

Mobile Regulation for the Future

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Abstract. This section shows technology changes in mobile communications field, like adaptive spectrum usage, 4G mobile services, new M-applications. A theoretic model is shown about the joining process of the value chain, and conflicts are shown on vertical integration in both directions. The staged rises of the mobile communications' level lead two main types of regulator activities. As a consequence in the near future there are some steps by the regulatory agency to be done.

Keywords: regulation, mobile communications, foresight, vision, spectrum.

1 Introduction

There is an inevitable trend seen the wireless mobility. The narrow band GSM telephony has spread all over the world. The new wideband mobile technologies, like LTE (Long Term Evolution) are to step into the market. Several applications, like navigation, locally based e-commerce, twitter or intelligent transport systems are running for the essential limited resource, which is the spectrum band.

This section first shows the most relevant technology changes in mobile communications field, like spectrum allocation, long term evolution technology, and some new applications. Then a model is shown about the extension of the value chain. It is also explained, that the vertical integration could cause tensions in both directions. Next we try to understand the role of regulation in normative and empirical way. The future-oriented regulatory tasks are in the next subsection, based on the previous statements. As a consequence of the spreading process, we can see the need for co-regulation with other agencies of related fields.

2 Spectrum Allocation

Spectrum allocations are more and more important. One new band usable for communications purposes has high value for the service providers. To build up a new wireless technology always new frequency bands are needed. The allocation process goes in several national, regional CEPT-ECC (European Conference of Postal and

Telecommunications Administrations, Electronic Communications Committee¹), and global ITU-R (International Telecommunications Union, Radio-communications' sector²) level. For service providers the right to use a slice of the spectrum means a high value asset. The national governments spend a lot on frequency allocation processes, and as a consequence, governments have the right to sell the free frequency bands, mainly through auctions, sometimes through beauty contest.

There are new flexible band techniques called Software Defined Radio and Cognitive Radio. According to REPORT ITU-R SM.2152 [4]:

- “Software-defined radio (SDR): A radio transmitter and/or receiver employing a technology that allows the RF operating parameters including, but not limited to, frequency range, modulation type, or output power to be set or altered by software, excluding changes to operating parameters which occur during the normal pre-installed and predetermined operation of a radio according to a system specification or standard.”
- “Cognitive radio system (CRS): A radio system employing technology that allows the system to obtain knowledge of its operational and geographical environment, established policies and its internal state; to dynamically and autonomously adjust its operational parameters and protocols according to its obtained knowledge in order to achieve predefined objectives; and to learn from the results obtained.”

These techniques do not need preliminary given frequency band. These adaptive technologies provide much more effective shared spectrum usage. So, these technologies are good to serve in huge metropolitan areas, where the density of the users is very high.

3 Long Term Evolution (LTE) Mobile

The next generation mobile technology deployed at the moment is called Long Term Evolution LTE (4G). The official name of these new technology standards, given by ITU is International Mobile Telecommunications Advanced technology [3], [5].

The major feature of LTE mobile internet system is that the upload speed can be much more than in the previous mobile internet systems. The LTE is mainly for data transmission not for voice. The other feature of LTE is that it tries to integrate the existing mobile systems. This may cause faster spread and lower prices at the introduction period.

A new capable technology stepping into the market would produce changes in the whole industrial value chain. The value chain of the broadband mobile services consists of devices, infrastructure services, applications and some solutions. The first application was localization based content providing. The more spread application is the navigation on smart mobile phones. These applications are mainly from e-commerce, and social applications are also spreading.

¹ The European organization CEPT-ECC see <http://www.cept.org/ecc/>

² The Global organization ITU-R see <http://www.itu.int/>

4 New Applications Based on Mobile Services

The users' prospective has been changed: "digital way of living" - is the new approach, integrating the previously segmented disciplines of e-commerce, e-learning or e-health, e-working. Digital living needs new approach to free and working hours, a new concept of working place, and also the opportunity costs in time and working environment. There are several new applications based on mobile telecommunications services. Most of them are provided by large telecommunications companies or their subsidiary companies.

The first group of applications is *mobile payment*, which is one of micropayments type. The deposit is paid or debt is asked before the transaction, and the payment service goes within the system. Acceptance of mobile payment is similar to other debit cards. In general micropayment systems do not pay interests after the deposit, therefore do not ask fee for the transactions. In case of mobile payment, it mainly goes from credit, so the transaction must have a fee over the exact payment.

The second group of applications and solutions is *mobile health*, including special devices based on mobiles. Some sensors may measure the health conditions of the users, evaluate the data and inform the user and/or other helping assistance. In case of high health risk or in case of emergency, the emergency call could be started without any human interaction. There are other, information services serving health issues: localization-based pharmacies, electronic prescription and data-storage of previous records of laboratory.

The third group of mobile based applications is *m-learning*. The mobile becomes part of the information infrastructure to learning management systems (LMS). This ecosystem consists of few on-line teachers, life-long learners, and schools. Really good improvement of competences may come from the blended learning process including personal consultations with the teacher and the facility based on-line communication through screens. There are three screens to learn: TV screen, computer screen and the mobile screen and online e-learning systems could use at least two of these screens.

E-government sometimes is served *on mobile*. This is the communications channel which reaches almost the whole population. Mobile communications are also available for needy population: jobless, homeless, immigrants, handicapped peoples, old age pensioners. So, the local public services - like help to the labor market, social food distribution, help-services for large families in education - may be organized through mobiles.

Navigation is available for mobile customers through satellite systems, some of mobile producers provide it without further fee. Locality based services can be organized based on mobile devices too. Navigation services are the basis for the future intelligent transport systems of avoiding traffic jams, mobile payment for highways or parking.

We can see that forward integration of mobile service providers is a strong ongoing process. Mobile industry spreads into other sectors, together with new applications serves as a business infrastructure for the business.

5 Joining Process of Value Chains

On the next figure is the joining process of the value chain in case of a new capable technology steps into the market. Four phases can be seen:

- 1st phase - Based on the new technologies the quality rises, the prices diminish, the infrastructure spread into new business areas;
- 2nd phase - Some complementary industries build in their services the already existing infrastructure;
- 3rd phase - The value chains merge, and form a new one together, providing a new compound service for the customers;
- 4th phase- The new *compound service itself becomes* the basis for other industries as a *business infrastructure*.

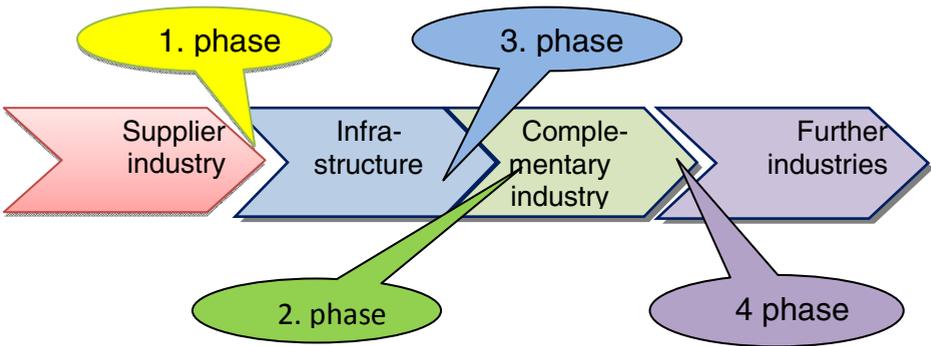


Fig. 1. Value chain extension in case of innovation

As we have seen previously, mobile telecommunications services spread into other sectors. Let us to build up models of this extended service provision. When two sectors are to joining along the value chain, there are always ambitions from both sides to integrate backward and forward the close value producing steps. As you may see on Figure 2, the telecommunications service providers try to integrate new ICT applications to provide more enhanced services for related industries; the professional users of related industries try to extend its own activities backward, using new ICT technologies. Both vertical integration processes of different industries go through tensions, even if it is forward or backward integration. The first reaction of the neighboring industries may be to resist, the second reaction might be to build up strategic alliances, and the third step can be the value chain joining process.

Regulation and the regulatory body in this joining process should play as a defender of the community interest. Community interest can be:

- Let the service provider provide more enhanced services, in order to provide basic services at lower price for the large scale of population;

- Let the innovative new technologies step into the market, in order to have the ICT market combatable and avoid any kind of monopolistic situation.

The regulators' balancing role may be examined also in Figure 2.

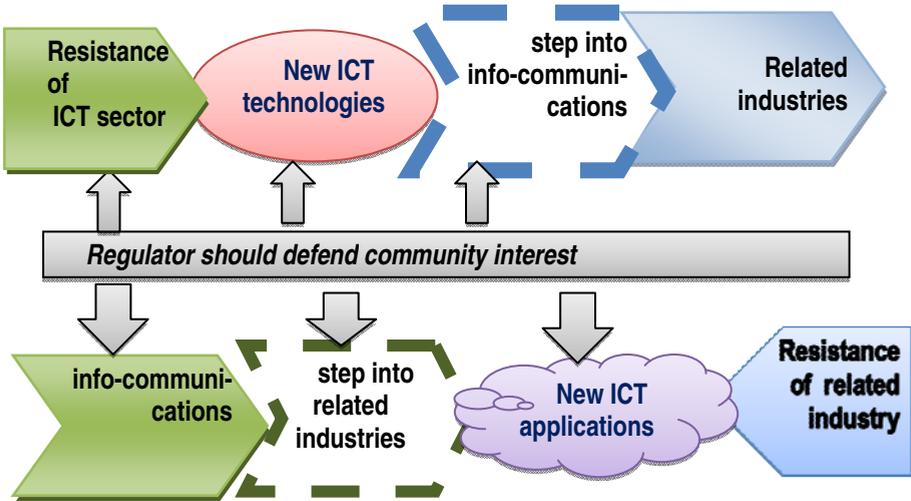


Fig. 2. Backward and forward vertical integration with related industries

6 Role of Regulation

Sector-specific regulation in wider sense includes market monitoring, rule making, individual decisions and information providing about the certain market. It includes also participation in the standardization process, although it is considered a self-regulation of industrial players. It should match to overall market regulation topics, like customer defense, privacy defense or accounting rules.

There are several function expected from a regulator: handle customer dependency, enhance innovation and network development, and handle forward and backward integration processes. Some solidarity steps should be done to ensure universal access to the infrastructure. Let us see the innovation model of the ICMT sector model reflecting [1] ideas on information technology.

We can see a *staged development* of the info-communications services at the “state of the art” level. New technologies come and provide business advantages for the first user groups. Then these technologies spread into the everyday life, and the business advantage melts away. Later this technology becomes essential even to participate in business. Remember the example of mobile telephony: first it used to be a status symbol for high level managers, then became normal usage for workers, now it is an expectation to have even for jobless or homeless peoples. As we see, the participation level shows also a staged development, only with a bit delay.

What should do with this staged development process the regulator? When the scale is rising, should react, in order to enhance the development of the market. There are two main types of regulatory action: innovative and solidarity actions of regulator. In case the state of the art level increases, an innovative action should be done, in case the participative level increases, a solidarity action should be done. See the whole staged development process together on Figure 3.

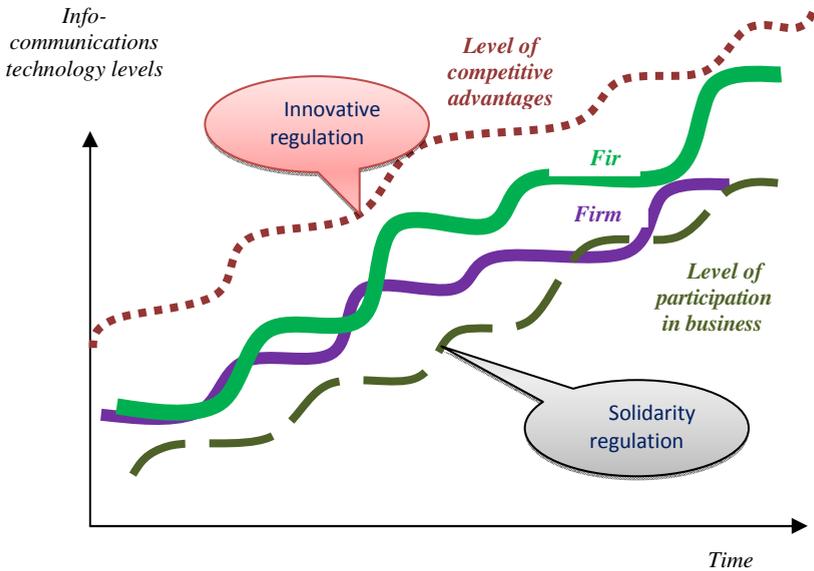


Fig. 3. Innovation model of the ICMT sector development

Innovative regulatory actions are:

- Let a new technology to enter into the market;
- Ensure scarce resources (spectrum or identifier) for the new technology;
- Ensure service based competition for innovative applications;
- Participate in standardization process.

Solidarity regulatory actions are:

- Make a price regulation;
- Universal access and universal service regulation;
- Enhance facility based competitions or ladder of investment;
- Ensure local physical networks in a non profit basis.

After having seen the normative approach of the regulation, we can also deal with the regulation with limited rationality [2]. The real regulator is a government agency, with limited power having external stakeholders. In case the value chain extends, the

players also change in the stakeholder model of the regulatory agency. So, there will be new players to be fulfilled with regulatory interventions on the market. Figure 4 shows the stakeholder model of the regulatory body in the future.

Based on these – normative and empirical – theoretic models of regulation duties some more detailed real regulatory steps can be described on mobile field in the next subsection.



Fig. 4. Stakeholder model of the regulator in the future

7 Future-Oriented Regulation Tasks in Mobile Communications

There are *classical regulation issues* in mobile, as in any kind of matured industries- Termination rates at interconnecting; prices of mobile roaming; domestic roaming in case of a newcomer on the national market; interconnection with internet service providers; prices of data transmission, and universal access provision through mobiles are also to be regulated.

Usually the *value of a spectrum* is based on the economic value of the market presence on the mobile market. It is usually sold by the government on auctions. But there are new technologies without allocated spectrum.

There is a new emerging issue on *frequency management* field. There are free bands without preliminary allocation, called “white spaces”, where the usage is shared cognitive radio and software defined radio, as it is mentioned above. This new element of the radio-communications’ market would produce the *following two problems* for the national regulatory agencies on the European mobile service market.

- The frequency fee nowadays goes mainly to the state budget of the national governments, and it covers the operational costs of the frequency management institutions, sometimes there is cross-financing to the whole regulatory agency from frequency fees. It would be missing from the state budget and the regulatory agencies would be financed from general taxes from other industries;

- The frequency allocation is one of the tools in government hand, to enforce some content providing issues in case of broadcasting channels. If there is no such tool in hand, it would be very difficult to enforce the expected percentage of the European or national content in the provided entertainment channel programs. It could open the door to an overflow of films or games or some non-wanted contents from out of Europe.

Although the spread of the white spaces is not an interest of European regulators, the trend is coming and it would be very difficult to stop it. It will be one of the discussed topics on the next World Radio Congress of ITU, and it is hard to foresee the results.

WHO issued a precaution approach to *power emission*, and there is a European standard on the maximum specific absorption rate (SAR). But customers do not have the information about the possible danger of the over-usage of mobile their handsets. The regulatory bodies should enforce service providers to inform their customers about radiation effects of mobiles. There are some survey, that the risk is higher in case of young children and persons already having decease.

Enhancing innovation, the *technology neutrality* has been a huge discussion since 2003. We can read on ITU side: It “means that different technologies offering essentially similar services should be regulated in similar manners. However, technologies offering similar services do not necessarily have similar features in all aspects, and exactly identical regulations may, therefore, result in the advantage of one technology over another in the market.” [7].

The *reliability of mobile communications* services is essential in case further industries build themselves on it. Other industries are regulated mainly by their own agencies, like financial sector, transport, health and social welfare, privacy defending.

8 Cross-Sectored Co-regulation Issues for Mobiles

The trust building toward mobile communications’ reliability can be handled through cross-sectored regulation processes together with different government authorities both at national and at European level. This is slightly different approach to the existing self- and co-regulation approaches, which was mainly industry based or civil based self-regulation [6].

The value chain of the ICMT (Informatics, Communications, Media Technologies) sector is expanding, and form a union together with value chains of other industries. Regulatory activities should follow the process of spreading information technologies. The new approach is to have common responsibility – among different sectors and their regulatory bodies – for the new, integrated network infrastructure for the information based society. Figure 5 shows that regulation should follow these changes in an industrial value chain, and regulation should extend these activities into new fields.

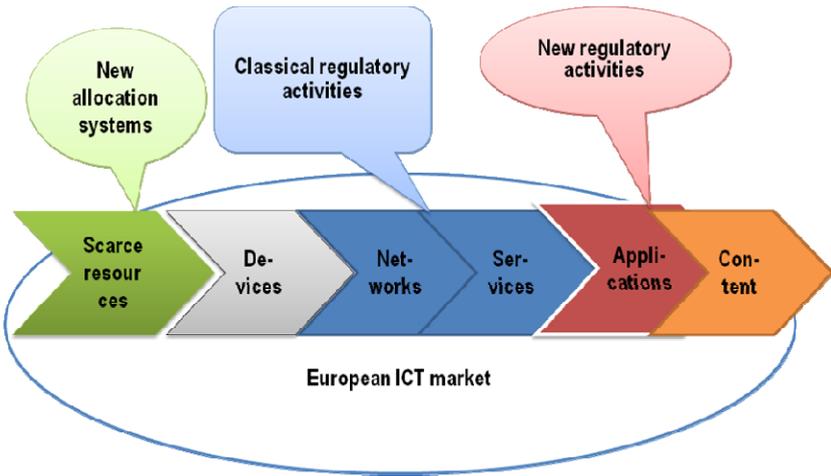


Fig. 5. Extending regulatory activities

These new fields have also been regulated until now by other sector specific agencies, but based on other technologies. There is a need to join the regulatory activities with the agencies of related industries, like financial regulator, transport regulator, privacy defending agency, health care regulator. See the following examples of the joint regulatory activities.

What is the border of payment services for mobiles? These systems (as we have described above) work as any other micropayment systems. Mobile based micropayment goes from debt, like debenture cards. So, the regulation of these services should go together with other financial services. But the sector-specific regulatory body should enforce the accounting separation of the revenue on mobile communications services and micropayment services

There is a regulation of emergency calls (e-calls), which should be similar in every EU (and associated) countries. The introduction of e-calls helps the tourism and the trans-European transport systems, because the caller party should not has to know any local emergency call, or should not has to speak local languages to ask for help in emergency case. The new regulation helps the automated mechanisms to spread. “In case of a crash, an e-call equipped car automatically calls the nearest emergency centre.” If we think on the traditional human based emergency calls, local emergency services might be informed a bit later, if there is a previous call centre before them in any cases. So, it is useful let to use both emergency calls: the trans-European and the local ones too. (In case of Hungary besides the European 112 the local 104 should remain too). We can see that the introduction of this new e-call public service is going slower than it was expected before, although there are many possibilities in it in long term. The new cars should be equipped with this ability, but the old ones do not have them. Regulators should force to build the emergency call devices into older vehicles too. This would enhance the trade of mobile industry in a new field.

There is a privacy issue how to *share information on localization data.* In case of e-calls it is already done the exemption in order to help to the person. Other cases should be regulated among other privacy issues, like: localization data of small

children for their parents, localization data of employees during working hours to their employers, localization data of assistant peoples at emergency services any time, etc. These are non-criminal cases but there are personal pending situations. On the other hand, service providers should provide localization data sharing services in case the customers want it: old age people living alone may share their localization data with their family members or health assistant services.

There are several *mobile based applications on e-health*. Data sharing of these equipments should be regulated together with privacy defending bodies. How to extend social security systems to m-health is one of the next questions to co-regulate with healthcare authorities. The expected benefit is that the patients may reach the health system earlier, and the rehabilitation could be cheaper. The most important would be to introduce M-health devices for professional drivers of trucks and public transport vehicles, in order to prevent mortal accidents.

The most recent development is a proposal about establishing the *Connecting Europe Facility*. In this, there are common rules of the Transport, Energy and Telecommunications industries. The initiative includes broadband mobile services too. On the other hand, there are expectations in the proposal to build up European high speed backbone networks, so the mobiles could also use that in the future [8].

9 Conclusions

Having seen the relevant regulatory steps in mobile communications' field we can conclude there are several new applications. Based on that, the mobile communication service providers try to make a forward integration, and build up mobile based application services, spreading into new related industries. Regulatory agency should follow the extension of the value chain.

As a result of the spreading ICT sector, the regulatory agency should build up cross-sectorized cooperation among related regulatory agencies. Examining the role of regulation we can see, that the normative approach shows two groups of regulative actions: steps for innovations and steps for universal services. The empirical approach to regulatory body shows, that there will be new stakeholders on the screen.

Having the future oriented analysis of the regulation, the regulatory agency may be prepared to the most probable future, avoid the least acceptable scenarios and achieve the most desirable ones.

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