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UMTS: The Economic Stake

EDITORIAL

Policy issues for the third generation mobile telephony

Report by Michel Didier and Jean-Hervé Lorenzi

By developing third generation mobile telephony, Europe is attempting to recreate the success achieved with GSM and assert its leadership in a vital sector of the digital economy.

But the initial enthusiasm has now given way to doubts. This new report provides an in-depth analysis of the economic outlook for UMTS. The authors are confident in the prospects of the new technology but are concerned about its profitability for operators. They argue that the French government has been right to revise and lower the price of the licences. They criticise the EU for not having coordinated the development of UMTS on a European scale and call for a fund to be set up to aid in the development of telecommunication services.

While this report is clearly sympathetic to industrial policy, whereas the previous one by Elie Cohen and Michel Mougeot was critical, both agree on one point: the worst is to run an industrial policy that shuns responsibility.

Jean Pisani-Ferry
Executive Chairman of the CAE

In the *Auctions and Public Affairs Management* report (CAE report no 34, 2001, presented in *Analyses économiques* Vol I-01, January 2002), Elie Cohen and Michel Mougeot discussed the processes used by EU member states to allocate the UMTS licenses. This new report by Michel Didier and Jean-Hervé Lorenzi takes a different angle, as it focuses on the economic perspectives of the UMTS technology.

After the successful development of the GSM technology, mobile telephony is one of the few sectors in which Europe enjoys genuine technological leadership. Being at the forefront of the development of new products and services however involves risks. While they remain confident on the long-term outlook for the UMTS technology, Didier and Lorenzi emphasize that its medium-term profitability looks alarmingly low. In view of the high degree of existing uncertainty, they claim that rather than remaining fixed, the license fees should be made contingent on the actual profitability of investments. They also claim that the time has come to unify the European market for telecommunication services. They envisage the creation of a European fund for the development of telecommunication services and argue that those Member States that benefited from windfall gains on the occasion of the sale of UMTS licences should contribute more than proportionally to this fund. They also call for the creation of a single European regulatory authority.

This report was presented at the *Conseil d'analyse économique* plenary session on 8th November 2001, and in the presence of the Prime Minister on 24th January 2002. It was published in French in April 2002.

This summary of the report has been written by the CAE's permanent staff, but the opinions expressed herein reflect those of the authors of this report or its comments.

Can we repeat the success of GSM?

By adopting the GSM⁽¹⁾ standard, Europe succeeded in taking the lead in the implementation of second-generation mobile telephony. The European Union, inspired by this economic and industrial success, hoped to do the same with the launch of UMTS⁽²⁾, in the prospect of the shift to the third generation.

The technical standards of the second-generation mobiles (2G) were adopted in the early 1980s. After a rather slow start, all of the wireless, or so-called second-generation, technologies (GSM and others) now encompass several hundred million subscribers throughout the world. It is a fantastic success, particularly for the European market and manufacturers. The standardisation of GSM was coordinated at the European level, placing Europe in the leadership position worldwide.

However, the development of 2G mobile telephony is now showing its limits due to the fragmentation of the global market as well as the saturation that is beginning to appear in Europe.

The 3G represents mobility plus the Internet.

Third generation (3G) mobiles aim to overcome these limits by offering new services. Their ambition is to provide not only

(1) Global System for Mobile Telecommunications.

(2) Universal Mobile Telecommunication Systems.

voice communication but also exchanges of all sorts of digitised data and Internet connection. 3G represents mobility plus Internet, as well as the prospect of developing services that are specific to travel (guidance, location of nearby services, etc.) or e-commerce.

European original equipment manufacturers have attempted to repeat and expand the successful approach used for 2G in the development of 3G. They agreed on the W-CDMA⁽³⁾ radio interface technology. They signed partnership agreements with the Japanese and with them created a new standardisation authority, the 3GPP⁽⁴⁾, responsible for defining the specifications of the UMTS standard worldwide⁽⁵⁾. They convinced the European Commission induced, by its decision in December 1998, required each Member State to allocate UMTS licences before 1st January 2000 according to procedures left to its discretion. The goal was to offer services as of 1st January 2002.

What is the economic profitability of UMTS?

A mere eighteen months ago, the widespread attitude was that new information technologies and communication would bring about another strong growth period. In a climate of 'new economy' euphoria, financial markets entertained the hope of double-digit growth in the telecommunications sector and recorded sharp upswings in stock prices.

Against this backdrop, European governments started allocating frequencies to operators, without any common rules or prior research, which led to heterogeneous procedures. Overall in Europe, the price of UMTS licences allocated to operators was approximately EUR 130 billion, around 15% of the market capitalisation of all European telecommunications operators. Due to these high amounts, much greater risk is associated with the projects and

(3) Wideband Code Division Multiple Access, (CDMA is the technology initially developed by Qualcomm in the United States).

(4) Third Generation Partnership Project

(5) Report by Cohen and Mougeot, already mentioned.

the borrowing cost, thus lowering the value of the companies.

More thought should have been given to the number of licences to be auctioned.

Building a telecommunications network involves fixed costs that represent a very large share of the production cost of the telecommunications service. The short-term marginal cost (the cost of one additional minute of communication) is low, and the average cost is rapidly falling as the communication volume increases. This situation has long favoured a monopolistic structure in each national market. The emergence of digital technologies has facilitated the coexistence of linked networks and enabled the markets to test the benefits of competition. With new value added services, it has proved very beneficial for the development of mobile telephones. As the number of licences is necessarily limited within physical boundaries (the partitioning of the available radio-frequency spectrum), the market is an oligopoly. Efforts to achieve maximum socio-economic yield should have resulted in setting an optimal number of licences according to the main parameters: price-elasticity of telephone demand and

1. An economic and technological breakthrough

The objective of UMTS is basically to increase the speed to 2 megabits per second (Mb/s), instead of the 9.6 kilobits per second (kb/s) of GSM: quite a jump in technology. However, in practice, the average speed of the first UMTS mobile networks would be between 64 and 144 kb/s, closer to the rates of current telecommunications networks using modems connected to PCs. This is still an important breakthrough.

UMTS also requires other technological progress. 3G terminals must be bi-mode in order to be compatible with 2G; they must have bigger screens for multimedia connections and much more powerful batteries.

3G base stations must be closer together than 2G stations and therefore will be more costly. The new services have yet to be developed. They should be user-friendly and attract the public. In addition, contrary to GSM, competition will be harsher with Japan, which seems to have somewhat of an industrial, or even commercial, head start, illustrated by the success of *i-mode*^(*).

As often occurs with breakthroughs, these difficulties have been under-estimated and the deadlines extended. Therefore, mono-mode terminals should be available in 2002, the first bi-mode terminals in 2003, bi-mode terminals appropriate for visiophony (a unique 3G service) in 2004 and reliable terminals at mass-market prices in 2005-2007. In the meantime, GPRS^(**) technology will be developed. It is an inexpensive adaptation of the GSM network able to reach speeds of 30 to 40 kb/s. Moreover, other technologies may prove to be competitive: speeds available on wireline networks, fourth generation mobiles, etc.

(*) *I-mode* functions at 9.6 kb/s like GSM, but uses packet switching. It provides access to a number of services (voice mail, games, advertising, software) to over 46 million subscribers.

(**) General Packet Radio Services.

the production cost curve, which includes a fixed cost approximately three times higher for UMTS than for GSM. But the countries seem to have opted for another approach, allocating N + 1 UMTS licences where there are N GSM licences.

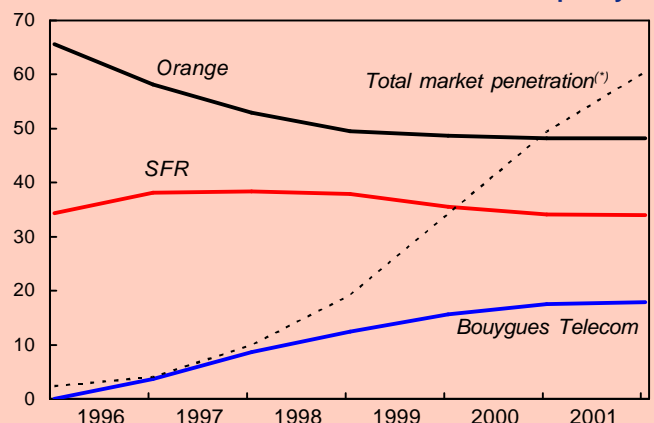
Financial outlook for the sector

Michel Didier and Jean-Hervé Lorenzi explore the financial outlook for the telecommunications sector in France using a model which provides forecasts until 2015.

Their main forecast is based on the following assumptions: UMTS will increasingly replace GSM from 2004 onwards;

penetration speed will be comparable with that of GSM, climbing from 10 to 70% over approximately six years; for GSM telephony (simple-voice and SMS), the ARPU (*average revenue per user*) will be virtually stabilised in real terms (it dropped from EUR 55 per month in 1998 to EUR 38 per month in 2001); for UMTS, the ARPU will reach EUR 70 per month in the very first years, then at the end of the period will come back to 50% over simple-voice ARPU. This central scenario is based on the amount and payment terms of licence fees as they were outlined in the initial licensing procedures in France (approximately EUR 4.5 billion per operator).

1. Evolution of the market shares of mobile telephony

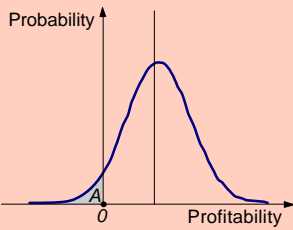


Note: (*) In % of the population.

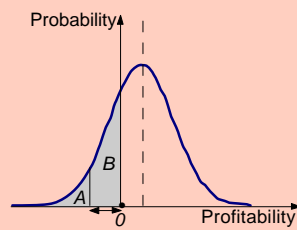
Source: ART, Executive Report 2000.

2. Distribution of profitability^(*)

a. Excluding fixed fee



a. Including fixed fee



Notes: (*) With a fixed fee, the likelihood of negative profitability, which measures the project's risk, sharply increases. A shift in the curve towards the left considerably increases the probability of failure (greyed area).

A = Probability of being 'ruined' before fee; A + B = Probability of being 'ruined' after a fixed fee.

A proportional fee from revenues reduces the desired yield but does not increase the risk.

Source: Authors.

Given the above scenario, the whole sector would need relatively moderate financing until 2007. However, for UMTS alone, the accumulated financing requirement would reach approximately EUR 15 billion in 2005, but then start falling and would be at zero by the end of the decade. The approximate equilibrium of the sector as a whole would therefore involve extensive internal redeployment between wireline networks and GSM, on the one hand, and UMTS, on the other hand.

The authors use the same model to measure the impact of some alternative assumptions. Revenues over 10% of the assumptions of the central account (higher ARPU) improve the sector's average profitability rate by two points (and vice versa for revenues below the threshold). A 20% drop in equipment costs through the pooling of equipment improves profitability by three points.

Although it does not reduce technological uncertainty, this system of licence fees considerably reduces the financial impact of the commercial risk.

The assumptions of three operators (instead of four), licence fees proportional to the amount of revenues and a twenty-year extension in the licence term all contribute to the economic equilibrium of the sector. Opting for proportional licence fees instead of fixed licence fees has a very strong positive impact on income (adding 12 points to the profitability indicator).

The model does not present a clear-cut decision regarding the choice of three or four operators for the French market. The only conclusion is that a three-operator market would be less exposed to instability than a four-operator market, but, in addition, less competition would probably result in higher retail prices.

The same model, applied to the German market, shows very little probability of six operators surviving the market, given the high price paid for licences. This is where a risk of instability lies, with consequences that could weigh on the entire European market.

For better coordination within the Union

The authors express their conviction that Europe can achieve success in third generation mobile telephones, provided that it takes new initiatives and ensures future development. The real issue is knowing whether it will spread to the mass market in the near future. Technical and commercial uncertainties currently preclude any definite conclusions. From an economic point of view, an essential prerequisite is a sharp fall in the price of terminals. The price of terminals is clearly connected to the size of the market. Success is conditioned by the capacity to launch a Europe-wide virtuous circle between the drop in prices and mass-market sale of equipment and services.

Given the magnitude of the risks, the appropriate economic

response involves contingent licence fees, in other words, an amount based on the sector's real development. The French decision to return to lower licence fees, proportional to financial results, represents a step in this direction. But other major European countries are not willing to remove the hurdle due to the ex ante setting up of the price of licences, even though this hurdle impedes (in the authors' opinion) the development not only of their own market, but also of the entire European market. European States have a direct collective responsibility to carry out the UMTS project.

In general, positive external effects linked to the information economy and innovation could justify not only that the States refrain from excessive levies, but also that they support projects introducing innovations.

The authors suggest that the necessary investments in technological research, innovation and development of new services should be co-financed by the payment of a part of the fees already levied by the Member States for UMTS licences.

These national contributions could be pooled into a European fund for the development of new telecommunications services. Such an approach would improve the European industrial capacity for equipment, balance out the various Member States' net fees and finally, accelerate UMTS development in Europe.

The State must also ensure the maintenance of effective competition. The increase in fixed costs (equipment and licences) in the new generation is contributing to market concentration. The paradox would be that, after succeeding in the second generation by opening the market to competition, the third generation would result in a return to excessive market concentration. The current regulations forbid the resale of operating licences in the event of difficulties, thereby generating a cost for withdrawal from the sector. This factor also disturbs the process of entry onto the market. The

authors therefore recommend creating a secondary market in which the frequencies purchased could be resold. This would encourage investment by reducing the cost of leaving the sector.

They feel that national authorities should maintain their role in those aspects of regulation which do not concern the Union level, but that an EU authority should unify the basic rules for the telecommunications sector. Europe must face the difficulty of distortion in the treatment of the various operators arising from the disparity in the procedures of operating licence allocation. For example, what would be the solution to a problem arising in the case of a merger between operators that each have licences in Germany and the United Kingdom? In a more general way, the Commission should state, even *a posteriori*, the rules that would have been desirable and should propose fee arrangements adapted to each country, in order to return to a situation considered more normal and consistent between countries.

In the authors' opinion, a few lessons may be drawn from a situation that led the French government to reconsider in-depth previous decisions that in the final event it viewed as inappropriate. Economic research that has not been carried out before the project launch can still be pursued effectively provided that efforts are appropriately allocated. It is striking to note how many extremely important financial decisions have been made by different European countries without the necessary prior economic research. The UMTS project is merely in its early phases, and beyond the third generation, a fourth is already emerging.

Second generation mobiles were a major success for Europe. Will the case be the same for the third? Without trying to answer this question, Michel Didier and Jean-Hervé Lorenzi conclude that success will be even more likely if it is achieved through collective efforts, in other words, if sufficient coordination is set up by the Member States, operators and original equipment manufacturers in order to rapidly develop a mass market. The

1. La réduction du temps de travail
Reduction in Working Time
2. Partage de la valeur ajoutée
The Sharing of Value-Added
3. Service public/Secteur public
Public Service and Public Sector
4. Croissance et chômage
Growth and Unemployment
5. Coordination européenne des politiques économiques
Coordination of Economic Policies in Europe
6. Pauvreté et exclusion
Poverty and Social Exclusion
7. Retraites et épargne
Pensions and Savings
8. Fiscalité de l'environnement
Environmental Taxation
9. Les cotisations sociales à la charge des employeurs : analyse économique
Social Security Contributions Paid by Employers: An Economic Analysis
10. Innovation et croissance
Innovation and Growth
11. Fiscalité et redistribution
Taxation and Redistribution
12. Emplois de proximité
Local Employment Initiatives
13. Régulation du système de santé
Regulation of the Health-Care System
14. Instabilité du système financier international
Instability of the International Financial System
15. Égalité entre femmes et hommes : aspects économiques
Equality between Women and Men: Economic Aspects
16. Agriculture et négociations commerciales
Agriculture and Trade Negotiations
17. L'architecture des prélèvements en France : état des lieux et voies de réforme
Architecture of Levies in France: Current Situation and Possible Reforms
18. Architecture financière internationale
Architecture of the International Financial System
19. Le temps partiel en France
Part-Time Work in France
20. Le cycle du millénaire
The Millennium Round
21. Retraites choisies et progressives
A Voluntary Gradual Retirement Scheme
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Life-Long Training: A Prospective Economic Analysis
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Regional and Urban Planning
32. Prix du pétrole
The Oil Price
33. Inégalités économiques
Economic Inequalities
34. Enchères et gestion publique
Auctions and Public Affairs Management
35. Démographie et économie
Demography and Economy
36. Enjeux économiques de l'UMTS
Economic Analysis of the UMTS Project
37. Gouvernance mondiale
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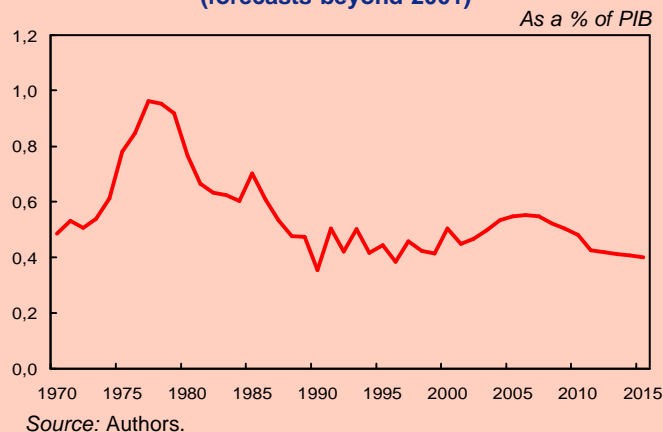
revision of licensing procedures decided by the French government on 16th October 2001, switching from fixed *a priori* licence fees to licence fees based on results, was an important step in the right direction. But now, beyond French borders, it is necessary to refocus on the European dimension of the UMTS project, taking a collective initiative to relaunch the project at the European level.

Comments

In his comments, Jean-Michel Charpin considers that the report presents a sound diagnosis and has received broad, if not unanimous, support in France and that it could be beneficial to present it to other European countries. He believes that the risk of concentration in the sector emphasised in the report would have benefited from more in-depth comparative analysis of the operators' financial vulnerability. He agrees on the necessity of gradual changes as uncertainties are detected. He considers that the authors' proposals aiming to 'refocus on the European dimension of the UMTS project' are wise, but not easy to implement.

Michel Mougeot is more critical. He believes that the report could have been more specific as to the key parameters that would enable the establishment of the optimal size of the oligopoly, and that the data used essentially come from operators or original equipment manufacturers and not independent sources. He stresses that the oligopoly could evolve differently according to the type of competition between operators and the degree of differentiation that they could acquire. He maintains the viewpoint developed in his report on auctions in favour of this kind of devolution and expresses his reservations as to the approach suggested by Michel Didier and Jean-Hervé Lorenzi to create a European fund representing part of the licence fees levied from the various Member States in order to finance the development of UMTS.

3. Investment (licences excluded) of telecommunications operators in France (forecasts beyond 2001)



Procedure followed in France for the allocation of UMTS licences

- 7 March 2000** The Telecommunications Regulation Authority (ART) proposes that the French government set the number of UMTS licences at four and allocate those licences by beauty contests for a period of 15 years. The ART suggests a licence fee of 3.75 billion French Francs (572 million Euros) per licence.
- 6 June 2000** The French government adopts the ART proposal and sets the fee for the use of the frequencies at 32.5 billion French Francs (4.955 billion Euros) per licence, half of which is to be paid over the first two years and the remaining balance over the following thirteen years.
- 18 August 2000** Publication of the notice of call for tenders.
- 31 January 2001** Registration of the two bids made, respectively, by France Telecom Mobiles and SFR.
- 30 May 2001** Decision by ART approving and making available to the public the preliminary investigation report for the authorisation requests filed by SFR and France Telecom Mobiles.
- 18 July 2001** Attribution of the UMTS authorisations to SFR and France Telecom Mobiles (which, in the meantime, took on the name Orange).
- 16 October 2001** Decision of the French government according to which the price of each licence will henceforth consist of a fixed part or 'entrance ticket' of 619 million Euros and a variable part equal to 1% of the turnover generated by the use of the UMTS frequencies allocated to each operator. The duration of the licences is extended from fifteen to twenty years.
- 29 December 2001** Publication of the second notice of call for tenders for the two remaining UMTS authorisations, taking into account these new provisions.
- 16 May 2002** Date of the filing of the offers.
A single bid is filed, that of Bouygues Telecom.
- 30 September 2002** Deadline for the publication of the preliminary investigation report for the authorisation request made by Bouygues Telecom, following the second notice of call for tenders.