New Regulatory Approach in ICT Sector

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Abstract—The information and communication technology (ICT) sector continues to experience significant changes. Choosing and adopting appropriate regulatory tools to respond to new market behaviours is increasingly complex for regulators in converged environments. In such dynamic environments, new regulatory approaches are becoming the fourth generation of ICT with particular reference to Serbian ICT market situation. Challenges that ICT regulators need to deal with as well as new opportunities arising from the growing interconnected network environment are also shown in this paper.

I. INTRODUCTION

The ICT sector remains one of the most rapidly evolving industry segments. The ever-expanding digital world influences almost all aspects of modern life. Nowadays, access to online services is essential in order to find a job, receive a salary, learn and make individual and business decisions. Overall goal is to bring ICT close enough to everyone. In achievement of this goal, innovation, investment and protection of the customer rights by encouraging the development of modern and effective regulatory tools are necessary. ICT regulators recognize that in such dynamic environment, new regulatory approach, so called a fourth generation of regulation, is required in order to enhance development of ICT sector.

The paper is organized as follows. After introductory remarks, the second section gives overview of global growth of ICT sector, as well as Serbian ICT market situation. Section III presents new regulatory trends and main and main issues for the fourth generation of regulation are described. In Section IV economic impact of ICT sector is presented. Section IV analyses potential challenges and opportunities of the new regulatory framework. Serbian ICT sector regulation is described. Concluding remarks are given in Section VI.

II. GROWTH OF THE ICT MARKET

Mobile broadband networks are being developed at an increasing pace. About 50 per cent of the world’s population was covered by a 3G network in 2013 [1]. The migration to Long-Term Evolution (LTE) technology takes place much faster than did the earlier migration from 2G to 3G networks. According to the GSM Association (GSMA), commercial LTE networks were operating in 88 countries in 2013, up from 14 in just three years. The Global mobile Suppliers Association (GSA) puts that number at 101 countries. Ericsson estimates that by 2019, 65 per cent of the world’s population will be covered by LTE, an increase from just 10 per cent in 2012 [1]. Mobile broadband (3G and 4G) shows the highest growth rate of any ICT, growing almost 20% during 2014. Additionally, LTE-Advanced is now commercially deployed on 9 networks in 7 countries worldwide [1].

The apps market involves new communications behaviours, new business models and includes a redefinition of the customer role. New apps and services, available on mobile connected devices, are offered to customers in order to inform them, play games, share files, exchange instant messages and videos, watch movies etc. The impact of all Internet-connected devices, apps and services on communications networks is enormous, making bright future for equipment vendors, manufacturers and apps providers.

Cloud services and data analytics (also known as “big data”) set additional strain on networks. Operators and service providers work intensively in order to identify strategies to cope with the ever-increasing traffic expansion.

Developing nationwide broadband infrastructure remains a key goal in most countries’ digital agendas and plans. Mapping the deployment of fibre transmission capacity require public funding due to a lack of private-sector economic viability. Although great efforts have been made to increase international connectivity, many countries face challenges in deploying and expanding next generation networks in order to support the ongoing growth in data traffic [1].

Today, xDigital Subscriber Line (xDSL) still accounts for over half or more than five out of every ten fixed broadband lines, with fibre optic Fiber to the X (FTTx) accounting for around a quarter of the total market for fixed broadband. Fibre is growing slowly, but permanently – Fiber to the Home/Fiber to the Building (FTTH/FTTB) account for over a fifth of all connected households in just nine countries worldwide. High household penetration of broadband is a key indicator of market maturity.

The Internet of Things is another strong demand generator for broadband. Embedding technology into everyday environment is likely to cause major social changes, as it will become more possible to track people’s movements, activity, interactions and interests, all of which raise major issues regarding privacy, security and personal protection. Since broadband environment is expanding continuously and involves non-traditional ICT and Internet players as well as providers from other sectors, reassessment of ICT regulation in order to bring more flexible approach to regulating issues at different levels is necessary [1].

One way to monitor progress in ICT developments in developed and developing countries, as well, and to measure the evolution of the global digital divide is ICT Development Index (IDI), introduced by International Telecommunication Union (ITU). It presents a composite
index that combines 11 indicators into one benchmark value on a scale from 0 to 10. IDI consist of three sub-indexes: the access sub-index, the use sub-index and the skills sub-index. The difference between the values of IDI between developed and developing countries is large. IDI values in developed countries are on average twice as high in comparison with developing countries. The developing countries are very heterogeneous in the terms of IDI. There is a great difference between IDI values for the highest and the lowest country. Developed countries are more homogenous regarding these values. Also, it can be noticed, that the highest growth is recorded in developing countries, not only on the IDI overall, but on both the access and use sub-indices, as well.

Last measures show that all countries in European region, with exception of Albania, have IDI values higher than 4.77, which is global average score for IDI. Values of IDI for Serbia show prominent increase during last five years [2, 3, 4].

Another way to define and evaluate market growth is Network Readiness Index (NRI). The World Economic Forum defines NRI as a nation’s or community’s degree of preparation to participate in and benefit from ICT development. This framework evaluates nation’s challenges and opportunities regarding ICT. Important stakeholders regarding development and use of ICT are individuals, businesses and governments who realize their roles in a general macroeconomic and regulatory environment. The degree of usage of ICT by stakeholders is linked to their degrees of readiness and capability benefit from ICT. Component indexes are: environment, readiness of nation and usage.

The environment component index measures potential of the environment that a country provides for the development of ICT. Sub-indexes that encompass environment are market, political/regulatory and infrastructure. The readiness of a nation presents a measure of the capability to support the potential of ICT. Sub-indexes that present a measure of readiness are business, individual and government readiness. The usage component measures the degree of usage of ICT by the principal stakeholders mentioned above. This component presents an indication of changes in behaviours, lifestyles, and other economic and non-economic benefits arising as a result of adoption of ICT. Sub-indexes used for measuring usage are individual usage, business usage and government usage. Measurement in the last five years shows that Sweden, Finland and Singapore have the highest NRI (Sweden: 5.65, 5.60, 5.94, 5.91, 5.93; Finland: 5.44, 5.43, 5.81, 6.04; Singapore: 5.64, 5.59, 5.86, 5.96, 5.97) [5, 6, 7, 8]. It’s notable that network readiness increases, but ranking varies from. Thus, in 2010, Serbian NRI has score 3.51 taking rank 84; in 2011. NRI score has value of 3.52 at rank of 93; in 2012. NRI score is 3.64 and rank 85; in 2013. NRI score is 3.70 and rank 87; and the best recorded score is measured in 2014, where NRI score equals 3.88 and rank is 80 [5, 6, 7, 8].

The ICT market in Serbia has been experiencing expansion for years, particularly in the number and structure of Internet connections and the total revenues from the Internet service provision. Positive growth trend maintained in 2013, with the total number of broadband users (without accounting for 3G network users) equals 99% of all Internet connections, which is approximately 8% more than in 2012 [9]. ADSL access represented the dominant Internet connection in 2013, accounting for 47% of all broadband connections (without 3G network subscribers) [9]. In addition to the ADSL, other means available for the Internet access were cable modem, which is another service provided by the CATV operators, directly, via Ethernet, via optical cable, by means of wireless access in the 2.4 GHz and 5.8 GHz unlicensed frequency bands, less often using the 3.4-3.6 GHz frequency band, as well as via mobile operators’ network (either via cell phone, or by means of special modems) [9].

The growth of the ICT market is influenced by the increased number of users as well as by the total revenues from the Internet service provisioning during past years. However, a certain slowdown in growth is notable in 2013. in comparison with the previous period as a result of market saturation and general economic trends [9].

Fig. 1 shows Serbian NRI in the last five years [5, 6, 7, 8]. It’s notable that network readiness increases, but ranking varies from. Thus, in 2010, Serbian NRI has score 3.51 taking rank 84; in 2011. NRI score has value of 3.52 at rank of 93; in 2012. NRI score is 3.64 and rank 85; in 2013. NRI score is 3.70 and rank 87; and the best recorded score is measured in 2014, where NRI score equals 3.88 and rank is 80 [5, 6, 7, 8].

Figure 2. NRI for Serbian neighbouring countries in 2014.

Considering neighbouring countries, latest measures in [8] show that only Albania has lower NRI (3.66) in 2014, in comparison with Serbia (3.88). The highest NRI in Serbian neighbourhood has Croatia (4.34), as depicted in Fig. 2.

As technology and media continues to evolve, regulatory challenges that ICT sector need to cope with increase rapidly. This evolving environment offers many opportunities for operators. However, the ability of understanding and managing the corresponding risks are essential in taking those advantages. In such environment, network operators need to ensure that their risk management of the business keeps pace. Hence, major
challenges for operators from regulatory perspective are failure to realize new roles in telecommunication market, lack of regulatory certainty on new market structure, new imperatives in privacy, security, and data integrity [10]. Reduced macroeconomic uncertainty is positive climate for operators. However, structural regulatory pressures on core service areas to increased competition from over-the-top (OTT) players mean that market conditions remain challenging. Operating environments vary significantly between regions, causing divergence of telecom industry performances. The main consequence of this divergence in regional performance is lack of confidence in the sector’s fundamental attributes.

Implementation of LTE networks and increasing customer demand causes that network capital expenditure remains at elevated level. This trend supports current regulatory models where competition presents catalyst for higher quality services. A combination of price deflation driven by competition from OTT providers and adjacent market players mean that telecommunication market conditions for operators remain highly challenging [10].

In emerging markets, shortages in spectrum and low prices require consideration of more rational market structures, either through consolidation or new wholesale mobile broadband networks. Regulators already recognize the need to reform existing rule to enforce development of ICT sector. However, market consolidation remains unclear. Pro-competition and pro-investment policies need to be balanced by regulator. At the same time, operators need to seize the initiative by prioritizing shared market positions and re-examination relative merits of in-market consolidation, in order to encourage progress. Market-structure related issues such as wholesale mobile network provision require attention both regulators and operators. Other relevant issues include provisions around spectrum release, licensing and sharing. At the same time, operator’s willingness to innovate their business models depends on new relationships with other entities [10].

ICT is one of the most important sources of new opportunities to encourage innovation and to intensify economic and social improvement, for both advanced and emerging economies. The risk of developing this kind of data-driven policy and regulation comes from exposure of private data to either companies or governments.

The uncertainty and concern around data privacy and security become severe issue expanding into new areas such as data sovereignty and internet governance. This issue has contributed to highly ambivalent attitudes among customers over access to reuse of their personal data. Some segments of the customers are willing to release personal identification and usage data on an anonymized basis. Still, many customers are convinced that information on customer purchasing and related behaviour benefit companies gathering big data more than end users themselves. Operators can reverse declining levels of trust among end users by enhancing privacy and security features to their service propositions. At the same time, proactive attitude is required on privacy and security issues with partners and policy-makers so that new demands for data sovereignty, personal data privacy and cybersecurity can be complied with in the long term.

Some new approaches to regulation and technology that contribute personal privacy protection from misuse are being developed. The focus is on the protection of individuals with regard to the processing of personal data and on the free movement of such data [11]. Operators are considered as having a natural competitive advantage in the big data field in comparison with other industry areas due to their legacy of strong customer, network and product information assets. The scope and diversity of this information presents additional challenges for telecommunication operators, since they use big data in the process of creating values within and beyond their organizations. Strategies concerning big data are important issue at many leading operators. There are numerous challenges emerging in repurposing of various data, showing lack of cooperation within organization, lack of leadership understanding and commitment around importance of data, and fragmentation of data sources all hindering progress. All these challenges have led to the fact that proportion of budgets projected to be devoted to big-data solutions is expending significantly in the coming period. However, there is no guarantee that these actions will generate values from big data. Long term benefits require carefully represented strategies to be balanced. Having this goal set, value opportunities from big data must be defined and prioritized.

IV. ICT SECTOR ECONOMIC IMPACT

The ICT sector is major contributor to economic development. Generation of revenues and securing investment in telecommunications is increasingly gaining in importance. Revenues from telecommunication sector in developed countries are under pressure from several reasons. These markets are highly competitive. In the mobile service segment many are close to saturation. However, number of customers is still growing. In addition to tighter customer budgets as a consequence of economic crisis, operators need to deal with revenue pressure from applications, which diminish traditional revenue flows [5].

Mobile sector is main source of revenues in developing countries, approximately 62% of total telecommunication revenues, and this portion continues to grow. Renewed investment is essential to satisfy requirements of advanced services, especially broadband. Progress would never be possible without major investment in telecommunication networks. Nowadays, investment is needed in improvement of existing services and their upgrade to broadband, but also to enable the access to more customers. Hence, monitoring of investment is essential issue for policy-makers [5].

ICT sector is infrastructure-intensive business. It requires large-scale and long-term capital outlays. For realisation and spreading of incomes earned on investment several years are needed. In a highly competitive environment, such as ICT, renewed investment is of great importance in order to meet the requirements of advanced services, including applications demanding large bandwidth and convergent services, for fixed broadband, and mobile broadband services, as well. One of the ways to measure investments in fixed assets needed to support development of ICT, regardless of the origin of capital, whether is domestic or foreign, public or private, is monitoring of data on capital expenditure. Results show that investment has declined in developed countries and increasing trend is notable in developing countries. The
ratio between capital expenditure is below 20% in most developed countries, and above 20% in the majority of developing countries. This emphasize the fact that most developed countries in terms of ICT deployment require relatively low levels of investment relative to revenue generated by telecommunication services. On the other hand, developing countries require more significant relative investment in order to enforce growth [5].

Data on foreign direct investment in ICT sector raise question on the cross-border movement of finance capital and on the extent of business internationalization in this sector. Recorded results show that after economic crisis, foreign direct investment in ICT declined significantly, but developing countries were less affected. Foreign investors agreed deals in developing countries, which present better economic prospects and are recognized as important sources of revenue growth. Developed countries remain the leading source of financing for foreign direct investment, but developing countries are getting an increasing role [5].

Since economic crisis affected ICT sector, operators feel pressure to provide services at optimal low-cost performance. Ensuring customer privacy is necessary step in achieving business success. On the other hand, only the market players that can reach all available customer data are in position to actually accomplish that goal. In this environment risk managers need to leverage traditional loss prevention tools in more sophisticated ways. It consists of new methods to transform their functions into profit centres in order to enable positive contribution to the company development. Due to the analysis of many consulting agencies, three leading success factors are: increasing of revenues and margins that can be achieved by share-of-wallet and greater market share, identification of new revenue sources such as data monetization, and improvement of operational efficiency [12].

V. NEW POLICY AND REGULATORY TRENDS

The evolution of telecommunication regulation can be described through several phases. The first generation presents monopoly utilities, public or privately owned, that were closely managed. The intent was to encourage improvements in efficiency and service. In this situation, regulation had task to simulate the desired effects of competition. The second generation is characterized by partial privatization and licensing of competing infrastructure providers. This regulatory phase is focused on balancing of opening up the access to incumbent’s network with the need of protection government infrastructure investments and ongoing shareholdings. The third generation brought full privatization. Regulation is shifted toward protecting competition in service and content delivery, with an increasing need for customer protection. Due to market and technology development, government policy-makers face even greater need to ensure access to digital infrastructures, primarily to fixed and mobile access networks. Broadband networks are more becoming non-optional utilities, even rights, whose availability and performance impact every aspect of the economy and societal development [14].

Choosing and adopting appropriate regulatory tools to respond to new market demands and the growing need for customer protection is increasingly complex for regulators in converged networks environment. Considering these various issues, regulators must be aware of international context within which they operate. In the mobile sector field, international allocations are realized in the development of regional band plans that guide spectrum usage. On the fixed network field regulators are striving in improvement of Internet access with cost reduction. The goal is to ensure fair and effective traffic management that balances customer demand and needs of network operators and content/service providers. In order to insure customer rights, regulators need to address multiple issues such as securing privacy and data protection in a cloud environment, and raising user awareness on the appropriate use and impact of shared content [13].

Analysing new trends in ICT market and all challenges and opportunities from its development, it can be noticed that stakes for regulators have never been higher. Regulators in this new generation of regulation must be able to oversee an increased range of services, delivered over multiple broadband and converged networks that create the digital ecosystem. Regulators also must protect customers from inappropriate content, faulty billing and fraudulent online activities. Another important issue regarding the fourth generation of regulation is involvement not only in economic necessity of creating affordable access, but also in the attendant social opportunities and challenges arising from better-connected communities. This is primarily related to developing countries [14].

The evolution of regulator’s role to the fourth generation regulation can be shown as a response to several critical issues coming from the changing of the environment. These issues, presented on the Fig. 3, stem largely from economic and social development realities and objectives set by government policy-makers. It is important to emphasize that these issues are additions to the more traditional tasks of regulators, which will become less important with the maturing of a competitive market place.

Figure 3. The evolving role of the regulator [14]

The main challenge for governments and regulators is how to enforce the private sector to cover as large a percentage of the population as possible, leaving only a small number of people to be connected by financial
subsensitive, triggering questions about freedom of speech. In developed countries and urban areas, this should be realized on a universal service basis, thus enabling every person or household to have access to broadband service. In developing countries and rural areas, the policy goal is to enable universal access, ensuring that each individual has access to broadband service somewhere in the community [14].

The source of success is in adopting policies that include broadband infrastructure. Effective program management involving all stakeholders is also needed.

International Telecommunication Union (ITU) highlighted the importance of allocation spectrum in an effective manner in order to meet increased demands for broadband wireless access [13].

Regulatory approaches to spectrum allocation and assignment for broadband communications has a direct impact on competition, costs and development speed. Spectrum should be allocated in a manner that maximizes its use and supports best economic and social outcomes. Where there is competition for spectrum access, auctions should be designed to achieve this optimal spectrum usage. Operators should be encouraged to improve efficiency and to maximize quality [14].

One option for regulators in the fourth generation of regulation may be to treat spectrum as a wholesale commodity, in fact, to charge a rent for its use but not requiring operators to lay out considerable capital expenditures to get licences. This approach can shift spectrum from a capital expenditure to an operational expenditure. As a result, operators would be able to deploy new infrastructure and to provide lower-cost services to customers. If operators were not effectively using the spectrum, they would lose the right of using it.

In the converged digital ecosystem, everything is interconnected. Standards and operational procedures are necessary to enable functionality of this system. Regulators need a common framework and forums where communities of interest can work together at a local, national, regional, and international level. A major role in facilitating such forums has the fourth generation regulator.

Customer protection activities are becoming more important with service convergence and the increased use of Internet. Many countries are adopting customer protection policies designed particularly for ICT customers, enforced either by regulator and/or a designated customer protection agency. Regulators need to collaborate with any and all agencies of interest in order to coordinate activities in the interest of customer protection. Also, regulators need to ensure that operators should clarify to their customers that complaints can be brought to independent regulatory entities.

Considering diversity nature of Internet, its openness and accessibility, some of undesirable elements of society have found ways to use the medium to commit fraud and other types of crimes. Government’s response to these crimes is set of general laws, which aim is to protect citizens, especially children. However, government involvement in issues concerning content control is very sensitive, triggering questions about freedom of speech. Significant enhancement in content provision represents an important challenge to content regulation. The relevance of this issue is becoming even more important since large proportion of the content may originate in other jurisdictions. One of the appropriate ways for the regulators is to encourage operators to develop self- and co-regulation methods to cope with complaints from customers. These methods can even involve blocking and removing offensive material that caused customer complaint.

In many countries, as well in Serbia, regulators need to consult with stakeholders before publishing regulatory decisions, determinations or guidelines. Service convergence and development of the Internet brought a large number of these stakeholders who are much more broadly representative of society. The main role in advising and communicating with policy-makers in government ministries and offices belongs to the regulator.

In order to be effective, fourth-generation regulators need to satisfy characteristics such as:

- openness to ideas and approaches;
- flexibility to keep up with rapid changes in the market;
- business sense to work with operators;
- knowledge of financial aspects of the business;
- political agility and understanding to work with political leaders;
- the ability to offer policy guidance;
- the ability to develop appropriate regulations to implement public policy; and
- an understanding of consumer issues.

Also, regulator should be innovative and capable to achieve the vision and goals set by policy-makers, but still to remain within borders of law [14].

According to the Electronic Communications Act of Republic of Serbia, regulation of electronic communications are divided between the Government, the Ministry in charge and the regulatory body, the Regulatory Agency for Electronic Communications and Postal Services, RATEL. The Government determines policy in the area of electronic communications and adopts strategies and action plans for their implementation. The Ministry supervises the implementation of the law and associated bye-laws. Also, it adopts radio-frequency allocation plans and bye-laws related to technical conditions applicable to networks and equipment. RATEL is functionally and financially independent from all other state authorities. The supervision of operators is divided between RATEL and the Ministry. RATEL is authorised to verify operators’ compliance with their obligations determined by the law, the implementation of bye-laws and decisions of the RATEL. To this end, it is authorised to request the necessary information from operators, to measure and test networks, services and equipment [15].

Activities in the process of Serbian ICT market liberalization can be divided into two phases. The first phase begins with the establishment of regulatory agency, RATEL, and lasts until 2010, when new law of electronic communication has been issued and marked a new phase in regulation. In the initial phase, despite great
obstruction, the first notable results have been achieved through licencing of three operators in mobile telephony. Further development is accomplished by opening the Internet market. Enforcing broadband access nowadays exist more than 230 providers in Serbian market. Similar approaches are deployed simultaneously on the content delivery market. Thus, there are more than 80 content operators. It can be noticed that major contribution of the first phase Serbian market regulation is diminishing of monopoly in all sectors, except in fixed telephony. There were some efforts to change this, but without any success. RATEL tried to eliminate the understatement of law by introduction of wireless fixed telephony (CDMA technology). Licences for this technology were granted to one existing and one new operator. However, this effort was too weak in comparison with monopoly in fixed telephony. Besides issues related to fixed telephony regulation, some additional issues emerged, such as prevention of potential monopolies, especially in the segment of relevant markets recognition and the application of multicriteria analysis for determination of operator with significant market power, whose prices are under a special regulation. Hence, prerequisite for final market liberalisation is achieved after issuing law of electronic communication in 2010. The major contribution of this law is abolition of monopoly in fixed telephony market. In addition to the ensuring regulatory conditions for deployment of new technologies, broadband communications and e-services, RATEL has announced five wholesale and four retail markets. Recognising a number of operators with significant market power, conditions for ex ante price control and cost based models are acquired. Thus, establishment of new monopoly is prevented [16]. Considering the need to follow the ICT sector development, RATEL has to be prepared for the transition toward the fourth generation of regulation.

VI. CONCLUSION

Regulators are major facilitators and partners in promoting development and social inclusion. One of the roles of regulator is sponsorship of public-private partnership among aid donors, governments, ministries and non-governmental organizations, especially in achieving universal access goals for rural, remote and underserved areas. In a converged ICT sector, the competition of operators and content providers is complex, especially if they report to different authorities on different issues. There is a need for softer, flexible regulation, free from bias. ITU is a leading promoter and argues for the transition to the fourth generation of regulation. In order to be effective, inter alia, the fourth-generation regulators need to be open for new ideas and new approaches, to show enough flexibility to keep up with significant changes in the market, to develop appropriate regulations to implement public policy. The regulators of this new generation of regulation differ from previous generation of regulator in the significance they place on the tendency of government social and economic policy goals, as well on the improvement of customer protection and broadband access.

ACKNOWLEDGMENT

This work is partially supported by Ministry of Education, Science and Technological Development of the Republic of Serbia under No. 36022.

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