribers are more “mobility-centric”, using consumer oriented portal services, and are considered “consumer” subscribers, even though they may sometimes use the service for business purposes. Figure 44 below compares business subscribers and consumer subscribers of 3G services.

Figure 44. 3G subscribers by consumer and business segments.



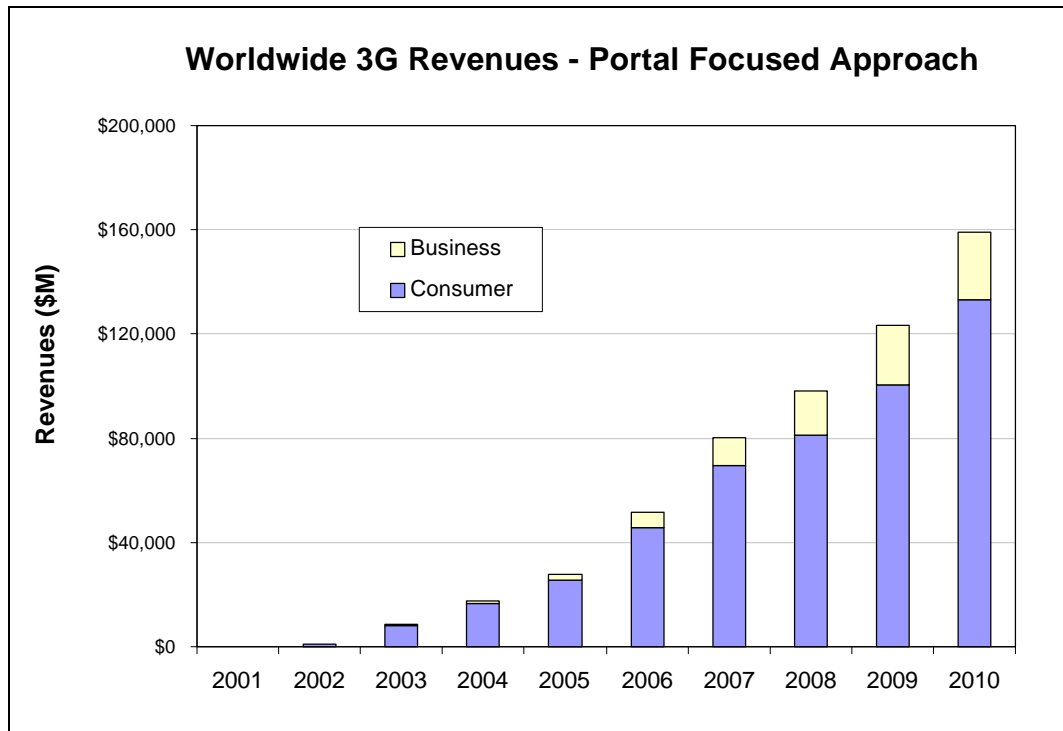
Source: Telecompetition Inc., February 2001.

6.1.4 Analysis for the Portal Focused Approach

This breakdown between consumer and business segments can be further analysed according to the basic business approach adopted. Figure 45 illustrates this for the revenue which accrues from a 3G services provider adopting a Portal Focused Approach.³² With this approach, the consumer market generates the bulk of the revenue. The consumer market provides the opportunity to capture new revenue streams and allows the operator to move up the value chain. Success in the consumer segment will more likely be achieved by those operators willing to make such investments.

³² Revenues from a Portal Focused Approach include Customised Infotainment and Mobile Specialised Services of Rich Voice, Multimedia Messaging Service, and the retail portions of Location-Based Services.

Figure 45. Worldwide revenues in consumer and business segments for a Portal Focused Approach (excluding Simple Voice) – 2001-2010.



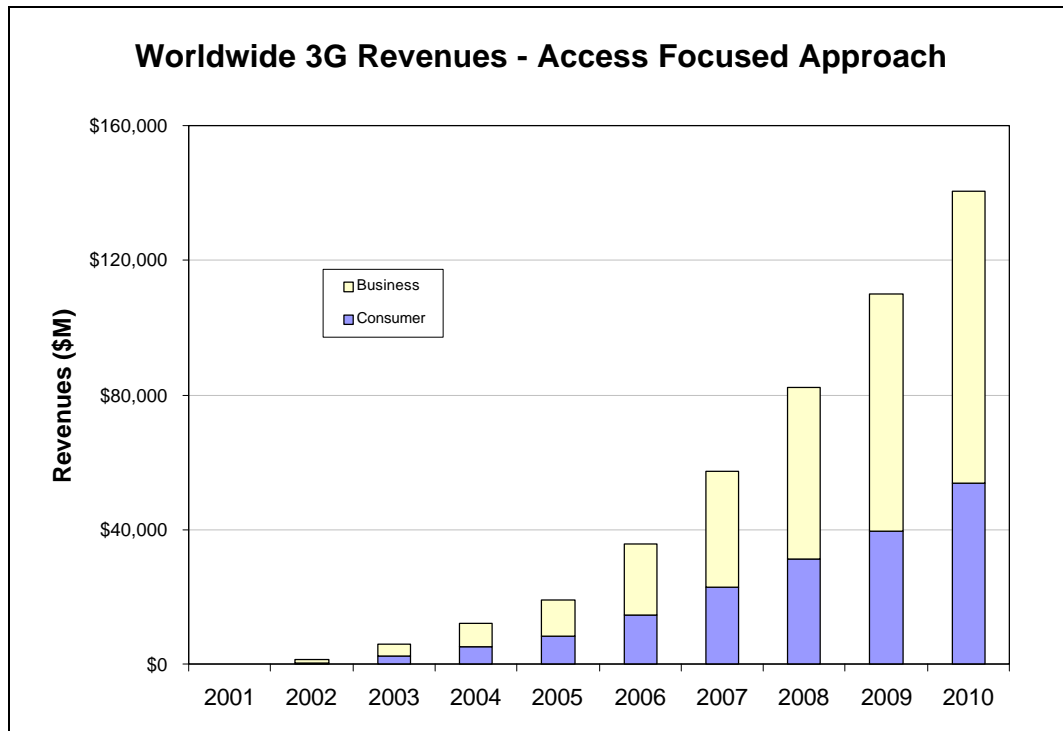
Source: Telecompetition Inc., February 2001.

6.1.5 Analysis for an Access Focused Approach

Adopting an Access Focused Approach³³ on the other hand results in revenue primarily from the business market segment (See Figure 46). If operators remain in the access domain of the value chain, the business segment is a more significant revenue source as it drives higher traffic.

³³ Revenues from an Access Focused Approach include Mobile Internet Access, Mobile Intranet/Extranet Access, and the Mobile Specialised Services of Rich Voice, Multimedia Messaging Service, and the wholesale portions of Location-Based Services.

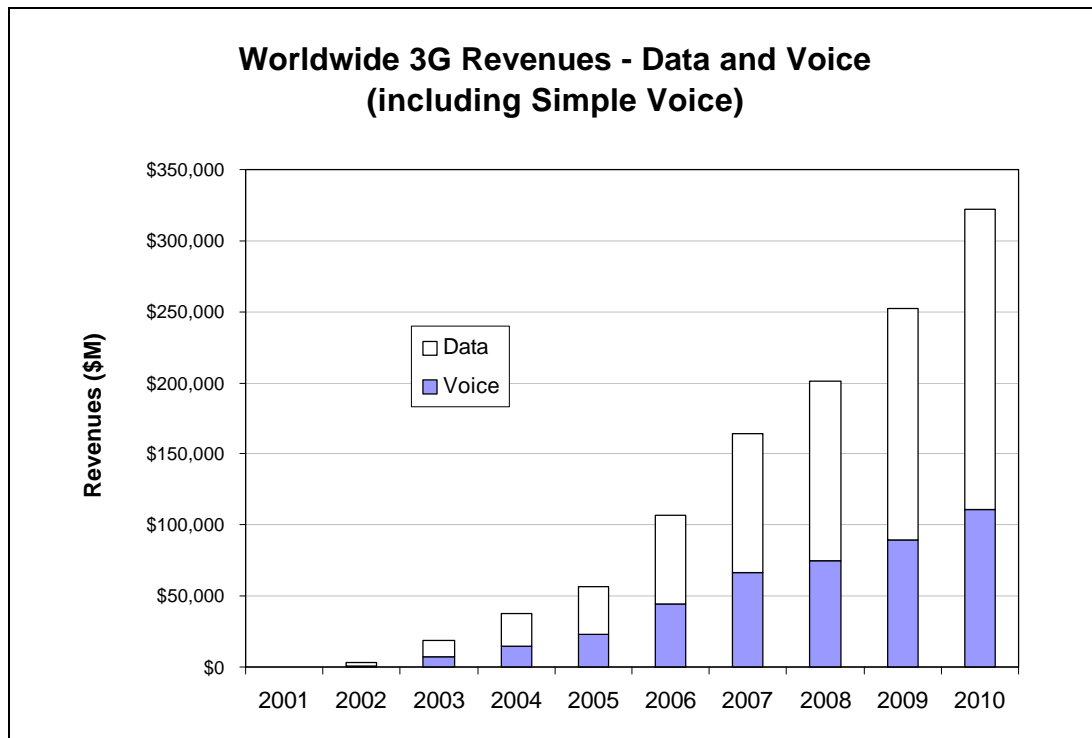
Figure 46. Worldwide revenues in consumer and business segments for an Access Focused Approach (excluding Simple Voice – 2001-2010).



Source: Telecompetition Inc., February 2001.

6.1.6 Analysis of Voice and Data

An essential element of 3G is the ability to deliver non-voice services, which should result in new revenues from data services, compensating for the decline in revenue from pure voice services. This is illustrated in Figure 47 that shows how data service revenues will rapidly dominate over voice revenues in the 3G environment. Figure 41 includes revenues from Simple Voice for the purposes of comparison. The 3G Simple Voice revenues are only a proportion of the total voice revenues in the mobile market.

Figure 47. Worldwide revenues for voice and data – 2001-2010.³⁴

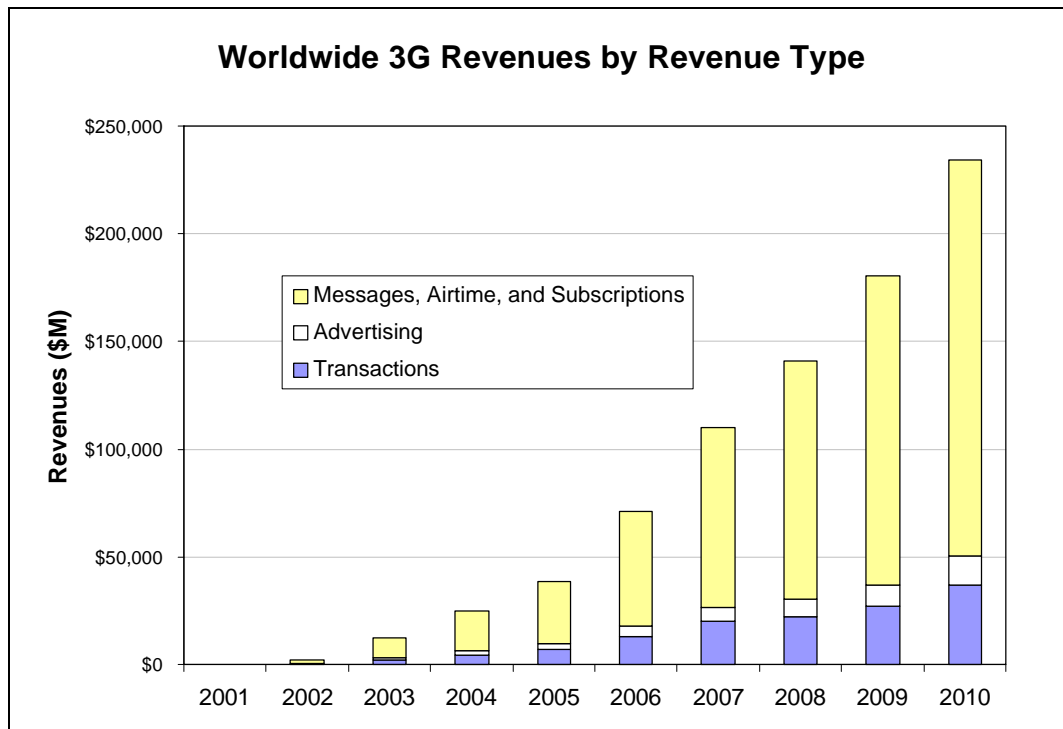
Source: Telecompetition Inc., February 2001.

6.1.7 Analysis by Revenue Type

The methodology used in this study also allows service revenues to be classified into the major categories of usage, transaction-based revenues and advertising. Usage includes message, airtime and subscription fees. The results of such an analysis, excluding Simple Voice revenues, are shown in Figure 48. The majority of the operator-retained revenues forecast in this study are generated through usage. Advertising and transaction-based services provide a new revenue stream for mobile services providers and are forecast to contribute over 20% of their total revenues by 2010 (excluding Simple Voice revenues). The bulk of the revenues generated by advertising and transaction-based services will remain with W-ASPs and content providers, representing a significant market opportunity for these players.

³⁴ Voice revenue includes consumer telematics (a component of Location-Based Services), the incremental voice traffic generated from Customised Infotainment, and all Simple Voice. All other 3G service revenues are considered data revenues.

Figure 48. Worldwide revenues by revenue source – 2001-2010.



Source: Telecompetition Inc., February 2001.

6.1.8 3G Penetration Scenario Analysis

A scenario analysis has been conducted to see the effects of a higher penetration rate of 3G subscribers within the total cellular user base. The results are illustrated in Figure 49. The lower curve illustrates how cellular voice-only revenues are expected to evolve with time. Over the period 2001 to 2010, total revenues from all cellular voice services are expected to remain essentially static on a worldwide basis. The continuing decline in voice tariffs will not result in a collapse of global cellular voice revenues because it will be compensated by the growth in subscribers and traffic. This global effect masks the situation faced in countries where cellular penetration rates are approaching saturation. Such countries are experiencing a loss of revenue as cellular rates decline.

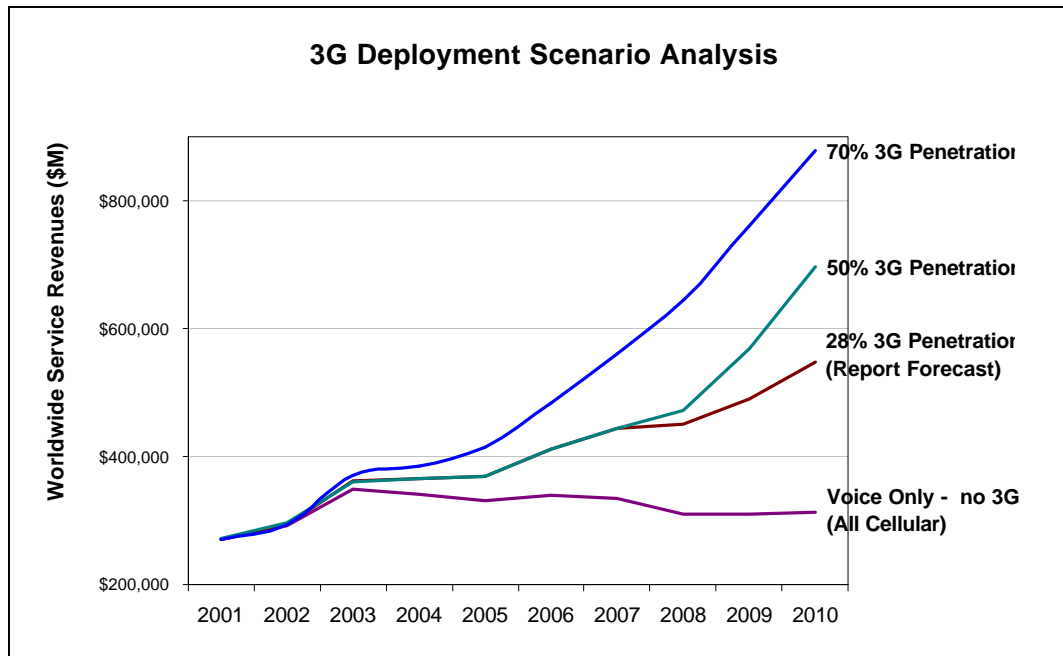
The 28% penetration curve illustrates the impact of revenue from 3G non-voice services under the assumptions used in this market study. The 28% of cellular subscribers on 3G networks in 2010 contribute almost \$240 billion of incremental revenue, equivalent to the total cellular voice market today.

If a greater percentage of cellular subscribers are on 3G networks by 2010 then the incremental revenues will be even higher. Given that the 28% penetration assumed in this study could be regarded as ultra-conservative, Figure 46 illustrates the impact of penetration rates of 50% and 70%.

If half of cellular subscribers were on 3G networks in 2010, they would

generate incremental revenues from 3G services far higher than the total voice revenues from the entire cellular subscriber base.

Figure 49. 3G deployment scenarios: total worldwide cellular revenue – 2001-2010.



Source: Telecompetition Inc., February 2001.

These scenarios are displayed in terms of the traditional ARPU indicator in Figure 50. The voice-only scenario of the lower curve shows a steadily decreasing ARPU. The downward pressure on prices for voice services results in today's ARPU of \$30 per month for voice declining to about \$11 per month by 2010.³⁵

The addition of 3G non-voice services under the assumptions contained in this market study (28% penetration of 3G amongst the cellular subscriber base by 2010) significantly slows the decline in ARPU, which stabilises at about \$20 per month by 2010.

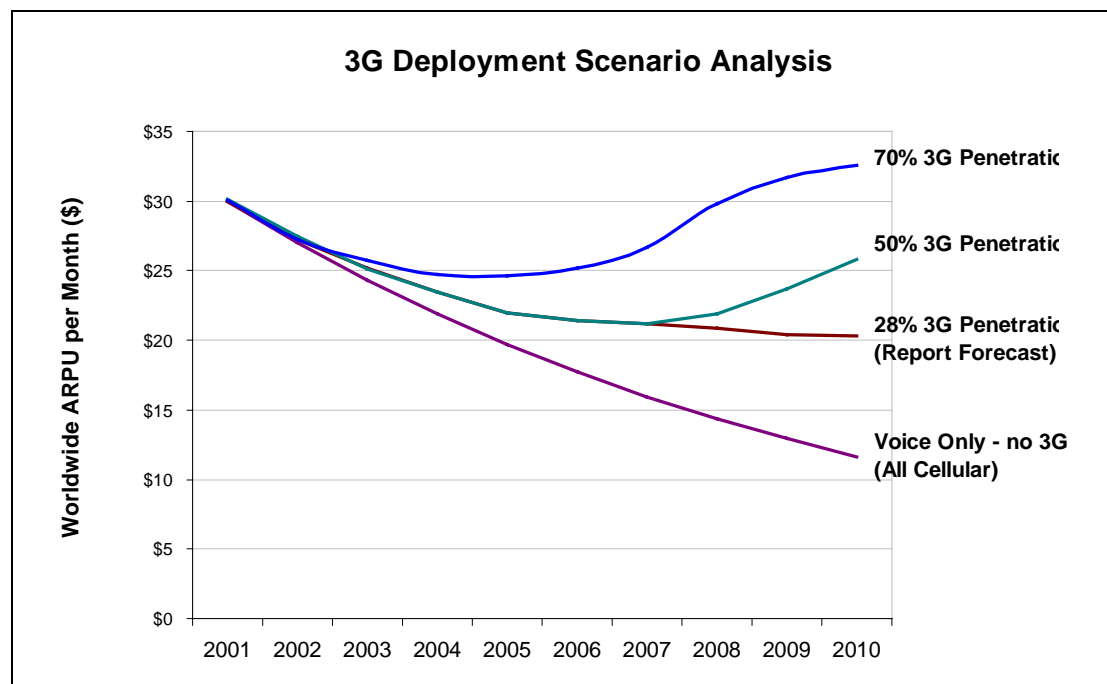
Restoring current levels of ARPU by 2010 would require 3G penetration rates approaching 70% of the cellular subscriber base by that time. But as ARPU is measured across the entire cellular subscriber base, and as that subscriber base is itself growing substantially, such a scenario represents a massive increase of almost a factor three in total market revenue.

Note that these scenarios only consider additional revenue from services delivered over 3G networks. Similar services will also be delivered using alternative technologies. For some service categories, 2.5G networks could be one of those alternative technologies.

³⁵ These are worldwide averages. The figures for individual countries could differ substantially.

Interim 2.5G technologies may be able to deliver some, although not all, services in the short term but are unlikely to be a viable long-term solution. As subscriber numbers grow, the inherent greater efficiency of 3G and the fact that it will generally be deployed over new spectrum will become increasingly important considerations. **Ultimately, only 3G can deliver the all-important global roaming capability and economies of scale necessary to satisfy the expectations of users.**

Figure 50. 3G deployment scenarios: ARPU per worldwide cellular subscriber – 2001-2010.



Source: Telecompetition Inc., February 2001.

6.2 Regional Forecasts for all 3G Services – 2001-2010

Revenue forecasts and projected mix of mobile services differ from one region of the world to another region. These variations stem from differences in demographics, current state of fixed network services, mobile services, Internet penetration, and user experience from current services and future expectations. In addition, country level assumptions were made on service commercialisation dates based on known auction plans and/or estimates of mobility infrastructure plans.

Regional forecasts divide the world into four regions: Europe, Asia Pacific, North America and Rest of World. Rest of World includes primarily Latin America and Africa. Table 11 shows the countries and administrative regions included in North America, Europe, Asia Pacific and the Rest of World.

Table 11. Countries and administrative regions considered in 3G forecast.³⁶

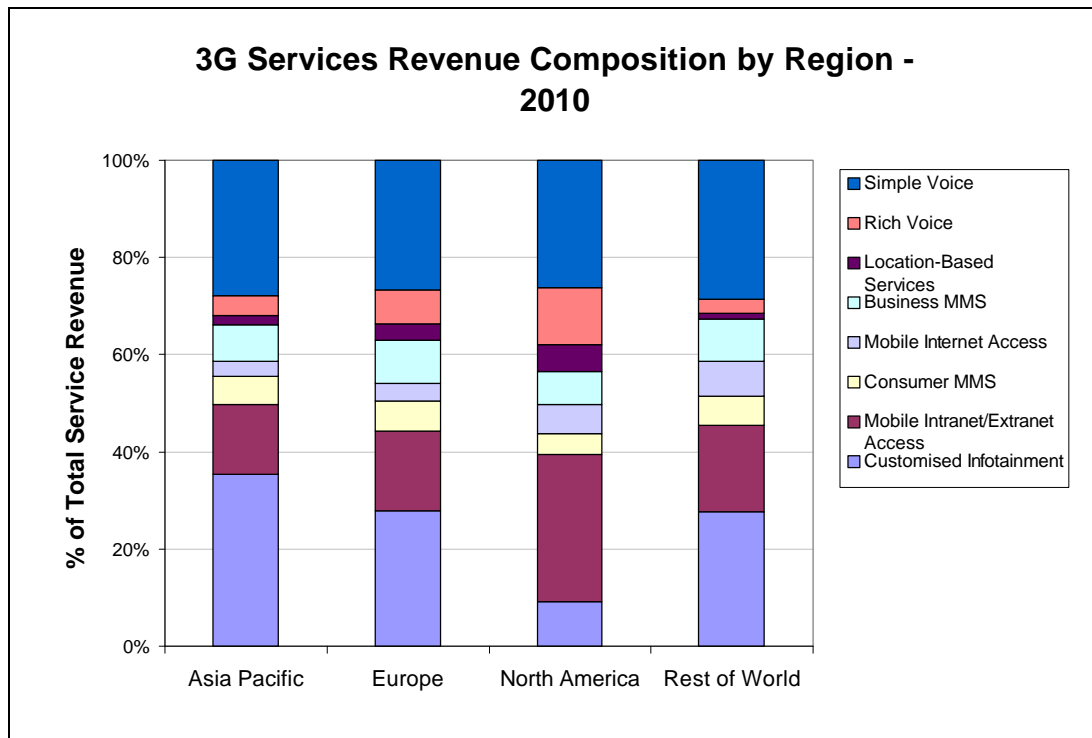
Countries and Administrative Regions							
ASIA PACIFIC		EUROPE		NORTH AMERICA	REST OF WORLD		
Afghanistan	Macau	Albania	Italy	Canada	Algeria	The Gambia	Nicaragua
Armenia	Malaysia	Austria	Latvia	United States	Angola	Gaza Strip	Nigeria
Australia	Maldives	Belarus	Lithuania		Argentina	Ghana	Oman
Azerbaijan	Mongolia	Belgium	Luxembourg		The Bahamas	Guadeloupe	Other
Bhutan	New Zealand	Bosnia and Herzegovina	Macedonia		Bahrain	Guatemala	Melanesia
Brunei	Pakistan	Bulgaria	Malta		Barbados	Guinea	Panama
China	Papua New Guinea	Croatia	Moldova		Belize	Guyana	Paraguay
China (Taiwan)	Philippines	Cyprus	Netherlands		Benin	Haiti	Peru
East Timor	Russia	Czech Republic	Norway		Bolivia	Honduras	Puerto Rico
Fiji	Singapore	Denmark	Poland		Botswana	Iran	Qatar
Georgia	Solomon Islands	Estonia	Portugal		Brazil	Iraq	Reunion
Hong Kong S.A.R.	South Korea	Finland	Romania		Cameroon	Israel	Saudi Arabia
India	Sri Lanka	France	Slovakia		Cape Verde	Ivory Coast	Senegal
Indonesia	Thailand	Germany	Slovenia		Chile	Jamaica	South Africa
Japan	Turkmenistan	Greece	Spain		Colombia	Jordan	Sudan
Kazakhstan	Uzbekistan	Hungary	Sweden		Comoros	Kenya	Surinam
Kyrgyzstan		Iceland	Switzerland		Congo (Brazzaville)	Kuwait	Swaziland
Laos		Ireland	Turkey		Costa Rica	Lebanon	Syria
			Ukraine		Cuba	Lesotho	Togo
			United Kingdom		Dominican Republic	Liberia	Trinidad and Tobago
					Ecuador	Libya	Tunisia
					Egypt	Martinique	Uganda
					El Salvador	Mauritania	United Arab Emirates
					Equatorial Guinea	Mauritius	Uruguay
					Ethiopia	Mexico	Venezuela
					Gabon	Morocco	Yemen
						Namibia	Zambia
						Netherlands Antilles	Zimbabwe

Source: UMTS Forum Report No. 9, September 2000.

Revenue forecasts for each region are based on the same worldwide average price for each service. This means that the revenue per unit will be the same when comparing regions. This approach allows for more meaningful comparison of opportunity across regions. For the individual mobile services provider, a more country specific revenue forecast could be derived by multiplying subscription numbers by the adjusted country specific price. In addition, Figures 51 and 52 provide further insight into regional comparisons, displaying total 3G revenues per population in each region and the revenue mix of each region in 2010.

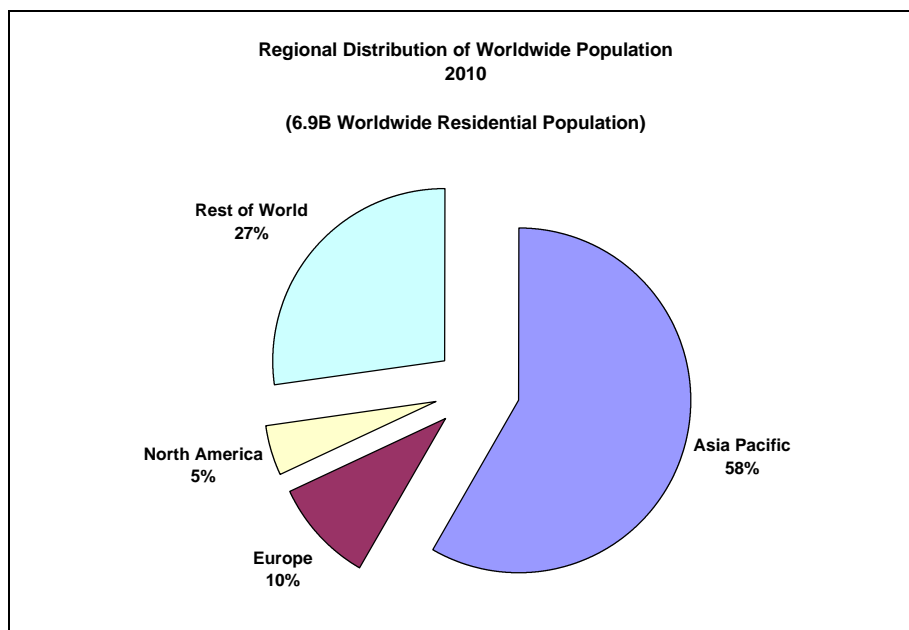
³⁶ Some countries do not appear separately in this table as their demographic data are incorporated into other regions in the ILO database.

Figure 51. 3G service revenue composition, by region 2010.



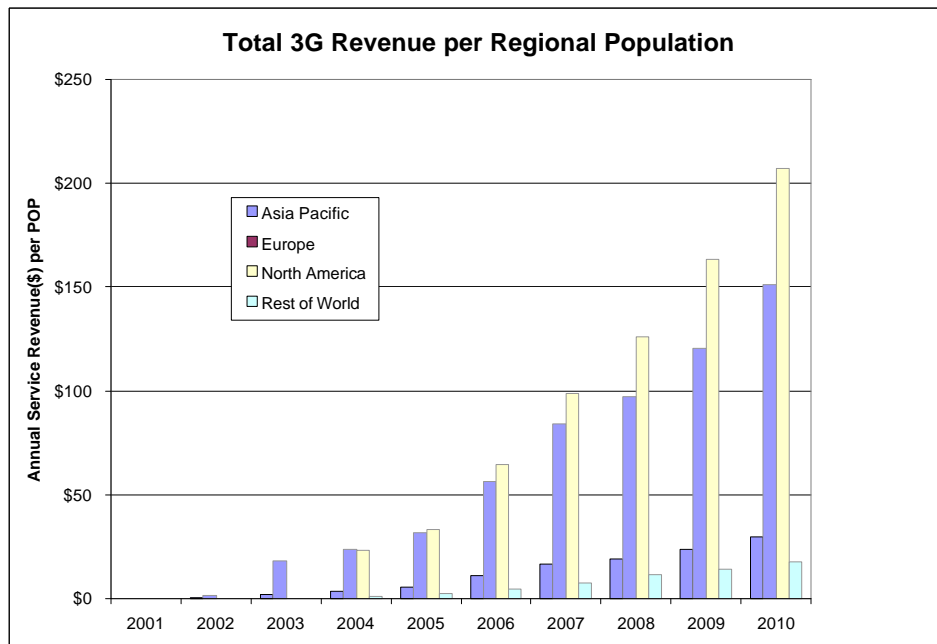
Source: Telecompetition Inc., February 2001.

Figure 52. Worldwide population by region – 2010.



Source: Telecompetition Inc., February 2001.

Figure 53. Annual 3G revenue for all services per population by region 2001 – 2010.



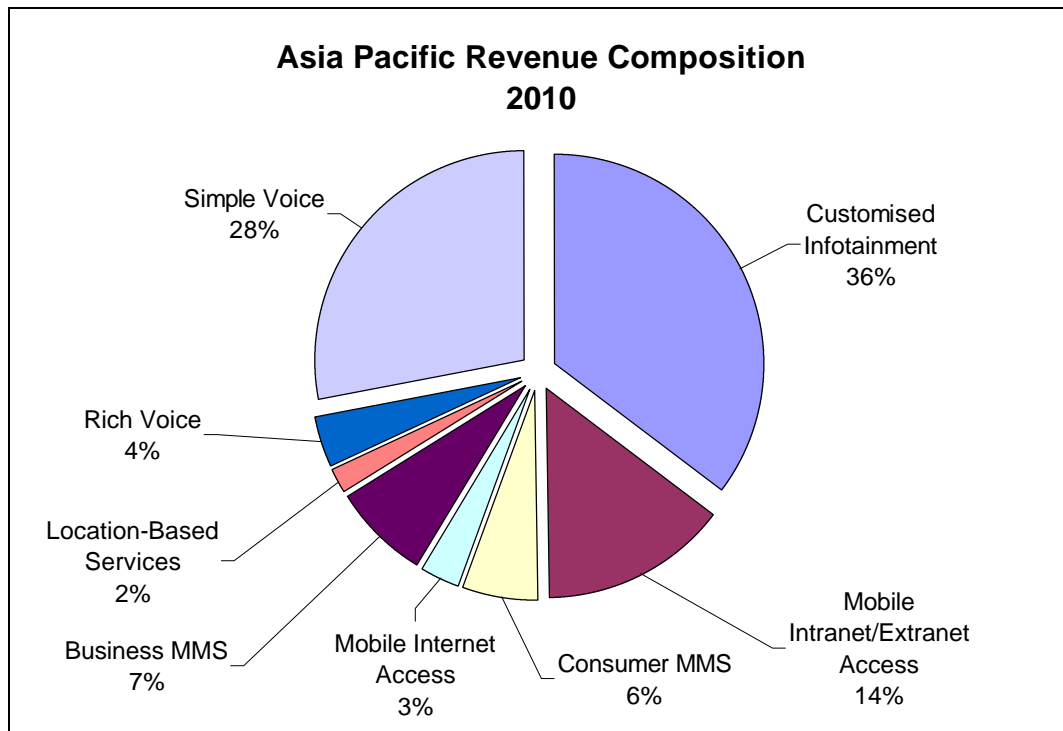
Source: Telecompetition Inc., February 2001.

6.2.1 Asia Pacific Demand

The Asia Pacific region is the highest growth market in the world. Many technologically advanced countries such as Japan, Singapore, South Korea, and Hong Kong are contributing to this growth. Also more than one-third of the world population lives in China and India alone. The political stability in these two countries is promoting economic growth and a customer base fertile for mobile services.

The fixed network phone penetration is very low in many countries of Asia Pacific, whereas mobile phone penetration far exceeds that of fixed phones. Thus it is expected that many users would be introduced to the Internet revolution via mobile phones. The deployments of 2G and GPRS networks are precursors for the emerging high bandwidth 3G networks. The 3G networks will have the capacity to meet the mobile data demands of this densely populated region of the world.

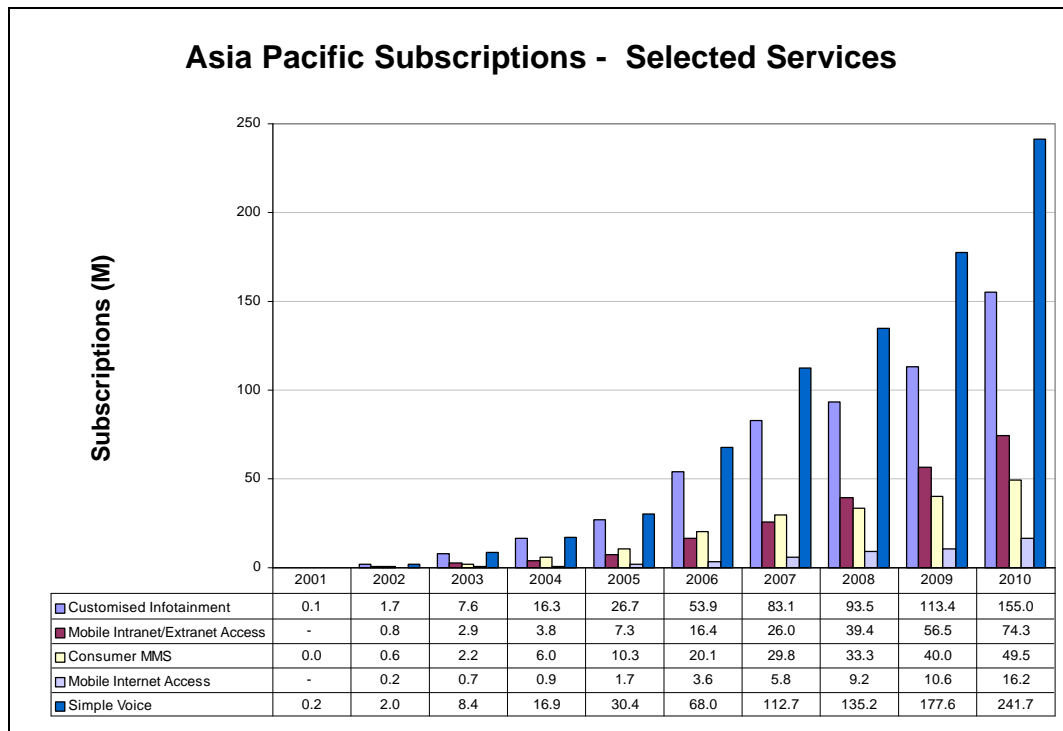
Figure 54 shows that 64% of 3G revenues will come from Simple Voice and Customised Infotainment services.

Figure 54. Asia Pacific 3G revenue composition – 2010.

Source: Telecompetition Inc., February 2001.

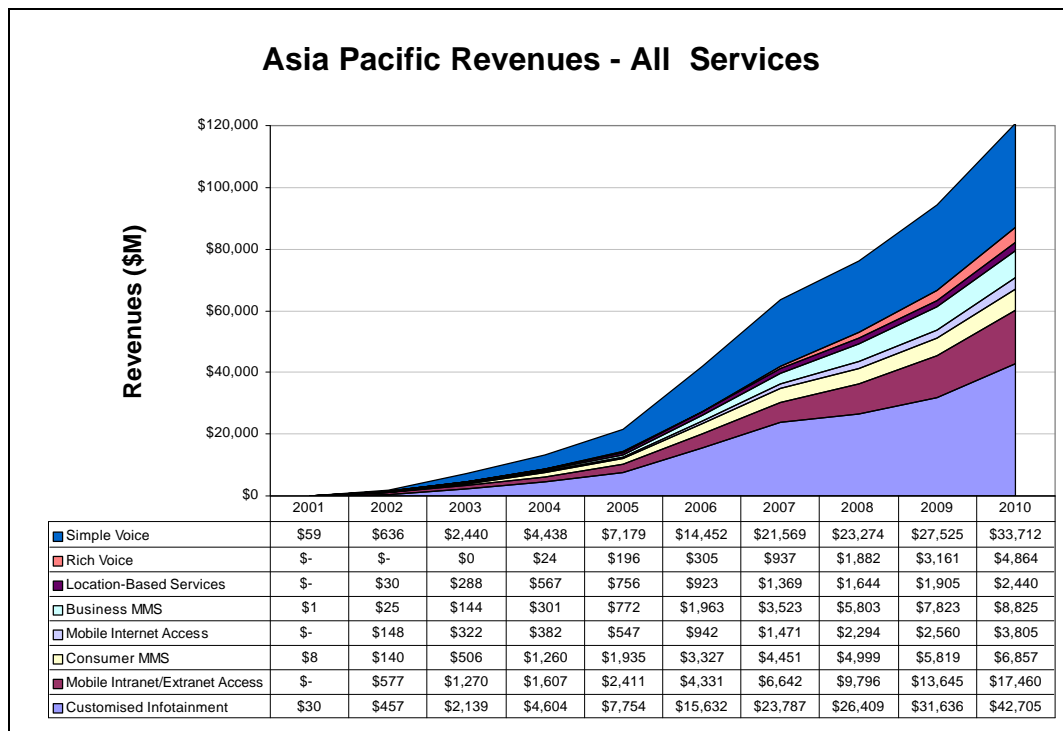
Figures 55 and 56 show the forecasts for the Asia Pacific region for selected subscriptions and revenues for the total 3G services market.

Figure 55. Asia Pacific demand for 3G services by subscriptions – 2001-2010.



Source: Telecompetition Inc., February 2001.

Figure 56. Asia Pacific demand for 3G services by revenue – 2001-2010.



Source: Telecompetition Inc., February 2001.

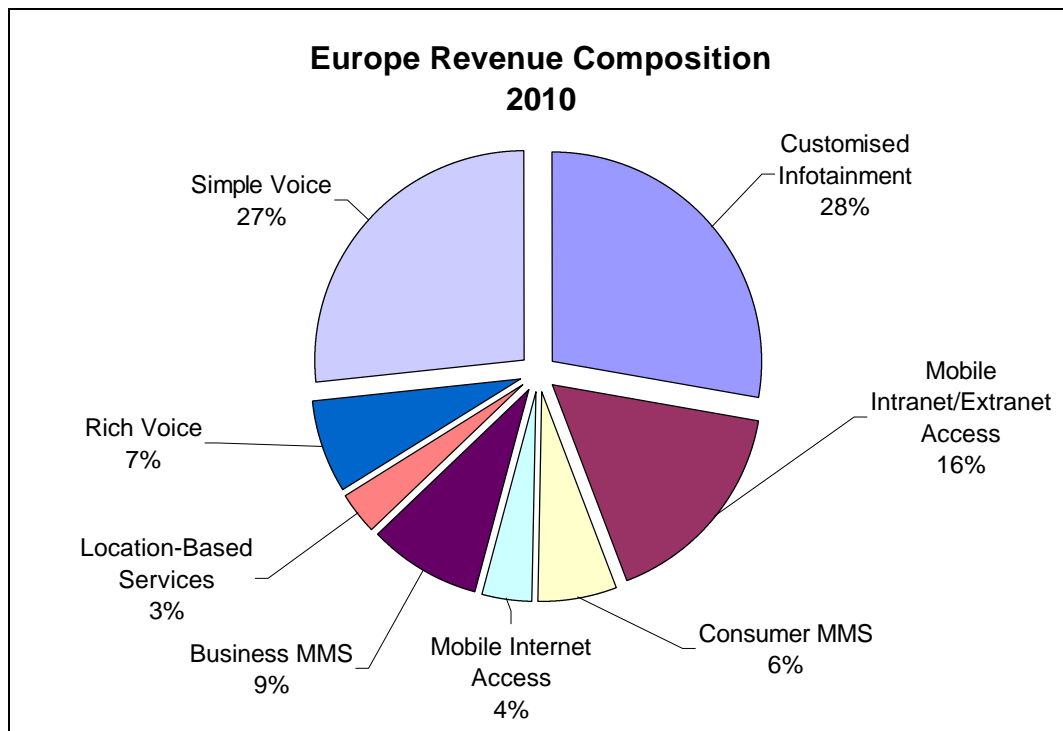
6.2.2 European Demand

Europe is a leading region of the world in the deployment of 3G networks. Mobile users in Europe are getting an early taste of initial wireless data services through the WAP (Wireless Application Protocol). There is a considerable show of interest by many users for these WAP based services. For multimedia applications 2G WAP is limited in bandwidth and thus causes frustration due to poor quality of service. GPRS is a stepping stone technology to the emerging 3G networks. GPRS with its 56 kbit/s bandwidth is expected to fill the void for the next couple of years as operators develop 3G networks.

European mobile operators have already invested more than \$100 billion in acquisition of licences for 3G spectrum. Speed of 3G network deployment would be important to get a timely return on this investment. The forecasts for countries in the European region assume an earlier 3G commercialisation date than that assumed in most countries in other forecast regions.

As shown in Figure 57, similar to Asia Pacific, over half the European region 3G revenue comes from Customised Infotainment and Simple Voice.

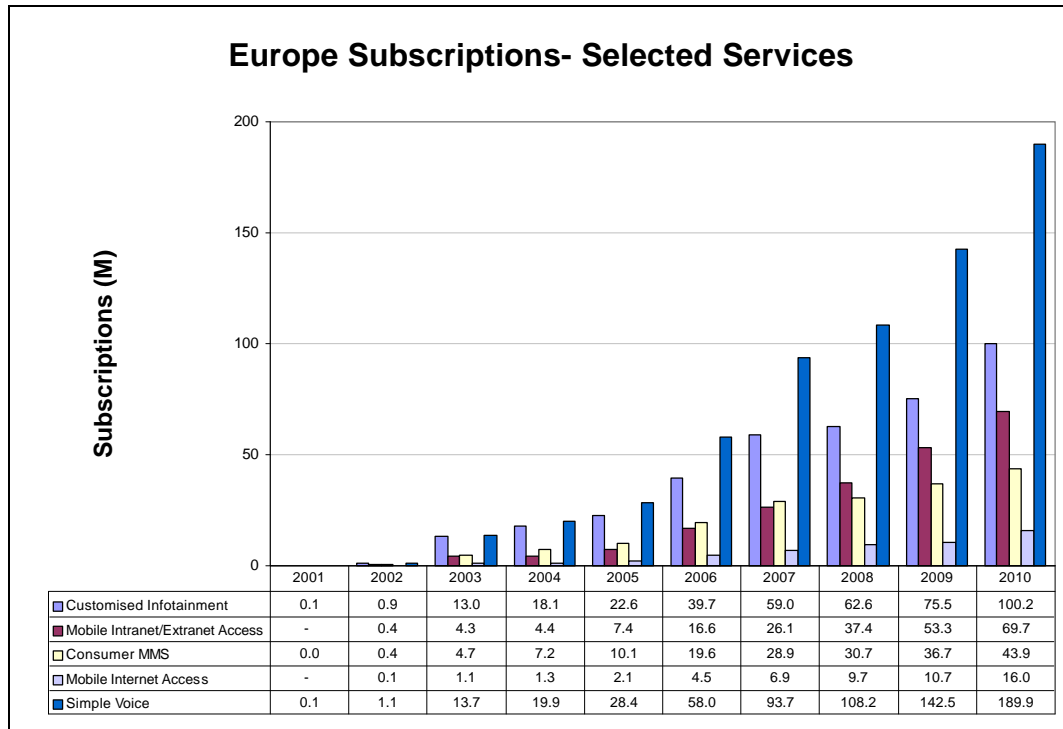
Figure 57. European 3G revenue composition – 2010.



Source: Telecompetition Inc., February 2001.

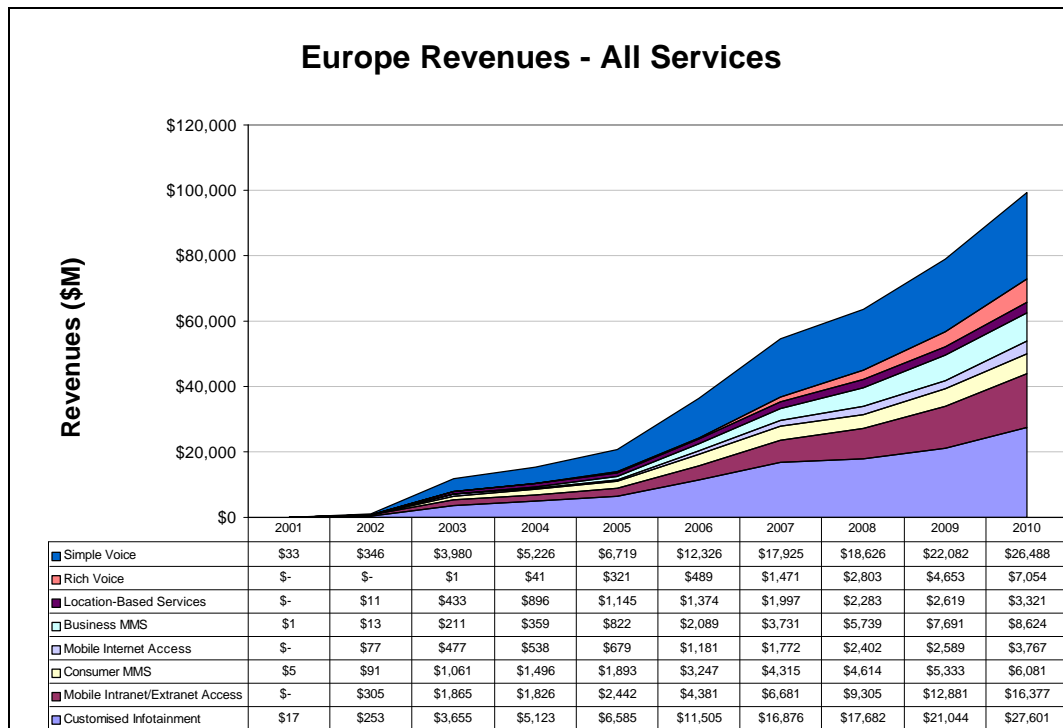
Figures 58 and 59 show the forecasts for Europe for subscriptions (where appropriate) and revenues for the total 3G services market.

Figure 58. European demand for 3G services by subscriptions – 2001-2010.



Source: Telecompetition Inc., February 2001.

Figure 59. European demand for 3G services by revenue – 2001-2010.



Source: Telecompetition Inc., February 2001.

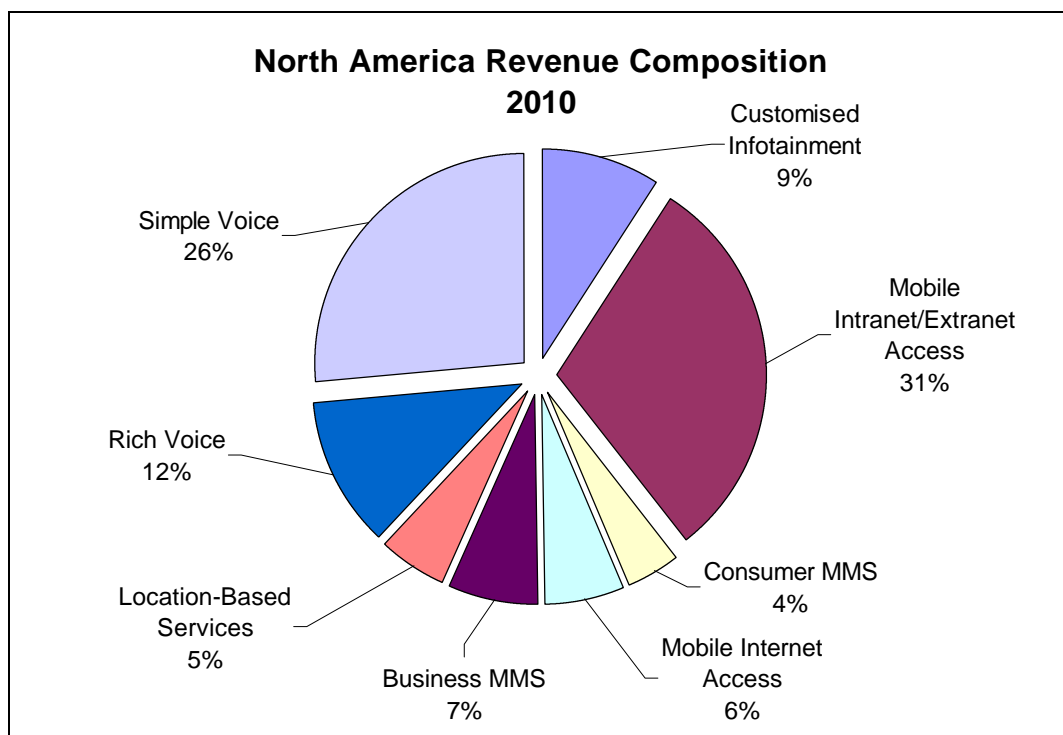
6.2.3 North American Demand

The demand for 3G type data services is continuously growing in USA and Canada. The US is a couple of years behind Europe and Japan in the introduction of 3G network services. The mobile industry in US is fragmented because of multitude of network technologies and lack of available 3G spectrum for today's market. Availability of such spectrum would open the door for widespread UMTS/W-CDMA technology deployment in the coming years.

The North American customer base has a rich experience of using high speed fixed Internet services. The bandwidth and capacity of 3G networks would be able to quench the thirst of this customer base for mobile Internet services.

As shown in Figure 60, 37% of the North American 3G revenue comes from Mobile Internet Access and Mobile Intranet/Extranet Access – services that are designed for the Internet-centric user. In contrast to Europe and Asia Pacific, Customised Infotainment only comprises 9% of total revenue.

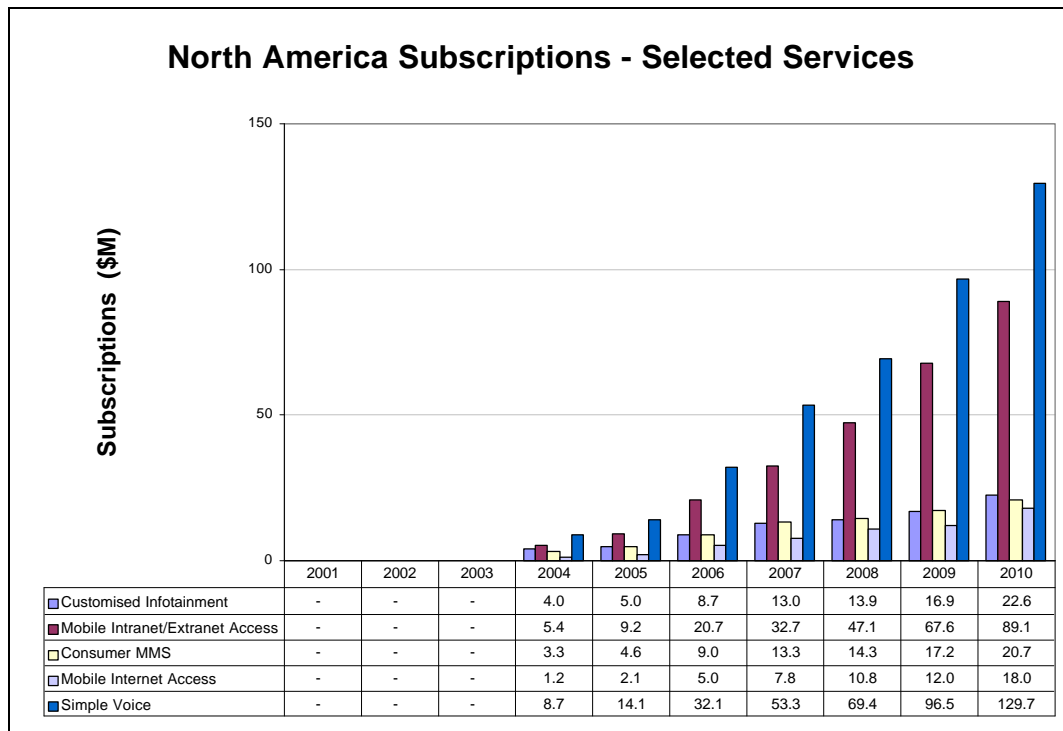
Figure 60. North American 3G revenue composition – 2010.



Source: Telecompetition Inc., February 2001.

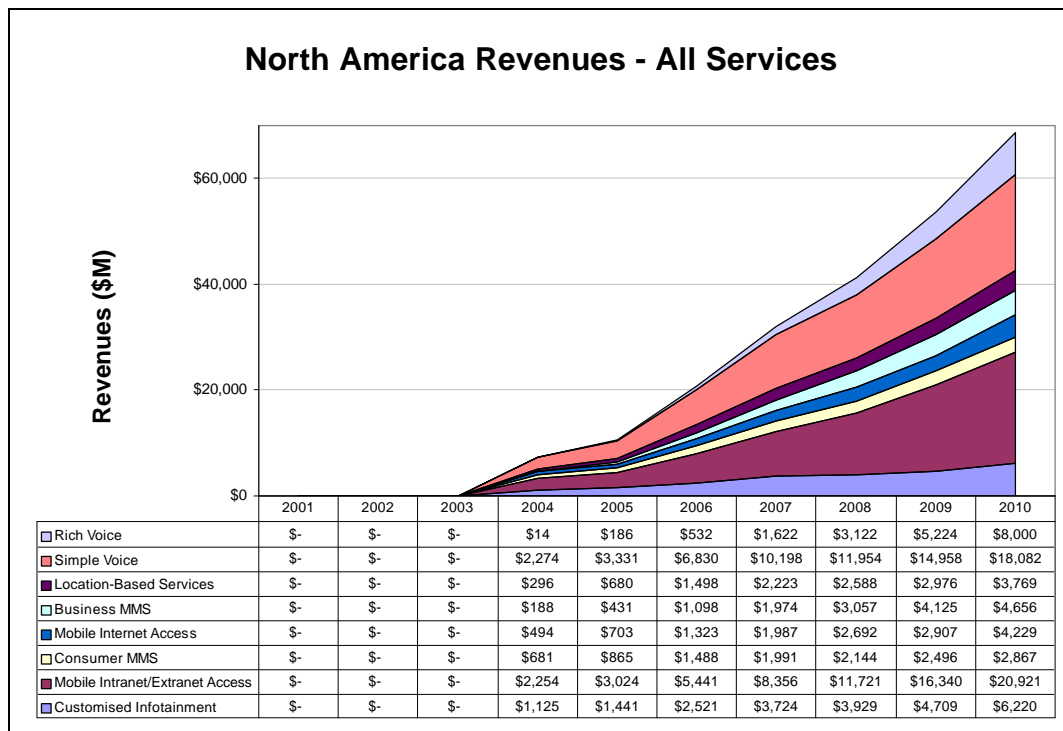
Figures 61 and 62 show the forecasts for North America for subscriptions (where appropriate) and revenues for the total 3G services market.

Figure 61. North American demand for 3G services by subscriptions – 2001-2010.



Source: Telecompetition Inc., February 2001.

Figure 62. North American demand for 3G services by revenue – 2001-2010.



Source: Telecompetition Inc., February 2001

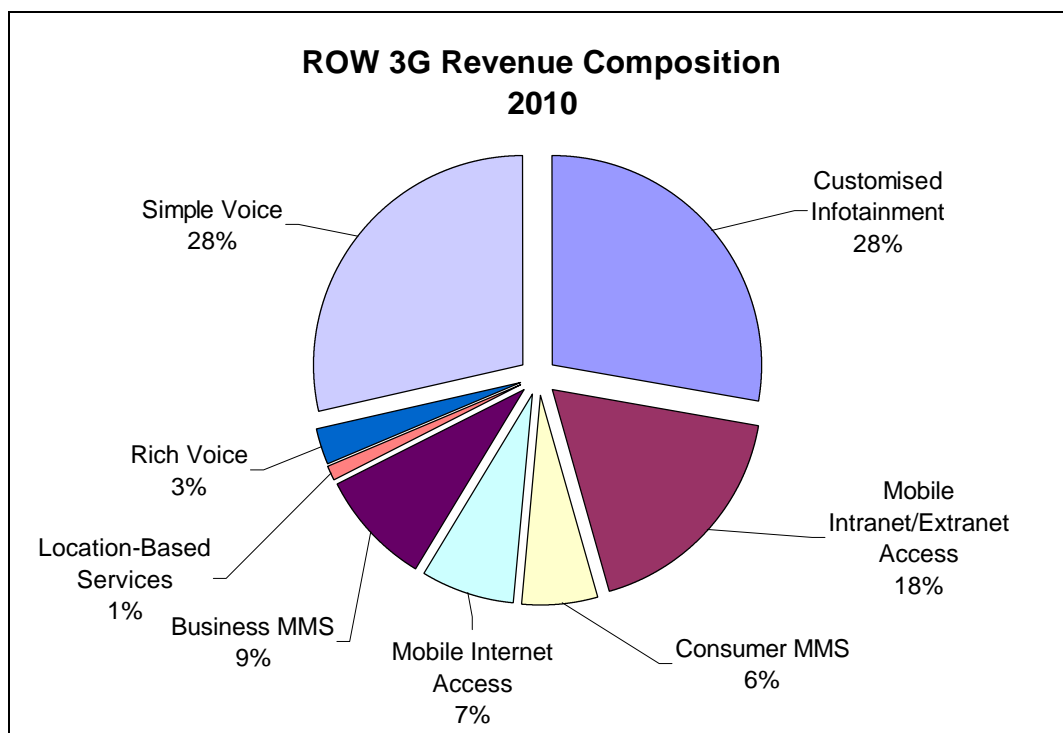
6.2.4 Rest of World Demand

The revenue-forecast picture in different parts of the Rest of World region is very mixed. There are some very rich oil producing countries in the Middle East with a high GDP. On the other hand there are some very poor countries with no political stability and a very poor economic situation with little telecommunications infrastructure. It was assumed that a large portion of the countries in this region would not commercialise any 3G services until after 2007.

As shown in Figure 63, Customised Infotainment and Simple Voice comprise over 50% of the 3G services forecast. Due to the later commercialisation dates, the 3G forecasts represent low service penetration levels, at the earlier stages of the adoption curve.

Latin America belongs to the Rest of World region and has a more significant revenue forecast. This is shown separately in section 6.2.5.

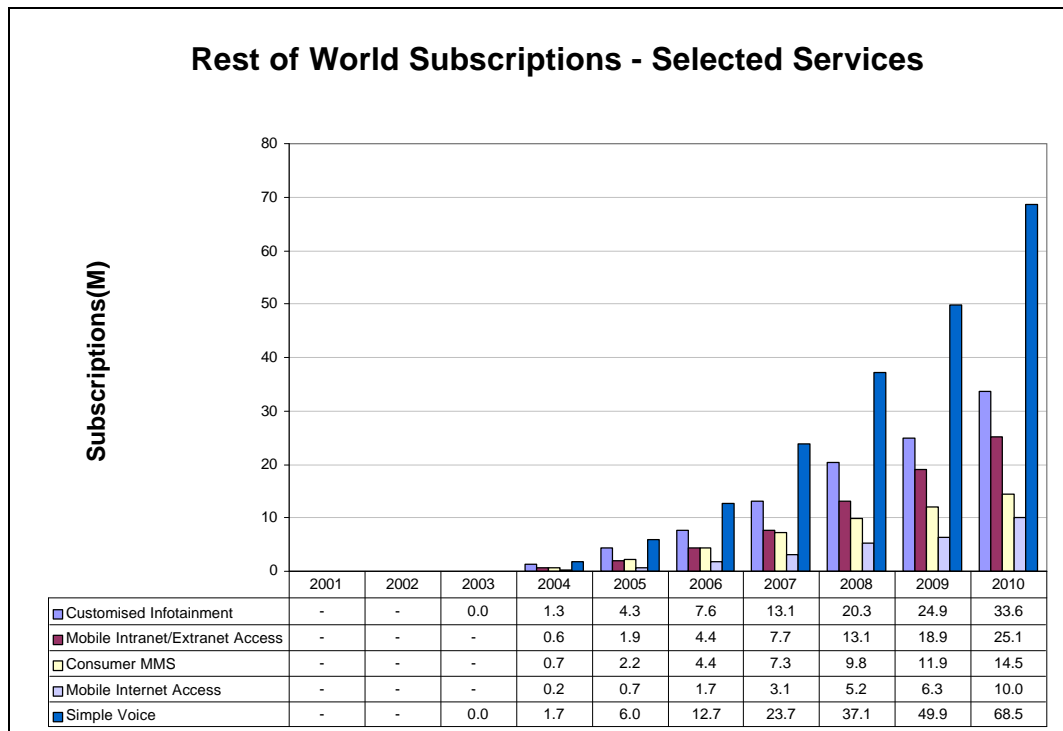
Figure 63. Rest of World 3G revenue composition – 2010.



Source: Telecompetition Inc., February 2001.

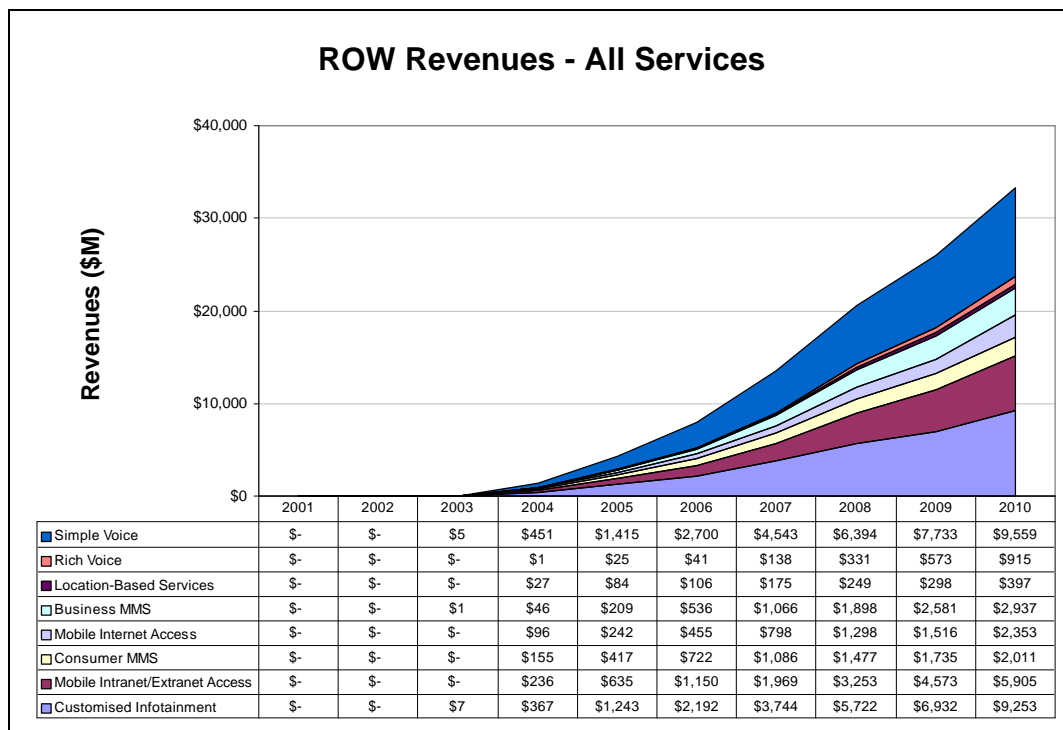
Figures 64 and 65 show the forecasts for the Rest of the World for selected subscriptions and revenues for the total 3G services market.

Figure 64. Rest of World demand for 3G services by subscriptions – 2001-2010.



Source: Telecompetition Inc., February 2001.

Figure 65. Rest of World demand for 3G services by revenue – 2001-2010.



Source: Telecompetition Inc., February 2001.

6.2.5 Latin American Demand

Latin America has a more significant revenue stream than most of the Rest of World countries. As shown in Figure 66, 54% of Latin America Revenue comes from Customised Infotainment and Simple Voice.

Figures 67 and 68 show the forecasts for Latin America for subscriptions and revenues for the total 3G services market. Latin America is also included in the Rest of World forecasts above.

Figure 66. Latin American 3G revenue composition 2010.

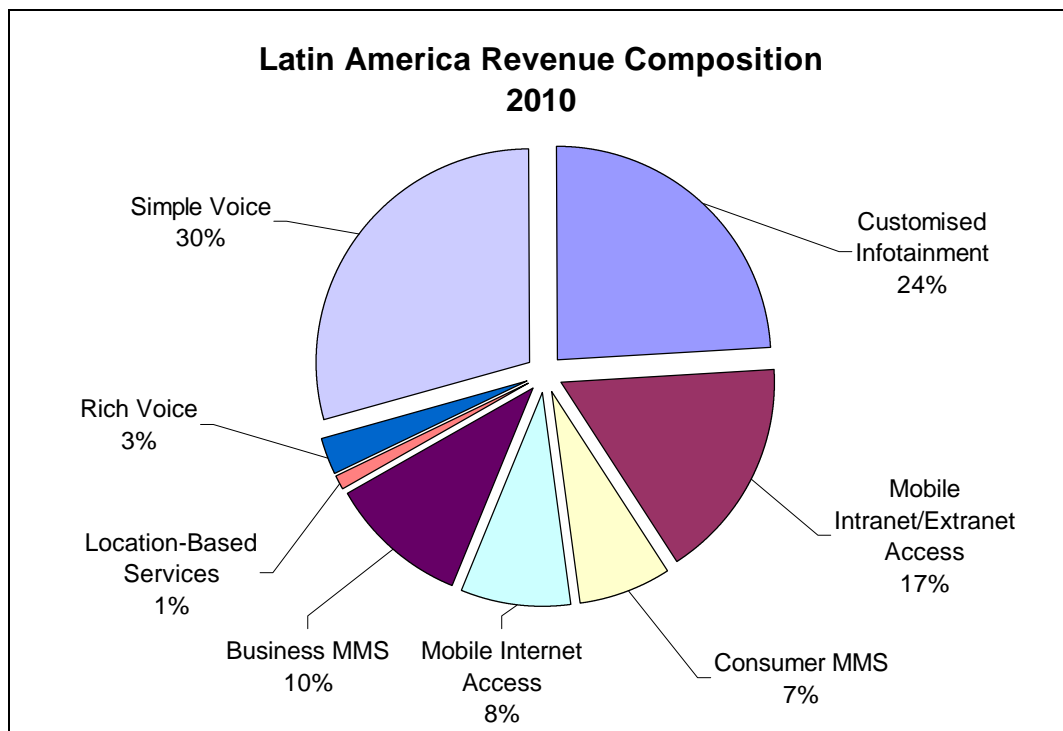
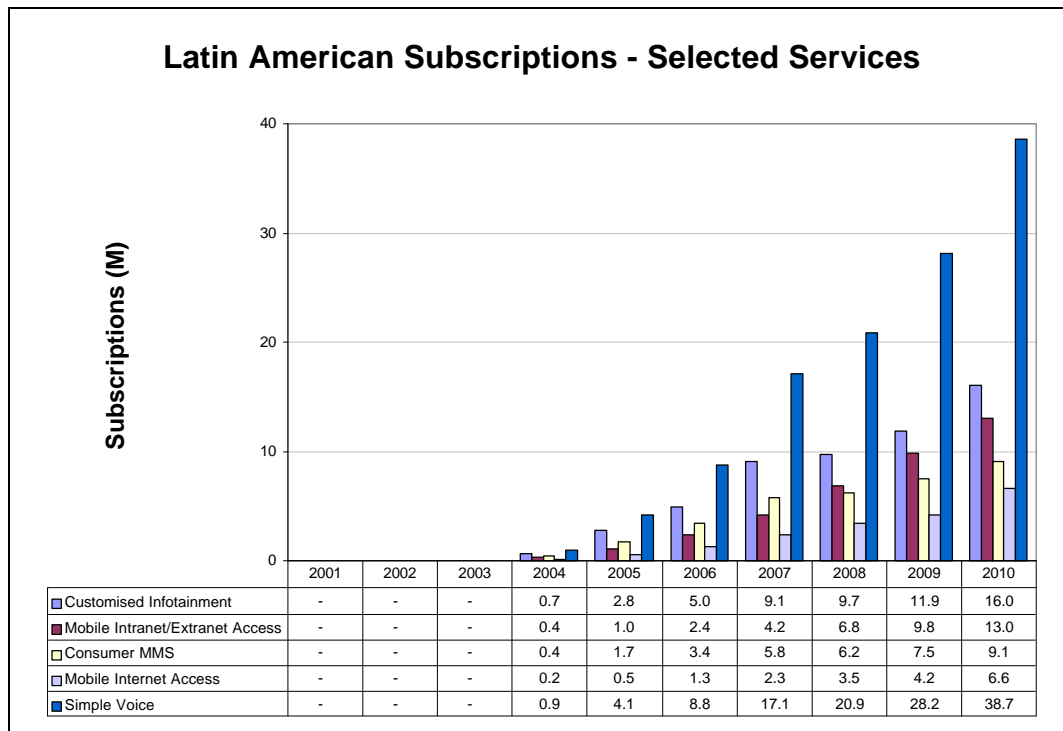
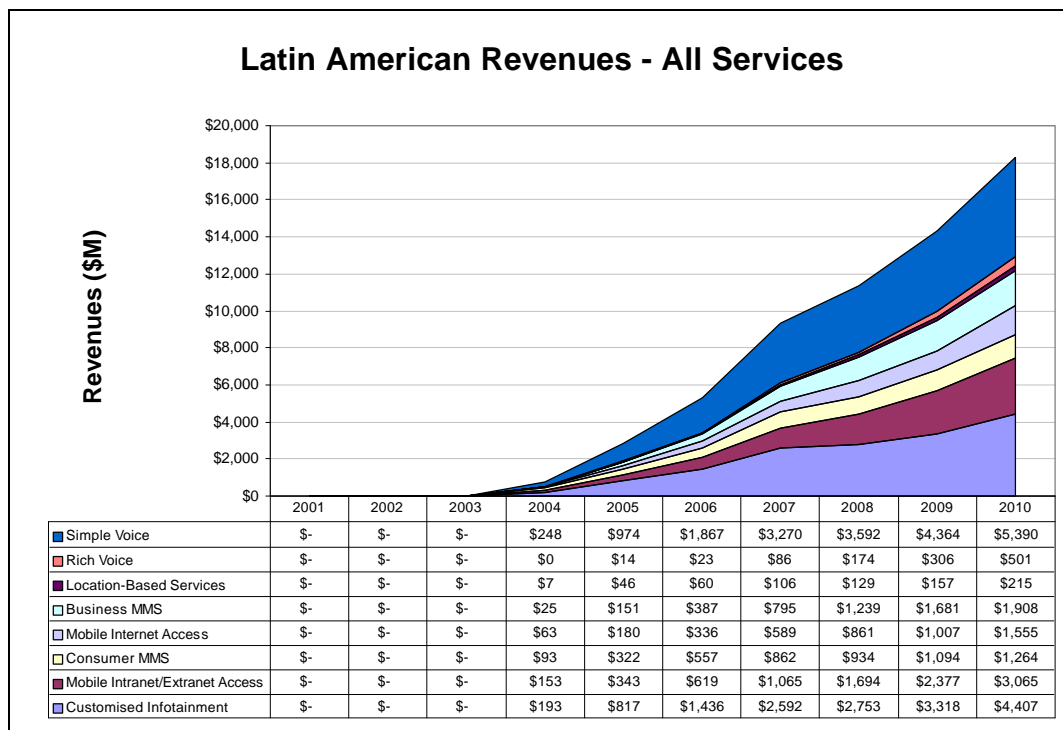


Figure 67. Latin American demand for 3G services by subscriptions – 2001-2010.



Source: Telecompetition Inc., February 2001

Figure 68. Latin American demand for 3G services by revenue – 2001-2010.



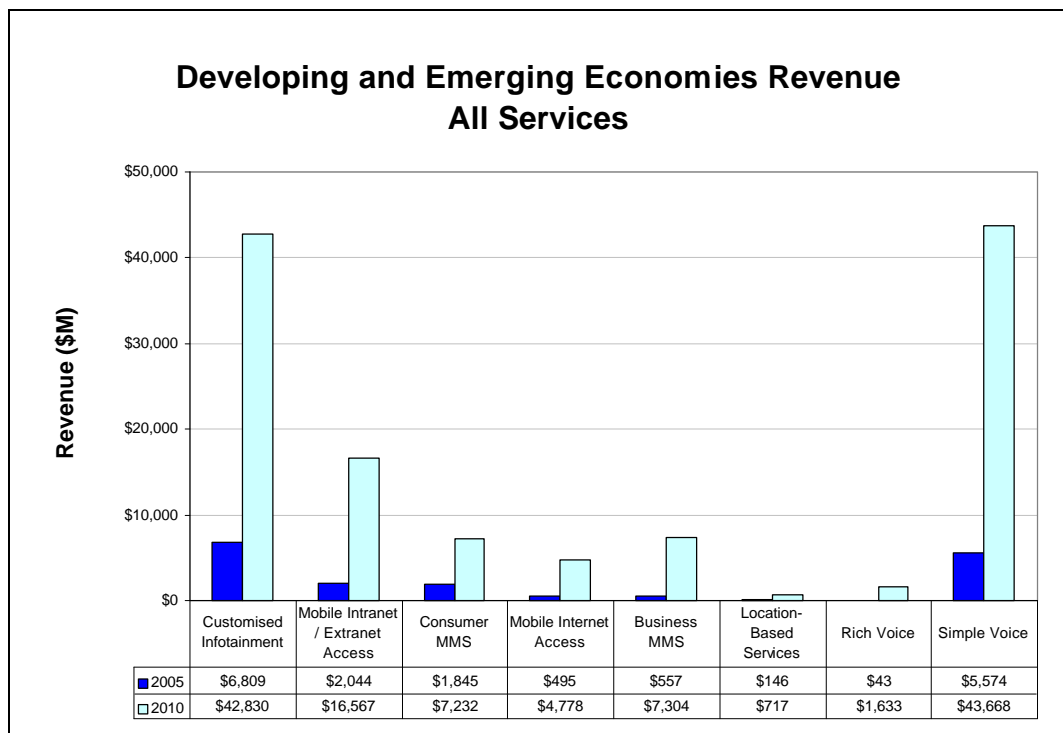
Source: Telecompetition Inc., February 2001.

6.2.6 Developing and Emerging Economies Demand

Developing and emerging economies can be defined by grouping countries by economic development instead of geographic region. The following forecasts are based on subtracting those countries and administrative regions considered part of the developed world by the ITU³⁷ (Western Europe, Greece, North America, Japan, Singapore, Taiwan, South Korea, Hong Kong, New Zealand and Australia) from the worldwide totals. Countries identified by the ITU as high or middle income have also been included as “Emerging Economies”. Examples of these countries are Brazil, Czech Republic, Hungary, Israel and South Africa. The Emerging Economies account for approximately 25% of the total revenues.

Figures 69 and 70 show the forecasts for the Developing and Emerging Economies for selected subscriptions and revenues for the total 3G services market.

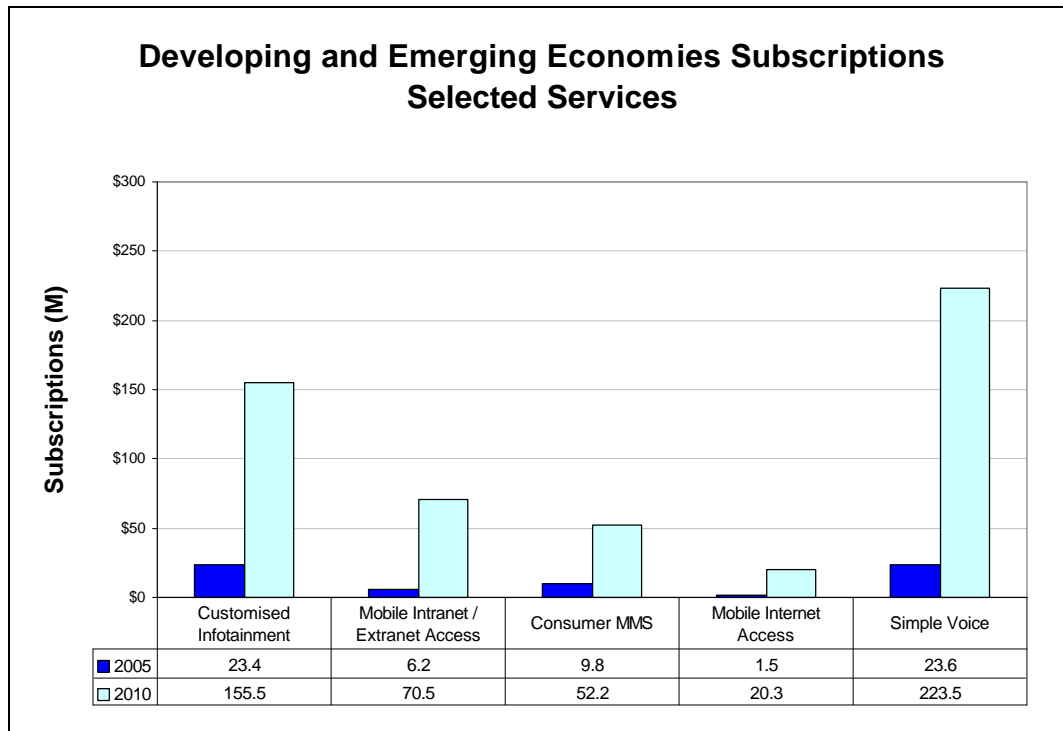
Figure 69. Developing and emerging economies demand for 3G services by revenue – 2005 and 2010.



Source: Telecompetition Inc., February 2001.

³⁷ ITU, World Telecommunication Development Report 1999 – Mobile Cellular.

Figure 70. Developing and emerging economies demand for 3G services by subscriptions – 2005 and 2010.



Source: Telecompetition Inc., February 2001.

6.3 Summary of Key Findings

- By 2010, the average 3G subscriber will spend around \$30 per month on 3G data services.
- By 2010, the additional revenue from 3G data services, assuming only 28% penetration into the worldwide mobile base, will add \$9 per month to total worldwide cellular ARPU.
- Advertising and transaction revenues are a new source of income for the 3G operator, representing almost 20% of revenue (\$60 billion). In addition, these new revenue sources provide an opportunity to strengthen relationships with users, which could decrease churn.
- Both business and consumer market segments are forecast to have significant revenue potential, with the consumer segment contributing about 65% of the revenue on a worldwide basis.
- Throughout the forecast period, Customised Infotainment is the earliest and single largest revenue opportunity among the forecast services, contributing \$86 billion in 2010.
- Non-voice service revenues will overtake voice revenues in the 3G environment by 2004 and comprise 66% of 3G service revenues in 2010.
- Simple Voice services will remain a vital component of an operator's service portfolio, contributing 34% of total 3G revenue in 2010.

- Asia Pacific represents the single largest total revenue opportunity (\$120 billion in 2010), while Europe and North America provide the highest annual revenue per POP (\$150 – \$200 per year).
- With the exception of some Latin American countries, most countries in the Rest of World region will still be in the first few years of service penetration by 2010. Therefore, revenues from all services for this region are small, contributing only 10% (\$33 billion) of worldwide 3G revenues in 2010, but with significant potential beyond the forecast period.
- Rich Voice services such as consumer videophone and multimedia conferencing, contribute around 7% (\$21 billion) of total 3G revenue by 2010, but are expected to increase significantly in the years beyond the forecast period.
- The Access Focused and Portal Focused Approaches provide roughly equivalent annual revenues in 2010 (\$140 – \$160 billion). The optimal strategy to target the consumer market is to adopt a Portal Focused Approach. An Access Focused Approach might be an appropriate strategy for addressing the corporate market.

6.4 Implications

For mobile network operators to realise these 3G revenues a number of important issues need to be addressed during the early 3G network planning stage. These issues include security, privacy, pricing, billing, and transitioning from 2G to GPRS to 3G.

Global roaming will be an integral part of 3G service offerings as it will stimulate new mobile traffic from people travelling across different regions of the world for business and pleasure. With the globalisation of world economies the movement of people across different countries will continue to accelerate.

Clearly, higher data rates will be achieved in the long term over 3G networks. Over time, user expectations for the superior connection speeds will be even higher than they are today.

Ultimately, only 3G can deliver the all-important global roaming capability and economies of scale necessary to satisfy the expectations of users.

7. Conclusions

The market study described in this report and in UMTS Forum Report No. 9 has introduced a logical and consistent framework for categorising 3G services. Detailed revenue forecasts for each service category have resulted in an estimate of the total market demand for 3G services worldwide.

A conservative approach has been taken when forecasting potential revenues that will be retained by 3G network operators and services providers. Price models and service adoption rates consistent with those accepted in the market today for analogous services have been used throughout. No premiums have been imposed for the delivery of 3G mobility. Substantial price declines have been assumed as services mature.

The revenue forecasts only include services for which a demonstrable demand and a reliable pricing and adoption rate analogue exist today. Entirely new services will be enabled by 3G, but estimates of their revenue contribution can only be speculative. Such speculation has been avoided in this market study by omitting any revenue contribution from radical new services. The revenue forecasts resulting from this study, therefore, represent a readily achievable goal based on today's experiences – they are a floor rather than a ceiling.

Despite this conservative approach, the study paints an optimistic picture of the revenue potential for 3G services. Even with the assumption that less than one third of cellular subscribers will be on 3G networks by 2010, the cumulative revenue potential for mobile services providers over that period is over one *trillion* dollars when Simple Voice is included, and \$800 billion if it is not.

Significant market demand has been identified for compelling 3G services in this study. Forecast revenue growth assumes current estimates for commercialisation of 3G networks. Co-ordinated deployment of 3G functionality could dramatically accelerate this revenue growth. The market's expectations are for worldwide roaming capability for next generation mobile services.

8. UMTS Forum Recommendations

TO BE PROVIDED

9. List of Acronyms

2G – Second Generation Mobile Network

2.5G – Enhanced 2G networks

3G – Third Generation Mobile Network

ARPU - Average Revenue per User

ASP - Application Services Provider

CPM – Cost per thousand (advertising)

DSL – Digital Subscriber Line

email - Electronic Mail

GSM – Global System for Mobile Communications

ILO – International Labour Organisation

IP – Internet Protocol

ISP – Internet Service Provider

LAN - Local Area Networks

MAG - Market Aspects Group

MMS - Multimedia Messaging Service

MVNO - Mobile Virtual Network Operator

NTT – Nippon Telephone & Telegraph (company)

OSP – Online Service Provider

PC – Personal Computer

PDA – Personal Digital Assistant

SMS - Short Message Service

UMTS - Universal Mobile Telecommunications System

VoIP – Voice over IP

VPN - Virtual Private Networks

WAP – Wireless Application Protocol

W-ASP – Wireless-ASP

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11. Index

A

Access Focused, 2, 3, 13, 14, 15, 16, 23, 24, 28, 29, 36, 48, 52, 71, 72, 92
 access-focused, 71
 adoption, 7
 advertising, 7, 15, 16, 21, 25, 35, 37, 38, 39, 41, 47, 48, 53, 73, 95
 Africa, 76, 77
 always-on, 9, 10, 11, 32
 application, 2, 4, 5, 6, 8, 10, 15, 16, 19, 23, 25, 28, 43, 82
 applications, 8, 10
 Approach, 2, 3, 13, 14, 15, 16, 24, 28, 29, 48, 70, 71, 72, 92
 ARPU, 2, 7, 56, 66, 67, 68, 75, 76, 91, 95
 Asia Pacific, 2, 3, 59, 65, 76, 79, 80, 81, 82, 84, 92, 99
 ASP, 2, 21, 40, 47, 52, 95

B

billing, 7, 13, 15, 28, 39, 48, 92

C

CAGR, 47, 61
 camera, 44, 55
 capacity, 21, 24, 42, 79, 84
 CDMA, 5
 conferencing, 4, 43, 44, 45, 56, 92
 content, 2, 3, 4, 6, 9, 10, 11, 13, 14, 15, 16, 18, 20, 21, 23, 29, 30, 34, 35, 36, 41, 47, 48, 59, 73
 CPM, 38, 95

D

data rate, 4, 7, 10, 18, 60, 92
 device, 8, 30, 31, 35, 42, 43, 44, 45, 47, 55, 69
 digital, 5

E

e-mail, 11, 28, 29, 31, 32, 95, 99
 Europe, 3, 40, 59, 65, 76, 82, 83, 84, 90, 92, 96, 97, 99

F

Fixed network, 9
 framework, 1, 5, 9, 10, 11, 12, 13, 16, 25, 93

G

game, 31, 43

I

i-mode, 10
 IMT-2000, ii, 5

April 2001

interactive, 43
 Internet, 2, 3, 9, 11, 13, 14, 15, 16, 17, 26, 27, 29, 30, 31, 32, 36, 43, 46, 47, 48, 49, 50, 59, 61, 64, 66, 69, 71, 76, 79, 84, 95, 96, 97
 investment, 96
 ITU, 5

J

Japan, 77, 90

L

LAN, 11, 31, 34, 95
 Latin America, 3, 76, 86, 88, 89, 92
 Location-based Services, 4, 10, 11, 16, 35, 41

M

m-commerce, 2, 8, 47
 methodology, 5
 MMS, 3, 4, 26, 27, 32, 33, 35, 36, 46, 47, 48, 50, 51, 52, 55, 59, 61, 95, 97
 Mobile Internet Access, 9, 11, 16, 29, 30, 31, 32
 Mobile Intranet/Extranet Access, 9, 11, 49, 50, 61
 mobile portal, 8, 10, 11, 17, 23, 29, 30, 53
 Mobile Specialised Services, 14, 15, 16, 24, 36, 70, 71
 MVNO, 21, 23, 95

N

North America, 3, 59, 65, 76, 84, 85, 90, 92, 96, 99

P

peer-to-peer, 11, 31, 32
 portal, 8, 10, 11, 12, 16, 17
 Portal Focused, 2, 3, 13, 14, 15, 16, 23, 24, 28, 36, 52, 70, 71, 92
 prepaid, 24

R

real-time, 11, 42, 43, 55
 Rest of World, 3, 76, 86, 87, 88, 92, 99
 Rich Voice, 10, 11, 16, 42
 roaming, 8, 11, 41, 42
 rural, 7

S

security, 8, 97
 Security, 97
 spectrum, 5

T

telemetry, 33, 47, 50, 53

terminal, 8, 9, 10, 11, 35, 42, 43, 44
transaction, 3, 8, 15, 16, 21, 28, 33, 37, 48, 53,
91

U

US, 5, 31
usage, 4, 7, 18, 20, 28, 31, 36, 48, 73

V

value chain, 2, 13, 16, 20, 23, 24, 28, 40, 70,

71
video, 10, 11, 27, 29, 32, 34, 43, 45, 48, 50, 55,
56
Voice Access, 11, 42

W

WAP, 82, 95
W-ASP, 19, 95
Web, 4, 11, 15, 20, 26, 28, 29, 31, 43, 45, 47,
48, 56, 57, 60, 97

12. Appendix A – Interviews

Interviews were conducted with a small group of companies representing different industry perspectives.

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AirFlash, Inc.
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13. Appendix B – Market Study Project Team Contributors

This report was prepared for the UMTS Market Study Project Team by Telecompetition, Inc. Significant contributions were made by many members of the project team and the UMTS Market Aspects Group (MAG).

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14. Appendix C – Remaining Services Country-level Regional Revenue Contributions

The following pages contain country-level information by service for each country that contributed to forecasts in this report. The percentage of revenue by region that each country represents is shown.

The region used is printed at the bottom of each page and the regions are as follows:

- Europe
- North America
- Asia Pacific
- Rest of World

Every effort was made to be as accurate as possible based on currently available information by country. These data are regularly updated and new country information is always welcome. Please contact Telecompetition, Inc. by email at info@telecompetition.com if you would like to comment on or provide updated information about your country.