Reviewing 3G "Optimism": Services, Segments and Stages of Reality

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Abstract

This paper starts by presenting a framework to compare approaches used to forecast the demand for third-generation (3G or UMTS) mobile telecommunications. This analysis envisions the models as forming a spectrum according to how finely they divide the potential market. The division may be in terms of particular services offered, devices used, and/or demographics. The spectrum ranges from the polar extremes of a single, undifferentiated market to models with ten or more services. Given the tradeoffs between massive data needs, model complexity, and the difficulties in aggregating demands across services and segments, it appears that there is an advantage to having a model with a limited number of services along with an explicit approach to the aggregation problem. We then discuss how to incorporate mobile network coverage decisions and demographic changes into a diffusion model. In the final sections we present a first look at how successful one set of 3G demand projections has been and concluding remarks.

1 Introduction

Despite delays in the rollout of 3G (UMTS) networks, many observers still approach demand forecasting for advanced digital mobile networks by listing every application-based service that these networks are or may be capable of providing (games, photos, messaging, locational, videocalls, security, etc., etc.), estimating the demand for these services, and then adding up these individual demands to arrive at an aggregate demand. In some cases this approach is combined with a subscriber segmentation method that involves numerous dimensions, beginning with the consumer and business sectors and then subdividing these on the basis of age, sex, lifestyle, psychographics, and so on. Analyses of this sort suffer from several problems that often are obscured by the detail, as we summarize below.

While the technological potential of 3G networks is great, surveys continue to indicate that the primary concerns of mobile subscribers are call completion, voice quality, and coverage. Furthermore, it is possible that these findings are biased toward the "known" over the speculative unknown. This, along with the new financial realities, has led some to state that the path to success is to limit the construction of 3G networks to only the most congested urban areas. The resulting deployment approach focuses on the network capacity problem, but restricts the availability of services and reduces the demand for network and subscriber equipment, thereby raising unit costs.

We have developed an alternative approach, focusing on a small number of market segments and the services needed to address them. We explicitly allow each service to be priced at its own level, and subscribers may chose one or more than one service. There are different sets of socio-economic, market, and technical drivers that determine the demands for these services. Using this approach eliminates many of the problems that arise in aggregating the separate demands from the everything-for-everyone approach, while still enabling us to think in terms of total subscribers and annual revenues.

Overall, we argue that a relatively simplified and pragmatic approach to the 3G market at a still largely pre-market stage has more merit than a more intricate one with numerous application and subscriber segments, even though the later may be appropriate in a mature market context. As the actual 3G market emerges, greater differentiation of services and subscribers may be called for. It should be easier to evolve a relatively generic service and subscriber-forecasting framework in this direction than to transform a highly specific, differentiated one.

2 Demand forecasting approaches

Approaches to forecasting 3G demand have ranged from an "it will do everything for everyone" approach to approaches with a single, undifferentiated market. What is needed are approaches that capture much of the richness of potential 3G services without having data and analytical needs that are so great as to introduce unneeded complexity or to prohibit usefulness.

2.1 The "everything-for-everyone" approach

One common approach to forecasting the demand for 3G mobile telecommunications is to develop a detailed list of services that may be offered or of market segments that may be served (or both) and to then develop demand estimates for each service and/or segment. The following two studies illustrate this approach:

- Analysys Research's (2001) report "Controlling the 3G Value Chain" forecasts revenues in Western Europe for 10 services covering content and data communications. (See Table 1 and Figure 1.)

- A November 2001 presentation by Arthur D. Little (2001) breaks out eleven services such as voice, multimedia, two types of messaging, etc. (See Table 2.)

Table 1 3G Services (Analysis, 2001)

E-payments
M-commerce
E-tainment
Paid Information
Free-to-air content
Videotelephony
Collaborative working
File transfer
Messaging and scheduling
Voice

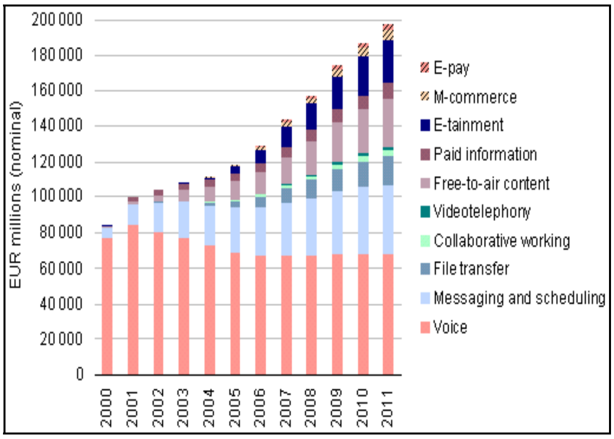

Figure 1 Revenue by service type (Analysys, 2001)

Table 2 3G Services (Arthur D. Little, 2001)

Voice
Multimedia
Messaging-low volume
Messaging-high volume
Telematics
Information services
Location-based services
M-commerce
M-Entertainment
Personal management
Other Internet/intranet access

There are several conceptual difficulties with these approaches. First, there is the unstated assumption that mobile telecommunications users can be unambiguously divided into market segments according to which service will drive their decisions to subscribe and their willingness to pay. In reality, it may be other factors that drive 3G subscriptions, ranging from marketing effectiveness and pricing to ease of use and creative content. Arguably the "killer apps" will not be an application as conceived by these models but a payment mechanism, a way of accessing or transforming content from other media, or a software for inputting or displaying information on 3G terminals.

Second, it is further assumed that the demand from each preconceived segment can be added together to determine total demand. We refer to this as the "3G can do everything for everyone" approach and believe that it is seriously flawed. By ignoring factors such as which services are likely to be profitable, how willingness to pay may vary across the market segments, and which services are likely to be accepted in practical user terms (not just conceptually), the everything-for-everyone approach can lead to wildly optimistic demand projections and unrealistic network rollout scenarios. Focusing on revenues rather than subscribers reduces this problem, but the assumption that the demands are separate and additive still remains untested and unproven.

And third, it is often assumed that early 3G subscribers will be "heavy users", while light users will remain on 2G networks. This too is a wobbly assumption, as new (marginal) subscribers may constitute the core—or at least a significant subset—of early users of a new service like 3G. (This was the case in some markets when 2G first appeared, contrary to then prevailing assumptions.) Correspondingly, initial 3G ARPU (average revenues per user) may be lower than 2G ARPUs rather than higher, which is the typical assumption.

2.2 The single, undifferentiated market

At the other end of the spectrum are demand models that have no differentiation or segmentation of the potential 3G market. One example of this approach is a survey-based forecast of 3G demand in Sweden by Coleago Consulting (2001). The survey respondent was asked about a generic service:

> "A handheld screen will become available that allows you access a range of services from wherever you are - at home, at work, on the move. For example, you can send and receive email, make cinema and restaurant reservations and pay for them, look at train timetables, opening hours and local maps, download music and games, and also browse the internet. In principle, would you be interested in using such a service if the price isn't too high?" (Coleago, 2001: 2)

There are two, related, problems with this approach. First, by enumerating certain services and not others, some market segments may be ignored or seriously under-counted. Second, terms such as "handheld screen" may be interpreted by respondents in several ways, ranging from a 2x3 cm mobile telephone screen to a 5x5 or 10x10 cm PDA screen or even a 25 cm wide tablet. It is difficult to predict the effects of these enumeration and interpretation issues on the quality of the resulting forecasts, especially since some 3G services may not need or rely on the display.

2.3 Limited number of services and segments

Given the problems with both the "everything for everyone" and the undifferentiated market approaches—which can be thought as the two extremes, alternative approaches that have a limited number of services (but more than one) have been developed.

2.3.1 Mapping subscriptions to subscribers

The Telecompetition, Inc. (2000) study for the UMTS Forum differentiates user needs and profiles across six services (mobile Internet access, rich voice, etc.) and five device categories (WAP phone, PDA, 3G tablet, etc.) (See Table 3.)

Table 3 Services and Devices (Telecompetition, 2000)

Services	
	Mobile Internet access
	Mobile intranet/extranet access
	Infotainment
	MMS
	Location-based services
	Rich voice
Devices	
	Smartphone/WAP phone
	PDA
	3G laptop
	3G web tablet
	3G multimedia device

In this model subscribers have one or more subscriptions to the services. All subscribers have a subscription to the "rich voice" service, and the relationship between subscribers and subscriptions to the other services varies over time and across countries. There are between 2.4 and 2.9 subscriptions per subscriber, but the mix varies by geographic region and changes considerably over the 2002-2010 forecast period. (See Figures 2 and 3.) While the data needs of this approach are high, the problem of aggregating demands from the services is dealt with explicitly. At the same time, the approach does not explicitly admit bundled service options (i.e. combining two or more of the six categories) and—curiously—it does not allow for more than one voice service, despite the fact that demand for voice is fundamental to overall demand, particularly in early years.

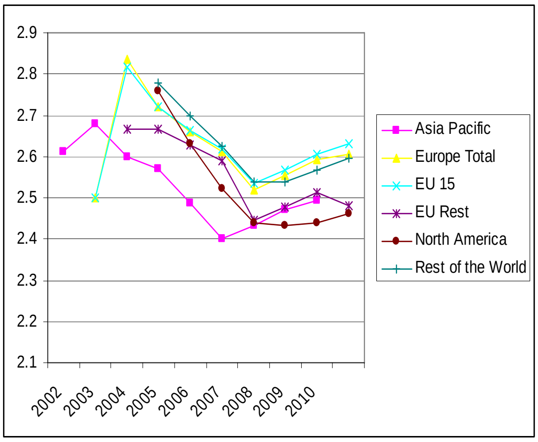

Figure 2 Total Subscriptions per Subscriber, (Telecompetition, 2001)

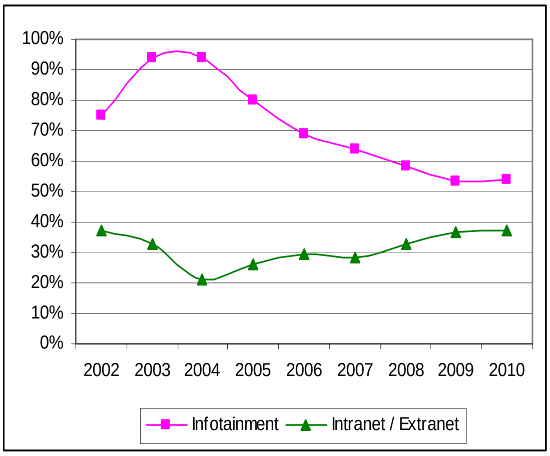

Figure 3 Subscriptions per Subscriber for Two Services—Europe only, (Telecompetition, 2001)

2.3.2 Additive services

The demand model used by Kalba International, Inc. in two of the releases of its multiclient study, *3G Mobile Multimedia* (1999-2001), takes a more direct approach. It assumes three alternate 3G services, each with its own set of drivers. These services are defined as:

- A *"combo"* service that combines voice service (initially circuit switched) and moderate-speed data attaining 64 kbps at the end-user level);
- An *IP voice* service for subscribers who want an inexpensive (cheaper than cellular) voice-based service, plus associated slow-speed value-added services;
- A service for those that require data access only (and may maintain their cellular service as a separate account) with end-user access speeds up to 144 kbps.

These demands are separate and additive. For example, a subscriber in a developing country might choose to subscribe to the IP voice service, using an inexpensive, lightweight handset. Others, along with a subset of the IP Voice subscribers might use the data access service via a PDA with built-in communications capability with its own terminal identifier or telephone number.

With differing mixes of underlying factors driving the demand for each service, the three services grow at separate rates and constitute shares of the overall demand that change over time. (See Figures 4 and 5.)

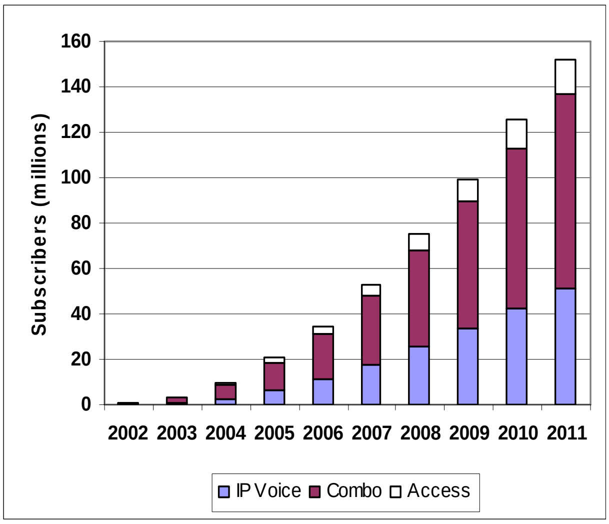

Figure 4 Total Subscribers by Service—Five European Countries, (Kalba International, 1999-2001)

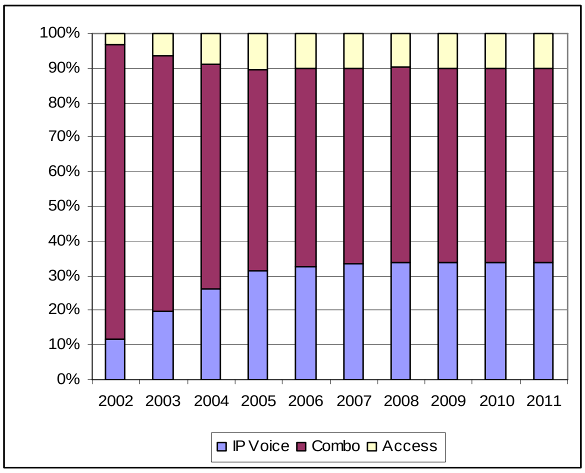

Figure 5 Subscriber Percentage Breakdown by Service—Five European Countries, (Kalba International, 1999-2001)

Figure 6 provides one illustration of how the mix of services changes differently over time and across countries and regions. The average demand shares for the "combo" and IP voice services for five European countries are compared to those for four Asian markets. The relatively inexpensive IP voice service represents a larger portion of the demand in the Asian markets as they have, on average, lower per capita incomes than the European markets.

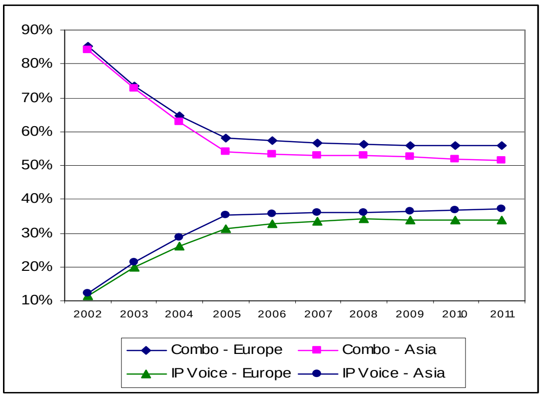

Figure 6 Shares for the Combo and IP voice services—Europe and Asian markets, (Kalba International, 1999-2001)

As a downside, the early "IP voice" demand (2002 to 2003 0r 2004) generated by the model "jumps the gun" to the extent that IP voice is not yet explicitly available via 3G (nor via 2G) mobile service. However, reliance on a limited number of generic service concepts helps avoid an even greater overestimation of early subscribers that can come from a premature focus on numerous innovative applications (games, photos, messaging, locational, video, etc.).

3 The diffusion model

Traditional models of diffusion are derived from the view that diffusion is the result of a learning process. (See, for example, Mansfield (1968) or Rogers (1995).) Potential users learn about new technologies, their uses and their prices. Adoption can lead to economies of scale on the part of the equipment suppliers and to network effects among both operators and consumers. The result is that one often observes an S-shaped logistic curve showing the growth of penetration over time.

However, in mobile communications this process does not happen in isolation. Decisions made by systems operators, licensing authorities, and others influence system deployment. The result is that coverage is a strategic and policy variable and, as a result, the rate of adoption is determined by, among other things, the interplay of consumer desires to adopt new technologies with the availability of those technologies.

It is important to understand that geographical coverage and population coverage are generally quite different in any country and the nature of the relationship between then varies from country to country. The Kalba model approaches this with an explicit model of system deployment that allows expected coverage to vary across countries or regions. Figure 7 presents coverage trends for three regions. In each case the measured variable is percentage of population expected to be within the coverage footprint of the 3G system.

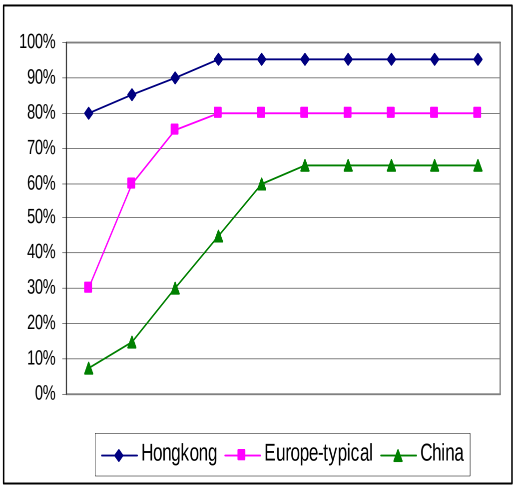

Figure 7 Comparison of coverage assumptions, (Kalba International, 1999-2001)

There are other, more general, considerations in the development of a diffusion model. One is how to treat demographic trends such as exogenous growth in population and changes in family composition and workforce composition. These factors are relatively stable in Western Europe, the US, and the UK—at least over the 10 to 15 year time horizon generally used in forecasting models, but tend to vary systematically over time in many other countries and regions. Another relates to the timing of the different phases of adoption—how long will it take before there is a significant drop in the growth of demand. One interesting aspect of the Kalba model is that there is no significant reduction in the growth of demand for the Western European countries through the tenth year. (See Figure 8.)

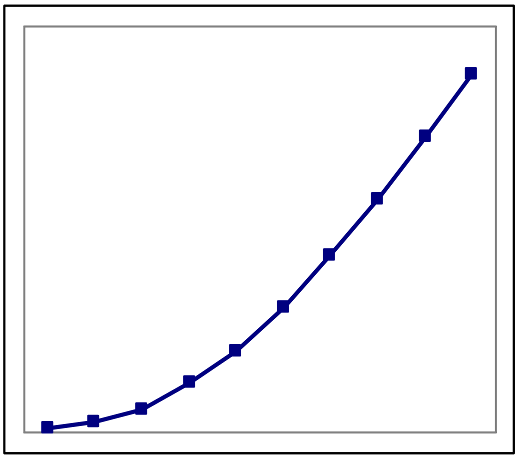

Figure 8 Generalized diffusion curve—five European countries, first ten years (Kalba International, 1999-2001)

Also, as Figure 8 reflects, the growth curve we project is concave, reflecting various diffusion (including increased coverage and lower prices over time) and learning (such as growing familiarity with new applications and improved ease of use) factors. Other 3G forecasts have often projected a "convex" rate of adoption, which assumes very optimistic early take-up and an inflection point due to intense start-up marketing and the inherent technological advantages of 3G compared to 2G. (Yet on a practical plane 3G has found it difficult to compete with 2G in most markets, due to limited coverage, limited availability of handsets, handset weight and power disadvantages, and higher price.)

4 Current experience

The financial problems in the telecommunications industry, in general, and among 3G licensees, in particular, are well known. Nevertheless, as of Summer 2003 operators have been providing 3G services for over a year in Japan and South Korea. In addition, commercial 3G service is now available in a number of other countries, including the UK and Italy. Table 4 compares predicted and actual 3G subscriber levels for the two countries with more than a year of wideband 3G service experience.

Table 4 Comparison of predicted and actual 3G subscribers—Japan and Korea (Subscribers in 1000s)

Predicted (Kalba)		EOY	Subscribers
Japan		2002	485
		2003	1925
South Korea		2002	133
		2003	533
Actual	**Start date**	**Date measured**	**Subscribers**
Japan			
NTT DoCoMo	Oct-01	May-03	478
Vodaphone	Dec-02	May-03	44
South Korea			
CDMA2000 1x EV-DO			
SK Telecom	Nov-02	May-03	10
KTF	May-02	Mar-03	310/89(*)

Notes: * KTF had 310,000 FIMM subscribers as of this date, but only 89,000 had EV-DO phones.
Sources: Kalba (1999-2001), 3G Today (2003), Korea Now (2003), KTF (2003).

So far these early subscriber figures are broadly in line with the "concave" type forecasts of the Japanese and South Korean markets projected by Kalba International (initially in January 2000). These forecasts took into account cellular and Internet penetration in these countries as well as various other factors.

In addition to the 3G subscribers listed in Table 4, South Korea has over 10 million CDMA RTT 1x subscribers, which we consider to be 2.5G subscribers (but others count as 3G subscribers), while Japan has a somewhat smaller number, which on a proportionate basis is a significant difference., Accordingly, we may see an acceleration in 3G subscriber growth in South Korea once EV-DO phones become more readily available there. While South Korea has a lower GDP per capita than Japan, its 3G adoption rate could surpass Japan's due to this high 2.5G exposure and its proportionately larger youth segment. Another difference between the two countries is recent economic growth, with South Korea generally experiencing a higher growth rate.

A similarity of the two markets is that the respective governments have allowed technology competition to occur, which may have helped stimulate early market startup and early-phase competition for subscribers. Also, we recognize that both Japan and South Korea have local industries with a stake in supplying 3G equipment, both domestically and internationally. This too may have helped focus early network deployment efforts. Finally, we note that neither Japan nor South Korea used an auction method for awarding 3G licenses nor imposed high fixed licensing fees.

In Europe, by contrast, 3G network deployments have been delayed or abandoned by most operators, notwithstanding a concerted government and industry effort to jump-start this market. However, early results from Italy suggest that subscriber growth could be quite robust, once multiple operators enter the market. The 90,000 subscribers reported in Italy in late May 2003, just two months after service initiation, reflect a positive early response to 3G.

5 Conclusion

In general, the actual experience to date of 3G service initiation suggests a number of lessons with regard to subscriber and other growth projections. One is that most prospective subscribers are not likely to be able to absorb and appreciate quickly the panoply of discrete applications-based services, as reflected in some of the forecasts discussed above. This suggests that applications-based services may need to be introduced one at a time over a period of years or, alternatively, as bundles of related applications (for example, Internet access, photo-based, video-based, etc.).

The notion of multiplicity of services and revenue streams may make more sense in market environments with large segments of mobile "enthusiasts", principally some young users and technically- or multimedia-oriented ones. The South Korean market may reflect such a case, although, apparently, 3G ARPUs have declined significantly once a multiplicity of services have been tried and their cost has become clear to 3G subscribers. Nonetheless, an age-based segmentation of the early-phase market may be of value (in the absence of a better multimedia propensity index) in estimating early adoption of 3G service.

Overall, however, the initial 3G market experience suggests that too much emphasis has been placed on discrete applications- and user-based segmentation and not enough on other factors. Among the latter are macroeconomic conditions, such as economic growth rates and financing availability, and, possibly, payment methods (prepaid, postpaid, etc.). Forecast models that were built on a "bottom-up" basis, using generous demand assumptions for numerous service applications, have turned out to be especially off the mark. This is not to say that in subsequent phases of the market, as demand for specific applications emerges, such models may not regain value.

6 Acknowledgements

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