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## Foresight for Mobile Radio Spectrum 2020

### Foresight Brief No. 44

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**Sponsors:** The IPTS (Institute for Prospective Studies) in Seville  
The European Commission Directorate General for the Information Society  
**Type:** International single issue foresight exercise on European spectrum demand up to 2020  
**Organizer:** SCF Associates Ltd  
**Duration:** 2004 to 2005 **Budget:** €100,000 **Time Horizon:** 2020

### Purpose

This brief is about a study on the Future Mobile Markets & Services that employed a Foresight approach. The role of the study was to provide a robust and realistic understanding of future demand for radio spectrum for mobile services up to 2020. The first challenge was to create an estimate based on sound socio-economic principles rather than techno-centric wish lists. The next was to achieve European consensus on this understanding so it could be supported by all EU players in international fora such as the ITU based in Geneva. The final goal was to develop and apply a method for estimating demand that could gain the support of and be taken up by the 136+ countries involved in ITU Working Party 8F that is trying to understand demand for services and their markets in preparation for WRC-07 – a World Radio Conference to take place in 2007 at which mobile radio spectrum will be apportioned internationally.

### Reorganizing the Radio Spectrum

The 'FMS' study on Future Mobile Markets & Services was triggered by imminent global discussions on the allocation of radio spectrum frequencies that are due to take place under the auspices of the ITU in 2007. Decisions taken at WRC-07 will be of prime importance economically and politically as it is of direct relevance for cellular mobile which by the start of 2006 had already reached over 2 billion users globally (source ITU, March 2006).

The first challenge was to formulate a new method to assess demand within the framework of the current ITU methodology that is based on socio-economics. Traditionally this field had been dominated (perhaps wrongly so) by the technology-driven visions of operators and suppliers rather than by the reality of affordability and the motivation provided by utility to consumers and business users.

A further challenge was to provide a realistic conceptualisation of new types of services through an examination of the business model for innovative mobile services termed 4G or fourth generation mobile. The final major challenge was verification to be carried out through an industry survey on prognostications as well as workshops.

### New Approaches to Assess Alternative Trajectories

Major objective was to research and develop a robust methodology, which could start with scenarios of possible alternative trajectories of economic development and go to types of users.

It would then continue right down to minutes of usage of specific services, at specific points in the future. Also it had to give the characteristics of services and traffic in ITU parameter terms. This required the project team to concentrate on a logical series of delivery goals:



- Scenario creation in a formalised and repeatable way
- Comparison of scenarios
- Characterisation of users and their uses
- Identification of future mobile services and their characteristics for spectrum usage (over 130 were specified)
- Projections for the adoption of services
- Projection over time of traffic volumes
- Projections of behaviour based on motivation and need
- Verification of early findings and scenarios with a structured questionnaire and form of Delphi analysis, a major survey exercise of industry experts
- Analysis of findings of the industry survey
- Business models for a new type of network architecture envisioned (4G)

The next step was to evangelise the methodology through:

- Identification of key stakeholders and decision points
- Presentation to key groups such as the European CEPT
- Public workshops with a large, diverse audience with invitations going out worldwide and invited speakers from Europe and the USA
- Companion EC projects with a technical focus such as 'Winner' including visits to their workshops.

### Surveying the ITU Community

The ITU WP8F questionnaire on spectrum demands and mobile markets sent to its member country delegations provided the basic information on demands, services, spectrum requirements and traffic volumes by service. The overall approach exploited scenario forecasting to show needs and motivations. From these data types of demand against disposable income under the impacts of the various economic scenarios could be identified. This whole methodology was aimed at producing a socio-economic approach to demand forecasting.

### Learning from the Failures of the Past

This approach was adopted from the outset for several reasons. Too often techno-centric views of new services have resulted in demand being underestimated or overestimated. Thus, while some major product launches in telecommunications over the past 20 years have turned out to be flops, seemingly trivial services have exploded in significance. The potential of simple messaging service or SMS for instance was completely missed. Whereas WAP - Wireless Access Protocol for mobile web access to rich data services was the subject of great industry hype and overoptimistic forecasts. Today's debacle is the comparative failure of 3G mobile and the staving off of a cheaper successor in the form of 4G.

The telecommunications industry has often forgotten a fundamental lesson when bringing a new product or service successfully to market, that the requirement of user needs takes precedence over technology dreams. There is a strong tendency in an industry driven by simplistic marketing to make forward extrapolations from past experience, even ignoring

that consumption is determined by levels of disposable income.

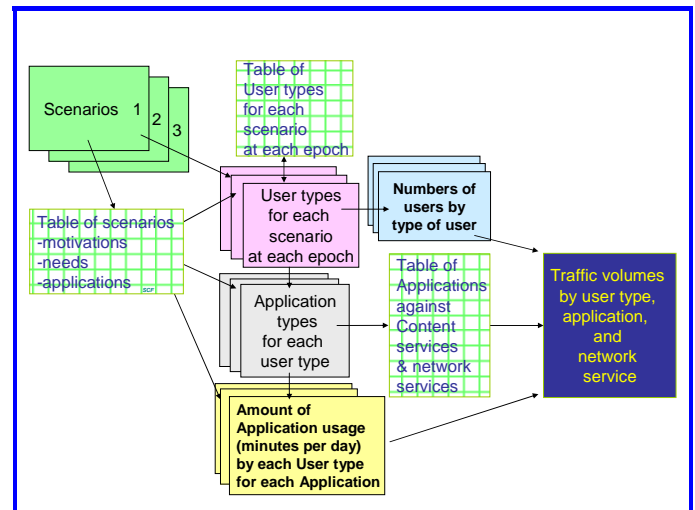
### Scenarios for Mobile Communication

The scenarios methodology recognised that in the case of wireless services, a regional market such as that of the European Union will be increasingly shaped by global forces. By 2020 there could be as much as five billion mobile users around the world shaping the technology, services, content and pricing. An estimation of all related parameters was carried out for three specific 'epochs' – now until 2010, 2015 and 2020.

The study also recognised a need for the verification of scenarios, firstly by a peer group in a workshop and secondly by a questionnaire survey of telecommunications industry stakeholders, but also economists and sociologists. The peer review led to several major changes and the questionnaire yielded 43 full responses most of which broadly endorsed the scenarios.

To proceed as efficiently as possibly further research was confined to three of the five scenarios – the two extreme disaster scenarios of financial collapse and a major disaster were discarded leaving:

- An **Optimistic** scenario economically,
- **Stagnation** of the economy in Europe, and
- A **Changing** scenario with pockets of prosperity and high migration to growth clusters of high tech industry.



For these three scenarios a detailed analysis was carried out on the motivations, needs and applications of different user types.

User profile tables were drawn up by age-group, income-group and epoch for the aggregated population of the EU. A key premise was that motivations drive needs from which services and usage levels can be determined. The overall method is summarised in the diagram above.

In addition to the organizers of FMS study various other stakeholder organisations were involved:

- **The CEPT** - a telecommunications industry body for Europe for standards and policy
- **The ITU** - the global industry body under whose auspices discussion for spectrum allocation will take place in 2007
- **National Delegations** for spectrum regulation worldwide who participated in the study
- The **IPTS** of Spain who commissioned the study and managed it on behalf of the Information Society spectrum group
- The **Information Society Spectrum Group**,
- The European **RSPG** or Radio Spectrum Policy Group.

### Demand for Mobile Communication in the Developing World

Take-up across Europe will vary greatly with the economic scenario, both in terms of level of usage and type of service in demand. A major future growth area for mobile telephony however will be the developing world. It will influence the EU and the OECD community in mobile products and services. Globally the demand for mobile applications and services will vary according to the EU profile with different levels of traffic placing different demands on the spectrum.

It was recognised at the outset that forecasting future demand meant that a much better understanding was needed of who would use mobile services, what they might want to use them for, how much they might want to use them and most importantly how much they could afford to pay for them.

A key point was that consumer and business segments would be much more educated in creating a lifestyle around advanced services. The game boys and girls of today will become the 'game people' of tomorrow - technophobia or lack of IT literacy will be less of a barrier than it is today. Key motivations were found to differ substantially across scenarios.

Ambitions decline with earnings. People turn inwards, retiring to a more basic and rural existence as the grey and green economies substitute for the normal monetary economy. Technology needs are minimised.

For the constant change scenario, survival in a situation of economic instability, both positive and negative, and continual migration to new clusters is the motivation. Long term, the scenario may be gently optimistic, needs are for autonomy, to find work and control a changing lifestyle while supporting local and remote families.

### Changing Service Patterns

The project found a wide range of services that could be brought to market. It identified over 130 services that could be classified under headings such as *Lifestyle*, *Entertainment*, *Communications and Business Applications* (More detail is available in documents from the FMS website)

Results for traffic growth between 2010 and 2015 show little difference between scenarios. The **Smooth Development** and constant **Change scenarios** show almost identical steady growth and there is real but gradual decline in traffic in the case of **Economic Stagnation**. It is only after 2015 that the big differences in traffic volumes become apparent.

Growth in traffic under the constant **Change scenario** is much more marked than in economic stagnation, as expected, growing four-fold between 2010 and 2015. However this is dwarfed by the **Smooth Development** scenario, where traffic grows almost nine times in the five year period. By 2020 there will be 8 times more traffic in the constant **Change scenario** compared with **Economic Stagnation**, and 15 times more than in the **Smooth Development** scenario, but most change will take place after 2015.

Growth in the **Smooth** and **Change scenarios** arises from different sources. In the **Smooth Development** scenario the huge growth in traffic comes from individual consumers, whereas in the **Change scenario**, growth from individual consumers is more steady, most of the growth resulting from increased use by enterprise. In the **Stagnation scenario**, consumer traffic is very limited indeed and almost all of the traffic results from enterprise use.

In terms of sectoral trends, the most important and least examined facet is the market analysis in terms of real customers and their real needs. On the basis of the scenarios user-profiles were developed with specific segmentations for consumer and business users. In consequence, the main segmentation could be described as two user-types as follows:

**Consumers:** These were analysed using segmentation in terms of age and income. The user population in each scenario was largely differentiated by disposable income and general economic outlook. In the **Smooth Development** scenario (the most prosperous case) we saw a widening of the middle class at all levels (upper, middle, lower) as the scenario progressed so that those at or beneath the poverty line reduced in number. By contrast the **Economic Stagnation** scenario swells the lower brackets with an expanding population at or below the poverty line, and more people in the lower earnings segment, with migration of upper middle class to lower middle class. In the **Change scenario**, we expect expansion of a lower middle class which is largely migrant, while there is a tendency for the lowest income segments to reduce in number as the scenario progresses.

**Business users:** These were divided by size of enterprise. The willingness of an enterprise to purchase changed in marked fashion from one scenario to another but the dominance of the micro enterprise (less than 10 staff) and the continued rise of the small and medium enterprise was notable with the big differences arising in the decline of the formal business community and its purchasing power in the **Economic Stagnation** scenario.

## Responding to the Needs of Certain User Groups

In the **smooth development** scenario, needs drive opportunities for education and retraining applications, as well as lifestyle organisational applications. These respond to the need for self-improvement in a busy lifestyle, especially for women who become the major consumers of mobile services of all kinds, be it self-restocking of the fridge to handling a job, children and relationships. In complete contrast, the economic **stagnation** scenario drives very simple applications aimed more at survival, so that voice and SMS are increasingly important. New services innovate by lowering costs (e.g. Voice-SMS) rather than by introducing new technical features and plain vanilla services rule. Constant **change** requires quite different applications. Need drives a requirement to support

migrant families and workers who must constantly stay in touch across the world at low cost, while maintaining continuity and accessibility in lifestyle services such as banking and shopping. Mobile services substitute for presence. Retraining occurs on the move and at low cost in response to constant pressure to update skills in a competitive job market in a knowledge-based society. Such requirements might need new low cost services and specific technical advances such as display technologies for self teaching, or projection from the handset or other terminal device. Consequently, the next stage of usage of radio services will most probably be oriented towards a range of ubiquitous applications, perhaps never seen before, that enhance lifestyles with supporting services and entertainment. The scenario work suggests a new era beyond the basic communications of voice and SMS.

## Avoiding the Techno-Centric View

The key lessons for research policy are:

- Avoid the use of techno-centric estimates for demand for consumer services, such as mobile and its spectrum requirements. Use instead a socio-economic analytic basis, grounded on disposable income and economic scenarios.
- Be wary in of vendors driving very high bit rates R&D policy and in regulatory spectrum policy making. As the 3G technology experience has shown they often cannot deliver these as easily as they claim.
- Move beyond the idea that one spectrum band equates to one service - the future is perhaps about 4G mobile technologies able to share spectrum.

The FMS study formulated the following recommendations:

- Examine market demand for technology not the technology itself
- Do so in terms of users motivation and needs analysis
- Use scenario approaches here.

## New Requirements for Shared Spectrum

The only key area requiring immediate active consideration is perhaps the area of spectrum regulation where new models of shared spectrum with expansion of the common unlicensed bands are perhaps in need of expansion so as to encourage the development of Alternative Wireless Technologies.

## The Relativity of Foresight Results

There is a temptation to consider calculations performed in the course of a Foresight study as predictions of the future. This temptation should be resisted. They are at best reasonable estimates of mobile traffic based on the assumptions and conditions of each scenario.

Perhaps the most critical issue to bear in mind when interpreting levels of final traffic, service and user type, the results presented in the FMS study are based on a great many assumptions and approximations.

## Sources and References

- The complete FMS study can be accessed at the FMS website <http://fms.jrc.es> which contains all working reports, workshop presentations, study reports and the major appendices.
- The main report is also published by IPTS (Institute of Prospective Technological Studies), DG JRC/EC, Sevilla, Spain, as a bound report EUR 21673, Forge, S., Blackman, C., & Bohlin, E., The demand for future mo-

bile markets and services in Europe, ISBN 92-79-00099-3

- ITU WP8F documents are only available to member country delegates, although it may be possible that certain summaries may be made available on application, to the ITU WP8F working party, in Geneva.
- 'Is fourth generation mobile nirvana....or nothing?' Forge, S. (2004) Info, Vol. 6 (1)
- Forge, S., Blackman, C. & Bohlin, E. (2006). Constructing and using scenarios to forecast demand for future mobile communications services. Foresight, Vol. 8 (3).

**About the EFMN:** Policy Professionals dealing with RTD, Innovation and Economic Development increasingly recognize a need to base decisions on broadly based participative processes of deliberation and consultation with stakeholders. One of the most important tools they apply is FORESIGHT. The EFMN or European Foresight Monitoring Network supports policy professionals by monitoring and analyzing Foresight activities in the European Union, its neighbours and the world. The EFMN helps those involved in policy development to stay up to date on current practice in Foresight. It helps them to tap into a network of know-how and experience on issues related to the day to day design, management and execution of Foresight and Foresight related processes.