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The future of mobile operators - new business models

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Research Question: This paper investigated business model innovation in telecommunication industry by analysing open business models that operators can implement to innovate and stay competitive in the market. **Motivation:** The study tends to cover all strategically important aspects for mobile operators present in literature – from telecommunication market analysis (ITU, 2017; Sujata et al., 2015), the importance of business model innovation (Ghezzi, Cortimiglia & Franc, 2015) to collaboration models that boost innovation activities (Xu & Chen, 2015; Dittrich & Duysters, 2007; Weiblen & Chesbrough, 2015) and to complement them with examples from practice. **Idea:** The aim of this paper is to analyse open business models and collaboration strategies operators have with partners and to show that business model innovation in telecommunication industry is as important as technological innovation. **Data:** The research was conducted by analyzing various studies, reports, reviews, books, white papers and articles. **Tools:** To answer the research question, we used statistical data published by respected bodies – ITU, Eurostat, Ratel as well as by leading vendors in telecommunication industry Cisco and Ericsson and leading mobile operators such as Telekom Austria, Telenor, Vodafone. **Findings:** The study highlights the rising importance of business model innovation and proposes open business models that operators can implement to increase internal innovation activities. **Contribution:** The study complements the open innovation literature, especially in the Serbian market where no similar analysis was performed. Findings of this study can help managers and directors refine internal innovation processes and propose collaboration models for their respective companies.

Keywords: Mobile operators, data traffic, innovation, business model, startups

JEL Classification: L22, L24, L96, M13, O31

1. Introduction

The development of mobile communications has strikingly influenced peoples' lives. Each new release resulted in a , higher bandwidth and a more intelligent network. The terms such as the Internet of things, virtual reality, artificial intelligence, big data, machine learning are all used in the context of digitalisation. It is a phenomenon which affects private, professional, and business spheres. Companies in the telecommunications sector are undergoing a fundamental shift to adapt to a digital world and have been developing from telephony service providers into data companies.

By being the 'backbone' of digitalisation, mobile operators become infrastructure providers. This significantly impacts their income since they went from service s (offering voice and messaging services) to data package distributors Telecom operators had to painfully experience the disruptive power of OTT (Over The Top) services. The traditional sources of their income are showing signs of becoming obsolete (Sujata et al., 2015). Messaging platforms such as WhatsApp, Viber, Skype, Facebook Messenger and many others, have drastically decreased the voice traffic and messaging services.

On the other hand, mobile operators are uniquely positioned to create additional value across a range of industries and to become end-to-end service providers. Operators are connecting more and more to the digital lifestyle of their customers as they move from selling gigabytes to selling services and applications-centric benefits (Allot, 2014). Nowadays mobile operators offer OTT services lisuch as music and video streaming

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services, cloud storage, location-based services. These services are provided by the operator itself or, more commonly, through different kinds of partnerships (BEREC, 2016). Today, in emerging markets, there are numerous opportunities for mobile operators and startups to collaborate (Bayen&Ajadi, 2017).

Companies commercialise new ideas and technologies through their business models (Chesbrough, 2010). Firms should consider changing their learning approaches over time to successfully renew their business models (Foss &Saebi, 2016). Corporate business model transformation is defined as “a change in the perceived logic of how value is created by the corporation (Aspara, Lamberg, Laukia&Tikkanen, 2013).

Open innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. This paradigm assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology (Chesbrough, 2006). Access to external sources of knowledge enables new combinations of technologies and therefore, contributes to the innovation performance of firms (Cheng &Huizingh, 2014). Companies wishing to engage in open innovation must (at least partly) re-organise their business models so as to accommodate their open innovation strategies and to subsequently enhance innovative performance (Saebi& Foss, 2014).

Mobile operators need a new business model that would incorporate their strategic objectives and targets. The goal of this paper is to show that, for mobile operators, the business model innovation is becoming as significant as technological innovation. Open business model is analysed as a possible model operators can use to enforce internal innovation and expand their portfolio. The research is conducted by means of questions:

1. How is telecommunication market changing, how it impacts operators and how they respond to it?
2. Which forms of partnerships do operators create with external organizations?
3. How does the digitalisation trend influence Serbian telecommunication market and how mobile operators respond to digitalisation trend compared to other developed countries?

The paper is structured in the following way. In the second chapter literature review on new business models in telecommunication market is presented. Research methodology is presented in chapter three. Telecommunication market trend and strategy of mobile operators is analysed in chapter four. Chapter five describes possible collaboration models between operators and external partners. Each model is followed by an example from practice. Chapter six analyses the situation on the telecommunication market in Serbia, and how operators are dealing with it. Chapter seven presents results and discussion; chapter eight concludes the work.

2. Literature Review

The telecommunications market is constantly evolving with an increasing demand for faster data speeds, ongoing external regulatory and competitive pressures and changing societal expectations (Vodafone, 2017). Operators are challenged to innovate in both technological and product segments (Asimakopoulos& Whalley, 2017). The survival of telecom service providers has become very demanding as the telecom market is now highly saturated and on the verge of big changes (Yang, Trimi& Lee, 2016). Driven by a digital transformation of the telecom business, operators need to evolve and adjust their portfolios. One of great challenges operators face is how to compete with other OTT providers (Wang, Lai & Chang, 2016). The impact of OTT service providers on telecommunication market, consumer trends toward the adoption of OTT services and how they influence operator revenues were analysed by several authors (Sujata et al., 2015; Lutilsky&Ivic, 2016; Gerpott&Meinert, 2016).

Monitor Deloitte predicted four possible scenarios that could happen to mobile operators in the future depending on infrastructure and services ownership. In the first scenario operators possess the whole system from technological assets to end-to-end customer services. In the second scenario, mobile operators still hold the network infrastructure, but have lost end user control. The third scenario defines mobile operators as end service providers, who do not control network anymore, and in the fourth scenario, the most pessimistic one, operators have lost the full control over all the elements (Monitor Deloitte, 2017). No matter which case happens to come to pass, each scenario triggers changes in the business that model operators have nowadays.

The business model can be defined in various ways. In a simple and short way, the business model is described as the “way of doing business” or its “business concept” (Hamel, 2002; Voelpel, Leibold, Tekie& Krogh, 2005). Campanovo and Pigneur (2003) define the business model as a detailed conceptualization

of an enterprise's strategy at an abstract level, which serves as a base for the implementation of business processes.

Ghezzi, Cortimiglia&Franc (2015) assumed that external and internal changes influence the company's strategy and affect business model elements; as a result, a strategic re-planning process should be triggered. New customer preferences also represent an opportunity for business model changes (Casadesus-Masanell& Zhu, 2012).

Mobile operators can take different actions to empower innovation and stay competitive in the market:

- to create a development centre (Rohrbeck, Thom & Arnold, 2015)
- to make a partnership with OTT players (Bayen&Ajadi, 2017; Xu & Chen, 2015)
- to charge OTTs mobile Internet access fee (Xu & Chen, 2015).

When mobile operators innovate the inside organization, the investment required is quite high and the approach is risky for operators as they do not have the necessary skills to launch such services (Sujata et al.,2015). Xu and Chen (2015) conclude in their research that for both mobile operators and OTT service providers the biggest profit on both sides could be achieved through cooperation strategy rather than through charging OTTs access fee. Hung and Chou (2013) conclude that technological turbulence significantly and positively moderates the effect of inbound open innovation on firm performance. A competitive advantage is a key strategic element of open innovation (Ghezzi, Balocco&Rangone, 2016). Creating networks with external organisations seem to offer flexibility, speed, innovation, and the ability to adjust smoothly to changing market conditions and new strategic opportunities (Dittrich &Duysters, 2007; Schneider & Spieth, 2013; Munir, Linaker, Wnuk, Runeson&Regnell, 2017). The ability of the firm to maintain and develop external connections is the first critical enabler that explains higher levels of success (Sisodiya, Johnson & Gregoire, 2013). Companies are trying to collaborate with startups and to transform them into engines of corporate innovation since the corporation has resources, scale, power, and the routines while a startup has promising ideas, organizational agility, the willingness to take risk, and aspirations for rapid growth (Weiblen& Chesbrough, 2015).

Using external knowledge for product development might also mean using the input from customer so that the product can be developed and optimized according to user wishes. The customers' feedback has been an important part of product innovation in recent years (Bosch-Sijtsema& Bosch, 2014; Schaarschmidt& Kilian, 2014).

3. Research Methodology

The paper reviews the literature on market trend in the telecommunication industry and analyses new business models mobile operators are implementing. To answer the research questions various studies, reports, reviews, books, white papers, articles were analysed. Operators strategy was analysed based on annual reports published by leading mobile operators. Statistical data were taken from respected institutions in telecommunication industry: International Telecommunication Unit (ITU), European Union statistical office (Eurostat), Republic of Serbia Regulatory Agency for Electronic Communication and Postal services (Ratel) and reports from global leaders in the ICT solutions (Cisco, Ericsson). For every proposed business model, an example was given, and these were taken from mobile operators' official press releases.

4. Telecommunications Market Trend

The demand for mobile data services to watch videos, browse the internet, and use applications have accelerated rapidly. One example of this trend is that at the end of the 1990s, the number of Internet users in the EU was around 15% of the population and only a fraction thereof used online shopping. Now, Internet penetration in this region has reached 85%, and the number of online shoppers has increased to almost 60% (Eurostat, 2017a; Eurostat, 2017b). Mobile broadband subscriptions have grown more than 20% annually in the last five years and are expected to reach 4.3 billion globally by the end of 2017 (ITU, 2017). The global mobile data traffic grew by an estimated 63% in 2016(Cisco, 2017). According to Ericsson (2017) traffic measurement for the period 2012-2017, in each quarter there was strong growth in data traffic, while voice traffic was stagnating. It is anticipated that by the end of 2022 mobile broadband subscriptions will reach more than 90% of all mobile subscriptions. These data show that telecommunication industry is shifting from an industry that was all about voice to one that is mostly about data.

Today, almost half of global telecommunication revenue (48%) comes from data, compared to only 22% five years ago (Vodafone, 2017). Global telecommunication revenues declined by 4% between 2014 and 2015 (ITU, 2017). Mobile broadband prices, as a percentage of gross national income per capita, dropped by half between 2013 and 2016 (ITU, 2017). The study from (2017) has calculated that the consumer migration to OTT messaging services will cost network operators nearly \$104 billion this year, equivalent to 12% of their service revenues.

These statistics show that the demand for data services was significantly growing in the past and will keep up with this trend. Mobile operators are constantly challenged with price erosion and increasing capacity demands. To follow the market trend, operators are forced to keep on investing in network infrastructure. On the other hand, having just good quality network for all the digital solutions would not be enough. Mobile operators nowadays are looking for ways to become the end-to-end service providers. Percentage of providers offering services such as video, music, cloud storage, location based services and etc. grew from 35% in 2011 to 85% in 2014 (Allot, 2014).

Annual reports published by leading telecommunications providers (Telekom Austria, 2017; Vodafone, 2017; Telenor, 2017) show that mobile operators have similar strategies: to be the best in the core business, to obtain network leadership, to expand their portfolio, to have the best customer experience and to offer digitalized services. Operators are working on a machine-to-machine communication solutions that include automotive, fleet management, smart cities, health and manufacturing. Cisco (2017) predicts that by 2021, M2M mobile connections will reach more than a quarter of total devices and connections. Mobile operators are preparing for the fifth-generation network. The 5G will enable a wide range of use cases for the massive Internet of Things. In 2022, the number of 5G subscriptions is forecasted to reach more than 500 million (Ericsson, 2017).

The digitalisation trend boosts tendency for infrastructure investment. This is extremely complex, and it requires operational, organizational and business changes (Contreras et al., 2015). However, every technology progress so far required similar reorganisations and operators are familiar with these dynamic changes. By only improving the network infrastructure, operators' revenue will hardly grow. Broadening product portfolio is the big challenge for mobile operators. To take advantage of digitalisation trend changes in business model are needed. Operators are working on innovations in some cases on their own, but more frequently they create different development programs through which they work with partners on creating new products.

5. Mobile Operators Partnering with Other Organizations

Innovation and creativity in the workplace have become increasingly important determinants of organizational performance, success and longer-term survival (Anderson, Potocnik & Zhou, 2014). Inbound open innovation or external knowledge sourcing refers to the practice of establishing relationships with external organisations or individuals with the purpose of accessing their technical or scientific competencies for improving internal innovation performance (Chiaroni et al., 2010). By pooling intellect in a system architecture, open invention and open coordination can produce superior products and services relative to those produced by a smaller number of minds huddled together in a single company (Chesbrough & Appleyard, 2007). Operators can access external knowledge sources by various means of agreements involving individuals, companies and other organisations that possess the relevant knowledge to complement the operators' internal innovation.

5.1. Mobile operators partnering with universities and R&D institutions

Almost every operator has some partnership with R&D institutions and universities. By being in contact with R&D institutions, they stay in touch with all the latest scientific achievements. In 2016, the Telekom Austria Group had research partnerships with the Vienna University of Technology, the Christian Doppler Laboratory for Wireless Technologies for Sustainable Mobility, the Christian Doppler Laboratory for Dependable Wireless Connectivity for the Society in Motion, and the Josef Ressel Centre for User-friendly Secure Mobile Environments (Telekom Austria, 2017). In collaboration with the Norwegian University of Science and Technology, Telenor will establish a lab within Artificial Intelligence and Big Data in Trondheim (Telenor, 2017).

5.2. Mobile operators cooperating with startups

Mobile operators can connect with startups in many different ways, depending on the amount of invested money and the level of collaboration (Bayen & Ajadi, 2017). Once collaboration is established, startups can be an important source of innovation and growth. Companies create different development programmes

through which startups receive support, funding, coaching, and co-location. Programs allow operators to engage with a larger number of startups, to pursue multiple interesting approaches in parallel depending on the number of startups they work with. When working with operators, startups can get equipment, market access and industry expertise and can add a well-known brand name to its list of customer references upon the completion of the joint project (Weiblen& Chesbrough, 2015).

To maximise the chances of success, choosing which startup to work with and at what maturity stage is an important factor. To organise a competition is a common way for operators to start a collaboration with startups. Mobile operators organise the competition usually by defining the category for solutions. Winners get short-term grants, but also a chance to continue working with the operator. Some competitions are held for public relations reasons rather than a real desire to engage in long-term partnerships. Also, startups sometimes focus only on seeking funding, not opportunities to collaborate (Bayen&Ajadi, 2017). On the other hand, operators organise competitions to find startups they want to work with through some development programmes, incubators, accelerators. The A1 Startup challenge is a competition that is held in Vienna, in which the A1 is looking for a startup to work on developing innovative digital solutions (A1, 2015). Telefonica organised the competition to identify the innovative technological projects with the greatest potential in the world. It was a virtual race that could be joined by innovative projects and startups from around the world (Telefonica, 2016).

Another way for operators to connect with startups and start working with them is to invest in a technical hub. and invested in the project by the European Commission, acceleration programme called *the Startup Europe Partnership* and a think tank called the European Digital Forum (Dawinderpal, 2014).

Once the startup or partner has been selected, operators can continue collaboration through different programs and forms of partnerships. Corporate incubation has become an established means to commercialise corporate innovation (Weiblen& Chesbrough, 2015). Mobile operators create a tech hub that can help startups develop their idea. Operators give the co-working space, financial investment, know-how and media relations. This is a way to offer internal operator knowledge and expertise and help the development of the invention. The program can last several months or a few years depending on the operator strategy. Operators define co-working conditions, and usually get a certain amount of startup equity. The Telenor Accelerate (Hungary) is a short acceleration programme lasting five months, one which includes a series of workshops and mentoring sessions and access to the Telenor infrastructure for testing and marketing opportunities among customers (Telenor, 2016a). The A1 Start Up Campus is the programme that can last up to three years. Startups are given space to work on the campus and business consulting from dedicated A1 experts in the field of technics, marketing, sales, finance, PR, legal area. In return, the A1 gets access to innovation and gets part of equity share (A1, 2015).

Operators can invest in startups directly, through their funds. For example, the A1 has invested €600,000 in Parkbob, a smart parking application. It combines real-time parking data with a database of parking regulations, linking these with geo-information to show where parking is allowed, what it costs and where free parking spaces are in real time (European communications, 2016).

The mobile operator can make an equity investment in the startup partner resulting in a joint venture run by both entities. The MTN, one of Africa's largest telecom operators, has partnered with the Rocket Internet and the Millicom International Cellular to develop Internet businesses in Africa through the Africa Internet Holding (AIH), a company dealing with e-commerce businesses across the African continent (MTN, Millicom and Rocket Internet each became 33.3% shareholders in AIH) (MTN, 2013).

The mobile operator can make a deal with a startup to resell its product by putting it in the product portfolio. The NavVis has developed a method for surveying building interiors with centimetre accuracy (it surveys building interiors by scanning them with lasers and simultaneously taking 360-degree panoramic photographs), and the Deutsche Telekom has integrated this new system within its product portfolio (Deutsche Telekom, 2017).

The mobile operator can acquire a startup to integrate it with its operations. This way the mobile operator can broaden its area of expertise and take a position in the new market or secure competences within the markets where they are already present. In 2016, the Telenor Group bought 95% of Tapad company (Telenor, 2016b). This startup tracks data points across multiple screens (mobile, PC, TV) to gain a better sense of where consumers are going and what they are doing online. It then packages and sells the information to media buyers, brands and other advertisers to create a better-targeted advertising. From the operator's point of view, this acquisition could improve understanding of customer behaviour and support a building platform for other business areas.

One operator can make different collaboration agreements with different startups. Startups can also collaborate with more than one operator. Mobile operators can also change the model of cooperation with startups as the product develops. One example of this is the cooperation between the Parkbob and the A1. The Parkbob firstly participated in a startup competition organised by the A1. After being selected, the startup employees moved to the A1 campus, where they worked together with A1 experts on developing the application. Finally, after two years, the A1 decided to make the direct investment to support the further development of the Parkbob.

Weiblen& Chesbrough (2015) discussed two different models of engaging with startups, a traditional one in which corporations have partial ownership over a startup and an open business model in which there is no equity involved. The study showed that companies were evolving more lightweight models to engage with startups to accelerate their decision making and their ability to attract, support, and retain startups in large quantities. Nevertheless, the equity-based model gives a better financial performance in the case of success, it is a way to get deeper insights into new technologies or strategic market for which the corporation is not able to provide a satisfying offering. The characteristics of these two types are shown in Table 1.

Table 1: Characteristics of collaboration models for outside innovation between mobile operator and startup

	Corporate venturing	Startup program (no equity)
Main goal	Financial return, Insight and influence	Product innovation, First-mover advantage
Number of startups	Low	Medium
Value capture	Equity stake	Product sales
Organizational anchoring	Separate venture capital arm, board level	Separate innovation unit, R&D
Time horizon of involment	Long term	Short term
Admission of new startups	Due diligence	Open

Source: Weiblen& Chesbrough, 2015

6. Serbian Telecommunications Market and Operators Business Models

There are three mobile operators in Serbia: Telekom Serbia (46.8% market share in terms of number of subscribers), Telenor (31.2%) and Vip mobile (22%) (Ratel, 2017). The telecommunication market in Serbia is quite mature. From 2013 to 2016 the number of subscribers did not change much (9.2 million in 2013 and 9.09 million in 2016); 91.8% of inhabitants are using mobile phones; the percentage is a bit smaller for smartphones - 71.2% of inhabitants (Ratel, 2017). Regarding the network coverage of the 4G signal, mobile operators in Serbia are on track with the EU average. The average percentage of the 4G signal in the households in 2016 in EU was 84%, and in Serbia the Vip mobile had the largest coverage with 94.3% (Ratel, 2017). Mobile communication industry in Serbia is getting to be data-centric; in the last five years, data traffic on an average has grown by 46% yearly. The expansion of OTT messaging services and social media is noticeable in the statistics for SMS and MMS traffic. From 2015 to 2016 the number of sent SMS messaged decreased by 12.8% and MMS by 17.3% (Ratel, 2017).

Statistical data show that the digitalisation trend has impacted the telecommunication market in Serbia, and, accordingly, mobile operators in Serbia are very active in innovation communities. The Vip mobile has a collaboration with the ICT Hub. One of their joint projects was a hackathon organised with topic digitization of agriculture (ICT Hub, 2017). The Vip mobile and the ICT Hub also organised a competition "Vip IoT Challenge". The task was to design and implement innovative Internet of Things (IoT) solutions using narrowband technology (Cord, 2018). The Telekom Serbia sponsors the Startit, an innovation centre for IT. Additionally, they created a programme, a MTS startup accelerator, through which they invested in the Startup academy (a programme that gathers and helps local startups) (MTS, 2018a). The Telenor and the MTS are both part of the Digital Serbia Initiative (organization that stimulates digital innovation) (Digital Serbia Initiative, 2017). Mobile operators in Serbia do not have their development centres. Still, they are broadening product portfolios and are offering new end-to-end services that are beyond their initial scope of offering pure data and voice traffic. In order to analyse operators' innovativeness in Serbia their product portfolios were analysed. It appears that mobile operators offer different services of cloud storage, applications for listening to music and watching TV, as well as some OTT services. The MTS offers software, created by the Green soft, for automated agriculture production processes management (planning, tracking, maintaining agriculture processes, employee and machinery control) (MTS, 2018b). The "MyKi Touch" is a solution offered in col-

laboration with the Alterco; it is a children's watch designed to connect parents with a child, by allowing transmission of calls, text and voice messages as well as monitoring the exact position of a child (Vip mobile, 2017a). The Vip Enterprise Mobile Management is a solution for business customers developed in collaboration with the IBM that enables accessing company applications and data on the move in an efficient and secure way (Vip mobile, 2018). The "Vipmatalica" is a result of collaboration between the Vip and the Kreativni centar; it is an online collection of children's stories (Vip mobile, 2017b). One very successful collaboration was between the Vip mobile and startup Things solver – together they created a tool - application that improved efficiency in the radio network; it allowed a better radio capacity allocation and planning, optimization and foreseeing future user problems (Milovanovic, 2018).

Some of the mobile operators in Serbia are members of larger international groups (the Vip mobile of the A1 Telekom Austria group and the Telenor Serbia of the Telenor group) and as such can take advantage of all the innovation achievements created within the group inside their tech hub and in some cases to participate in them.

7. Results and Discussion

The first question paper investigated was how the telecommunication market is changing and how mobile operators respond to it. Mobile communication industry in the last twenty years has been characterized by constant technology development from lower-generation network connectivity (2G) to higher-generation network connectivity (3G, 3.5G, and 4G or LTE) with each new technology resulting in faster, higher bandwidth and more intelligent networks. Today, mobile operators are preparing for the fifth-generation network that will enable a wide range of use cases for a massive Internet of Things (higher traffic volume; indoor or hotspot traffic; traffic asymmetry; and spectrum, energy, and cost efficiency). Statistical data published by respected institutions in telecommunication industry such as the ITU (2017) and the Eurostat (2017a, 2017b) show that there is an increasing demand for data-centric services, on the one hand (mobile broadband grows 20% annually), and operators revenue decline, on the other (revenue declined by 4% between 2014 and 2015, and broadband prices dropped by half between 2013-2016). The results indicate that to respond to data traffic growth, mobile operators need to invest in infrastructure and improve network capabilities. The need for data-centric services is rapidly growing and predictions by the Ericsson (2017) and the Cisco (2017) are that in the next five years data traffic will dominate the mobile network. The revenue decline mobile operators are facing indicate that having a good quality network is not enough for generating satisfactory revenue and that mobile operators need to make changes in their portfolio and to offer more innovative data services. Therefore, to ensure their position as content providers, mobile operators need to expand their offer, beyond pure voice and data; they need to offer end-to-end services. Rarely do operators have enough knowledge, skills and finance to create new products internally which means they have to make some changes in the business model to empower innovation and generate new data services. These results have shown that for mobile operators innovation in the business model is as important as innovation in technology.

The second research question was what kind of partnerships mobile operators form with external organizations. To keep up with the newest trends and achievements, it is important for operators to be well informed. That is why many of them partner with R&D institutes and universities. There are several benefits mobile operators can obtain when working with a startup: growth of core revenue, creation or improvement of their image of innovative content provider, creation of a new revenue stream and reduction in the costs in some areas (Weiblen& Chesbrough, 2015; Bayen&Ajadi, 2017). One of the first and biggest challenges operators face is to choose the right startup to work with. Innovation hubs gather startups from different fields and as such are attractive for operators; that is why many operators choose to invest in hubs. A competition is also a popular way to select a partner. Competition and investment in local tech hub are collaboration programmes that do not require equity. The other ones can vary depending on the company's strategy and the depth, duration and success of collaboration between the operator and the startup. For instance, in the early stage on the inside development programme operators do not necessarily acquire equity, but as the product develops and the depth of cooperation increases, the operator usually acquires part of ownership over the startup. This is the case in which the operator develops the product together with the startup; in case they notice a good business opportunity that is already developed and want to profit from it, they can sign a joint venture with the company, and resell the product. There is always a trade-off between these models: if collaboration is established at the early stage, the risk of product failure is higher but in case of success the profit is bigger. On the other hand, the probability of failure with already formed products is lower as well as profit margin. Another compromise is between the number of startups the operator can work with – the more investment they make in one startup, the less funding is left for the other startups, but

in case of success the profit will be higher. If operators work with several startups and solutions, the probability that at least one will succeed is higher but also the profit might be smaller. A summary of all collaboration models between startups and operators with listed examples is presented in Table 2

Table 2: Collaboration models between the mobile operator and the startup

Collaboration models		Examples
Partner/Startup selection	Organise startup competition	A1 startup competition, Telefonica virtual race
	Invest in technical hub	Telefónica, Orange and Startup Europe Partnership, European Digital Forum
Forms of partnerships between Operators and startups	Internal development centre	Telenor Accelerate, A1 Start up campus
	Make direct investment	A1&Park Bob
	Sign joint venture	MTN&AIH
	Content reselling	DeutscheTelekom&NavVis
	M&A	Telenor&Tapad

Source: A1, 2015; Dawinderpal, 2014; Deutsche Telekom, 2017; European communications, 2016; MTN, 2013; Telefonica, 2016; Telenor, 2016a; Telenor, 2016b

Reports published by leading mobile operators (Telekom Austria, 2017; Telenor, 2017; Vodafone, 2017;) demonstrate that mobile operators have awareness about the market trend that generate constant need for new services, and that they are trying to increase their innovation activities in collaboration with different partners, which confirms that open innovation is the way to enforce internal innovation and create new products.

External knowledge and knowledge from other industries can not only complement the existing expertise in the company but can also broaden the perspective for new ideas and approaches. Working with dynamic, adoptive and fresh motivated experts like the ones working in the startup can lead to generating some new ideas and solutions that operators were not even aware of before the collaboration took place. One of the examples for this is a very successful collaboration between the Things solver startup and the Vip mobile (Milovanovic, 2018). Data mining and radio access optimization know-how was combined and as a result, a tool that allows a better radio capacity allocation and planning, optimization and foreseeing future user problems was created. This tool made financial savings for the company, but it was also the first product that was created inside the company and could be sold to other operators.

The telecommunication market in Serbia is characterized by a constant growth of data traffic, a reduced demand for SMS/MMS and broad operators' portfolio with a range of innovative services they have created in collaboration with different partners (children's watch, cloud storage, solution for data security, agriculture management tool). They also tend to increase innovation activities by connecting with a local hub (Vip mobile and ICT Hub, Telekom and Telenor with Startit). These results answer the third research question that the telecommunication market in Serbia is changing in the same direction as in other developed countries.

Conclusion

The paper shows the business models mobile operators use to broaden their portfolios and stay competitive in the market and it highlights the importance of business model innovation in the telecommunication industry. Mobile operators have the clear strategy for technical improvements. Statistical data show the growth in data traffic in the past years, and predictions are that this trend will continue. To respond to an increasing market need for data consumption, operators are focused on modifying their infrastructure and are working on goals such as network virtualisation, M2M and fifth generation network. Improving technical performances of the network is imperative since it is dictated by the market trend. Nevertheless, if operators are offering only good quality network without OTT services, financial achievements will not be satisfactory. The revenue of mobile operators is threatened by the OTT service providers and to respond to it, mobile operators need to expand their portfolio and to offer end-to-end services. To achieve this, they should modify their business model which shows that innovation in business model is as important as innovation in technology.

The topic of open business models is widely present in literature. However, there was not so many research dealing with their application in the telecommunication industry (Xu & Chen, 2015; Dittrich & Duysters, 2007; Weiblen & Chesbrough, 2015). An analysis of different reports and offers has shown that mobile operators are aware of the market trend and are already working on empowering their innovation processes. Operators make different partnerships with various institutions such as R&D institutes, universities and startups. Operators create different development programmes through which they offer support, funding, coaching, and co-location. Programmes allow them to engage with a larger number of partners and to work on multiple interesting approaches in parallel. Mobile operators can connect with startups in several ways, depending on the amount of invested money and the level of collaboration. This confirms that operators use open business models to increase innovation activities.

The mobile communication market in Serbia is getting influenced by the digitalisation trend. This has been proven by statistical data showing the growth in the data traffic, decrease in SMS and MMS traffic and high investment in the data network. Portfolios of mobile operators in Serbia showed that they are applying new business models to create new products. They invest in innovation hubs, organise startup competitions, invest in startups and resell the contents of other companies.

The publication dealing with open business models mobile operators apply in Serbia was not found in literature. This area should be examined in more detail. For further research primary data should be collected from operators to investigate their experience on cooperating with partners and creating offers that are out of their scope. Since telecommunication market in Serbia is changing in the same direction as in other developed countries, the results could be generalized to other markets as well.

The paper analysed possible models mobile operators can implement to empower their innovation activities. The study can help managers and directors to refine internal innovation processes and provides information about possible collaboration models they could have with other companies.

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