Radical and Disruptive Telecom Projects Based on Business Model Innovation

Tsvetoslava Kyoseva¹, Peter Lindgren² and Vladimir Poulkov¹

¹Faculty of Telecommunications, Technical University of Sofia, blvd. Kliment Ohridski 8, Sofia, Bulgaria
²Aarhus University, School of Business and Social Sciences, Birk Centerpark 15, Office: CGC LAB, DK-7400 Herning, Denmark
E-mail: ts.kyoseva@gmail.com; peterli@btech.au.dk; vkp@tu-sofia.bg

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Abstract

Every Business Model Innovation (BMI) at a given moment reaches its tipping point of Innovation, from which the inevitable outcome is the reversion resulting from the saturation of the Business Model Ecosystem (BMES) by value propositions (products, services, processes and technologies). This paper explores Business Model Innovation in the telecommunication industry and how it struggles to pass this tipping point via different kind of BMI with a special focus on initiatives of Radical and Disruptive BMI. Furthermore, it covers an analysis related to the evaluation of the radicalness and disruptiveness of new coming value propositions with focus on the businesses’ Business Models (BMs), their related value propositions and technology innovation characteristics. As part of the research different businesses in the telecommunication BMES are approached with set of questions and the results are analysed in two scenarios: Technological and Business Model Innovation characteristics, which have been the key impact on the Telecommunication BMES in terms of identified radical and disruptive BMI.

Keywords: Telecommunications, Disruptive and Radical Business Model Innovation.

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1 Introduction

The evolution of the telecommunications’ BMES from a BMES driven by technology to a BMES driven by the needs of end consumers is a fact over the past few years [1, 3]. Telecommunication businesses are in a situation that they have to balance between the need to introduce new products and services on one hand, and to reduce the cost of investment and operation on the other. This is considered as the beginning of consequent trends that reflect the dynamic development of the telecommunications industry and the telecommunication networks as a whole. And here comes the question: “What are the main drivers of development within this Telecommunication BMES in the coming years?”. Up to now there is a strong indication that convergence of networks and telecommunication technologies would be the main driver for radical changes maybe even disruptive changes in the Telecommunication BMES. But are there indication and/or facts proving that expectation?

The starting point in this paper is the consideration that an important role in this transformation will not be “Incremental” BMI of an existing product, service or process of products and services that changes the existing value propositions of BM’s radically (reach) and is new to the business, market, industry, world incrementally [24, 25], but will be played by so-called “Radical” and/or “Disruptive” BMI, defined as:

- “radical” – BMI of a new product, service or process of products and services that changes the existing value propositions of BM’s radically (reach) and is new to the business, market and industry (radicallity) [24, 25].
- “disruption” – BMI of a new product, service or process of products and services that displaces the existing product, service, market or industry due to implementation of a totally new BM approach, a technology or a Business Model (BM) to the world [24, 25].

There are by other words different approaches for definition of the change in BM’s or BMI. The change of BM’s or the BMI carried out can lead to incremental, radical or disruptive BMI results and can hereby be expressed in a 3-dimensional BMI framework model inspired by the research (Taran et al.) [24]. The 3-dimensional BMI is depicted on the Figure 1.

The three dimensions are covering the ranges to the explained degree below:

- Radicality – where low (score 1) is an incrementally new, middle (score 2) is a radically new, and high (score 3) is a disruptively new.
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Figure 1  A 3-dimensional business model with reflection on achieved innovativeness.

- Reach – where low (score 1) is considered as a new to the Business (firm), middle (score 2) is considered as new to the marketplace and/or the industry, and high (score 3) is considered as new to the world.
- Complexity covering 1–7 BM Dimensions – ranging from low (score 1) where change happens in 1–4 BM Dimensions simultaneously, middle (score 2) where changes happen in 5 BM Dimensions simultaneously, and high (score 3) where any change happens in 6–7 BM Dimensions simultaneously.

The 3 types of BMI into these models gives us the possibility to mark up the areas of incremental, radical and disruptive business model innovation as seen in Figure 2.

Figure 2  Incremental, Radical and Disruptive BMI seen in the 3-dimensional BM.
The main BM dimensions of the Complexity dimension in focus in this research in the 3-dimensional BMI are listed and explained in the following Table 1.

What is however very important is that the new BM’s should be accepted by existing customers and users in the BMES and recognized by them as a valuable offering from the businesses – product, service or processes – independent of they are radical or disruptive.

In this regard, an overview of the BMI as a driving force in radical and disruptive technological aspect during the last couple of years in the BMES is provided. The analysis combines the “what” and “why” of the identified radical and disruptive BMs, which have been successfully commercialized according to the respondents being part of the BMI and our research. In this hence we focus on the implemented BM’s technology are able to return their investment within the expected timeframe. Further investigation on the reasons why these technologies have not been widely implemented or are not justified economically is done by identifying how important was the technology for the customer acceptance of the BMI.

Table 1  Incremental and Radical orientation, and focus of the research of each BM Dimension in the proposed BMI Framework

<table>
<thead>
<tr>
<th>Business Model Dimensions</th>
<th>Incremental BM Innovation</th>
<th>Radical BM Innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Value proposition (Products, Services, Processes of products and services)</td>
<td>What the Business is doing but in better way</td>
<td>Business is doing something differently</td>
</tr>
<tr>
<td>2. Users and Customers</td>
<td>Existing users, customers and markets</td>
<td>New users, customers and markets</td>
</tr>
<tr>
<td>3. Value chain function</td>
<td>Exploitation (lean, continuous improvements)</td>
<td>Exploration (open, diversified)</td>
</tr>
<tr>
<td>4. Competences</td>
<td>Familiar (e.g. technology)</td>
<td>New and unfamiliar (e.g. technology)</td>
</tr>
<tr>
<td>5. Partner network</td>
<td>Familiar and/or existing partner network</td>
<td>New networks (alliances, joint ventures)</td>
</tr>
<tr>
<td>6. Value formula</td>
<td>Incremental cost cutting in existing processes</td>
<td>New processes to generate revenues, or radical cost cutting in existing processes</td>
</tr>
<tr>
<td>7. Relations</td>
<td>Continuous improvement of existing relations in the distribution channels</td>
<td>New relations to new channels are built</td>
</tr>
</tbody>
</table>
Based on the analysis an outcome about what are the business and technological characteristics, which may form an important set of parameters for radical and disruptive BMI in telecommunication BMES. This hypothesis was tested by studies of the value chain of telecommunications operators or as we call them in this paper businesses (firms, companies, enterprises) [25] – along the value chain in the BMES.

As an absolute necessity for our research was the participation of representatives from Telecommunication operator, Telecommunication vendor, Telecommunication integrator and Over-the-Top provider of alternative services to the offered by the telecommunication operator. A proposal to future BMI in telecommunication technologies, networks and BM based on identified parameters will be suggested.

Within the executed research the analysis is reduced to the necessary base for setting some future researches. One recommendation in this direction is the inclusion in the research representatives from other bodies in the BMES, part of telecommunication BMES value chain that could have effect on the process of BMI, such as regulation and standardization bodies. Some more recommendations in continuing the future investigations and research are also given at the end of the paper.

2 Research Methodology

The applied analysis is based on the framework model introduced earlier that evaluates the radicalness and disruptiveness of a new BM’s coming value propositions (products, services and processes) and embedded technologies [13]. The research is further focused on businesses’ BMs, their related value propositions and technology characteristics. As part of the research, the different businesses (companies, firms, and enterprises) are approached with set of questions following the format of the suggested research methodology.

In order to implement a business’s strategy, they have to create and implement BMI project/s. Typically research and results show that many new BM’s are based primarily on what the Businesses are already able to do to achieve their business strategies. Much BMI can therefore be classified as incremental – not radical and disruptive.

This sequence of steps identifies the BMI as a central part in each and every Business that intentionally would like to have BMI as part of its strategy.

Based on the 3-dimensional BMI and its BM Dimensions as shown in Table 1 an overview of the steps taken in the research is presented in Figure 3. In general, the research is approached on three major parts.
First part is named Preparation and is related to the research approach and research methodology. This part is related to the research preparation itself. It covers two aspects. As a starting point the Questioner had been done based on the requested information that should be gathered from the respondents to answer the research questions. Questions are divided in three main groups. The list of all questions is presented in Table 2.

<table>
<thead>
<tr>
<th>Question</th>
<th>Research Purpose of the Question and Link to the BMI Typology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Is innovation part of your Business strategy last 5 years?</td>
<td>Identification of the intentionally introduction of BMI project/s by the Business.</td>
</tr>
<tr>
<td>2. What is the last innovation that had been introduced by your Business? (name and one paragraph description)</td>
<td>Identification of the <strong>Business Model Innovation project</strong> that is going to be analysed further on. All the other questions in Group 2 and 3 will consider this BMI example. It is used as well to define the <strong>Value Proposition building block from Complexity dimension</strong>.</td>
</tr>
</tbody>
</table>
3. How many innovations had been introduced by your Business last 5 years?
   
   Open questions that allows any number to be reported and gives the researcher an ability to double check the answer from Question 1, mainly to verify if the Business innovates on purpose or by accident. Furthermore, the **Radicality dimension** of BMI can be identified since the risk for the Business is higher when it comes to more intensive innovation strategy for the period of 5 years.

4. Can you please list them?
   
   Double check if the interviewee is aware of innovation activities within the Business and what is considered as innovation at all by asking him/her simply to list them.

**Group 2 – Technology related questions (assume the last innovation launched)**

5. What type of technology was part of the innovation realization?
   
   Goes to **Core competences** building block of **Complexity dimension**. As well as, is the technology typical for the Business or it is totally new (for the Business, Market/Industry, or the World) and the results are related to the **Reach dimension** of the BMI project.

6. Was the technology an important element for the successful adoption by the customers?
   
   Identification of **technology importance** for success of the BMI result.

7. If yes, what were the 3 most important technological features for the successful acceptance by the customers?
   
   Used to identify pattern on both technological and business features for those BMIs that are considered Incremental and Radical.

8. Did you continue to improve the originally applied technology after the innovation commercial launch?
   
   Identification of **Incremental vs. Radical project related to 7 building blocks**. When incremental project is identified the building block receives 0 score, and when radical is identified the building block receives 1 score. This model is applied to all building blocks from Complexity dimension.

9. If yes, what was the main reason to do so?
   
   The answers are used for consideration whether the BMI project is further improved or not based on internal/external to the Business needs.

**Group 3 – Business related questions (assume the last innovation launched)**

10. What was the main innovation driver within the industry value chain? (options: the Customer, the Vendor, the partner, Your Business, Other)
   
   Was the BMI project started from internal need or it was driven by external party. The answers are used to identify in the radical results are more from internal needs or from external ones, and vice versa. Goes to **Value chain architecture building block from Complexity dimension**.

(Continued)
<table>
<thead>
<tr>
<th>Question</th>
<th>Research Purpose of the Question and Link to the BMI Typology</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. Is there any external organization involved in the realization?</td>
<td><strong>Network building block</strong> is identified. Used categories are University, Business Partner, Client, and Other (could be the Business itself, which relates to an incremental Network building block).</td>
</tr>
<tr>
<td>(options: University, Business Partner, Client, Other)</td>
<td></td>
</tr>
<tr>
<td>12. What kind of business change had been triggered by the innovation?</td>
<td>Goes to the <strong>Result section</strong> of the analysed BMI. As well as it defines the <strong>Target Customer building block from Complexity dimension</strong>, e.g. is the result leading to new market or it services the existing one. Used categories for Business change are: No change, I don’t know, Consolidation (of existing value propositions), Optimization (of existing value propositions), and Business model/ process change.</td>
</tr>
<tr>
<td>(e.g. change in business model, etc.)</td>
<td></td>
</tr>
<tr>
<td>13. What percentage of overall Business budget had been invested in the</td>
<td>Applied in <strong>Profit formula building block of Complexity dimension</strong>. Used ranges are: 0–5%, 5–15%, 15–30%, 30–50%, more than 50%, and I don’t know.</td>
</tr>
<tr>
<td>development of the innovation? (options: 0–5%, 5–15%, 15–30%, 30–50%,</td>
<td></td>
</tr>
<tr>
<td>more than 50%, I don’t know)</td>
<td></td>
</tr>
<tr>
<td>14. What was the ratio between the financial investment and the return</td>
<td>Used to identify if the return from the introduced BMI project was measured at all, and what is the outcome if they were. Goes to <strong>Profit formula building block of Complexity dimension</strong>. Set options are: less than 5 times, more than 5 times, I don’t know, and Other.</td>
</tr>
<tr>
<td>from the introduced innovation? (options: less than 5 times, more than 5</td>
<td></td>
</tr>
<tr>
<td>times, I don’t know, Other)</td>
<td></td>
</tr>
<tr>
<td>15. What is the name of the Business you work for?</td>
<td>Those that provided the name of the Business they work for, could be researched further based on publicly available information on the Internet. The Business name is still not to be disclosed.</td>
</tr>
<tr>
<td>16. What is your role within the Business?</td>
<td>Balance between technical vs. business responsible employees, as well as management vs. experts is been targeted.</td>
</tr>
<tr>
<td>17. What is the relation of your Business and the Telecommunication</td>
<td>Identification of the <strong>Business’s role in the Telecommunication industry</strong>. The following categories are used: Telecom Operator (TO), Equipment Vendor (EV), Service/Product Vendor (SPV), System Integrator (SI), and Telecom Consultant (TC). It is used to analyse for potential patterns for BMI projects depending on the Business role in the Telecom industry.</td>
</tr>
<tr>
<td>industry? (e.g. telecom operator, equipment vendor, service vendor,</td>
<td></td>
</tr>
<tr>
<td>partner, etc.)</td>
<td></td>
</tr>
<tr>
<td>18. Your Business is located in which country?</td>
<td>Additional information is gathered to set the geographical importance of the Business location.</td>
</tr>
</tbody>
</table>
The first group is named general questions and has the purpose to give an overview of whether the BMI had been a central part of business strategy, policies and plans, and how focused on it was the business last 5 years.

The respondents were asked what was the last BMI that had been introduced by the business they work now. The main purpose of the question is to give a base for identification of technology role within the BMI. All further questions and answers should assume the last introduced innovation by the Business.

Intentionally, the definition of BMI – incremental, radical and disruptive BMI – was not given to the respondent – but was analysed afterwards and related to the research framework and model for incremental, radical and disruptive BMI.

In addition, people had to give a number for introduced BMI's, and consequently mapped by the researcher in the framework model of the project.

The last question aims to analyse what the respondents actually perceive as a BMI. By having listed different innovation as examples, the researcher is able to calibrate the answers in-between practice and theoretical definition of BMI.

The second group of questions explores in more details the technological aspects of one elected BMI project – suggested the last launched by the Business should be explained by the responder and in particular the technological contribution to the successful acceptance of the innovation by end consumers.

Deep details about what type of technology had been part of the discussed BMI were gathered. The respondents were further put into a situation to analyse as from their point of view how important was the technology for the successful launch and consequent customer acceptance of the innovation, especially in adoption phase. For those who identified the technology related to the BM frameworks technology approach – as of a high importance, the next question was asked, namely, about the specific features that contributed to this success. Furthermore, the interviewees had been asked whether they continue to improve the BMI so that patterns about disruptive, radical or incremental BMI could be registered.

And last group of questions are related to the economic impact of the BMI to the Business. In this section, it was investigated if the Business did a closed innovation, only with internal resources, or it was set-up for open BMI. The section starts with gathering information about who was the main driver for the BMI, and in particular, is it the Business itself, or some other external body like the customer, the vendor or supplier, any other party, etc. Since the realization could be done with external resources as well,
the next question targeted the identification of this external partner, if any. Likewise, interviewees were asked to express their opinion about what kind of business change had been triggered by the BMI. The outcome is grouped in the categories of changes leading to optimizations, those that appear in the form of consolidations, and new business models and/or processes. In addition, two financially related questions were asked: one about the percentage of development budget invested and second about the return ratio out of the BMI.

Next step is the identification of potential respondents. The research took form of online interview based on existing contacts and covers 33 experts in the industry, at different positions in the Business they work for, and located worldwide in 12+ countries with multinational operations. It could be summarized that a balance between respondents with technical job function and respondents with business job function was targeted. Also, roles from expert level till top management level were intentionally approached, as when it comes to BMI the perception could vary from one extreme to the other. The last one is very important because usually top management considers the project as innovative one while the experts believe that it is not, or vice versa. Another diversity of respondents’ businesses that was sought was in terms of different operation type, placement and roles of businesses BMs through the value chain with the telecommunication industry. Those that were researched were representatives of:

- **Telecommunication operator** (TO) is the Business that invests in building infrastructure, e.g. fixed cables or mobile license, for delivering traditional telecommunication services like telephony to its clients.

- **Telecommunication Equipment vendor** (EV) delivers all the needed core infrastructure equipment for the mobile or fixed network of telecommunication operator. Typically, this is the Business that delivers the necessary application servers for launching new products and services by the telecom operator. Last couple of years this has been shifted to the Over-the-Top (OTT) providers.

- **Service/Product vendor** (SPV) or so called OTT providers are delivering alternative products or services to those that telecom Businesses are offering, but directly to the end users. The last means that the value chain in the industry is somehow changed in a way of adding new entrants that are not building their own infrastructure with totally different business models, e.g. being paid for online advertising, but not for the voice over Internet service.
• Telecommunication **System integrator** (SI) is this Business that usually integrates the equipment delivered by the telecom equipment vendor with the infrastructure within the premises of the telecom operator. The reason why this profile is researched as well, is because there is a trend into a direction that their role in the innovation process is becoming more and more of high importance.

• **Telecommunication consultants** (TC) are Businesses that work close with players in the industry and bring concentrated knowledge in solving specific issues or gives support in different areas where the Business has internal gap.

Summary is visualized on Figure 4, where it is presented that the majority of respondents are representatives of telecom operator 44%, followed by 18% from Service/Product vendor, the equal of 15% for Equipment vendor and 15% for System integrator, and 8% for Telecommunication consultants.

**Second** part is dedicated to the research Execution, which took form of the following combination:

• Direct distribution of the questionnaire to the respondents. This is the preferred way as the questions relate to specific information that usually is treated as internal for the Business due to its relation to competitive advantages and the public research in a disclosed form is considered as not effective enough. The respondents were willing to take part in the research only in case the name of the Business they work with is going to stay undisclosed.

• After first received results from each and every respondent, a couple of iterations for clarification of the answers are done.

• As a result, the final answers are compiled.
Third section is focused on the Outcome from the conducted research and has the listed herewith phases:

- Analysis of the results, where the received information is compared with theoretical models.
- Research outcome is focused on identification of what technologies are listed as disruptive, radical, and incremental, as well as further identification of their business and technical characteristics related to BMI disruptiveness, radicality and incrementalness. In addition, the financial impact is assessed as well, in case the respondents are capable to provide the needed information.

3 Research Results

The results of the conducted research are analysed and explained below. Some conclusions are dropped out of them with the intention to compare with what was known and what was not within the industry before this study was executed. All interviewees are approached directly and the Business they are working for is to remain undisclosed, due to some confidential information provided during the discussions.

The first group of more generic questions gave us an overview of how the Business had been performed in terms of number launched BMI’s and, what is the most important, whether the person is aware of them. It appears that the last one was a little bit difficult question for most of the interviewees, as s/he appeared to be aware only about those that are within their area of expertise or involvement, e.g. if the interviewee is an engineer then in the specifics were related to the concrete technological aspects. The period that had been researched is 5 years backwards as the products, services, and technology lifecycles in this industry are with this timeframe and shorter or longer period would be inappropriate.

On the first question, “Is innovation part of your Business strategy last 5 years?”, 94% of the respondents replied with a positive answer (see Figure 5). This is not a surprise as there is a common understanding, regardless business job function, that BMI and all activities related to it could be a powerful tool against competition. Other more interesting topics to be analysed are, how much of them really understand this power of BMI, if they have clear plans how to apply it through their business roles and what is the actual outcome from it. This was exactly the focus of the next questions.
Summary on answers from the second general question “What is the last innovation that had been introduced by your Business?” is provided in Figure 6. Both Telecom operator and Service/Product vendor innovations are focused mainly on infrastructure BMI projects – a set of software and/or hardware that is implemented as an enabler for delivering value proposition to the Business. While equipment vendors and System integrators are targeting innovations in the field of OTT services. OTT services are defined as a value proposition out of the infrastructure BMI project. In regard to the Telecom consultants, here it also appears that this group of business is oriented towards the innovations in different areas meaning processes (optimizations achieved e.g. by changes in the steps of existing process to the Business process), services and infrastructure.

It can be seen in Figure 6 that each and every group is focused on the innovation types that they have their competences in and thereby have their capabilities through their placement in the value chain and BM role to deliver.
Table 3  How many innovations had been introduced by your Business last 5 years?

<table>
<thead>
<tr>
<th>Number of Innovations</th>
<th>Number of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–10</td>
<td>31</td>
</tr>
<tr>
<td>10–20</td>
<td>8</td>
</tr>
<tr>
<td>100+</td>
<td>2</td>
</tr>
<tr>
<td>1000+</td>
<td>4</td>
</tr>
<tr>
<td>Many</td>
<td>2</td>
</tr>
<tr>
<td>No information</td>
<td>1</td>
</tr>
</tbody>
</table>

Telecom operators and Service/Product vendors are more as can be seen in Figure 6 focused on innovations based on infrastructure (a.k.a production technology innovation), while Equipment vendors and System integrators are more moving into direction of innovation in the field of OTT services (a.k.a product technology innovation).

On the next two questions, “How many innovations had been introduced by your Business last 5 years?”, the respondents’ answers are with no pattern of consistency and vary from few numbers (below 10) to 1000+. Summary of the answers is depicted in the Table 3.

It could be explained either with lack of understanding on what is innovation or lack of information. But when they are asked to explain further with the question “Can you please list them?” a long list had been enumerated. Some of them are listed below in a written raw form of the respondents. This could be considered as a common misunderstanding what is exactly an innovation and, as one of the main reasons why the definition was not given in advance is this to be assessed as well, the list consists of different examples that do not have the elements of being an innovation.

- Fraud Detection;
- Solar power plant, virtualised core network, digital TV;
- LTE; CSFB, U900; power savings features, Virtual Packet Core;
- RAF – Real Time Anti-Fraud. Steering of roaming for LTE traffic, IoT inbound detection, IoT management for all types of M2M devices;
- Sales process automation;
- Hybrid technology access, managed WLAN cloud, RCS;
- Wireless system for monitoring of arterial blood pressure at each cardiac cycle;
- SmarTrack – Light system for signalling of pedestrians crossing road trough pedestrian cross way type “Zebra”;
- 3D-SAC 3-dimensional system for assessment of climbers;
- ClimBoard – Smart wireless board for training of climbers for home use;
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- CA, 3CA, V+, G.fast, Voice+ (VoLTE, VoWiFi), Vectoring;
- Remote sensing system for fibre and cooper cables, NGN access platform, FBAR filters (patented), intelligent monitoring system for NGN;
- New tariff structures, combined fixed + mobile modem, over-the-top TV & video service, virtualized network infrastructure, various cloud services;
- 4G/LTE, Public channel in Viber, Cloud based services, Virtualization, TV sport channel;
- Hybrid technologies (g.fast, remote powering, etc.);
- Evolved communication suit;
- Policy control solutions;
- Real time charging;
- Cloud telecom services;
- Voice over IP application with parallel ringing functionality between your mobile phone and computer;
- Portfolio of cloud services, like central contact storage and synchronization, fax2email, etc.;
- Data VPN via mobile device;
- SDN (Software-Defined Networking) and NFV (Network Functions Virtualization) – innovation in technology;
- LTE and LTE architecture to support growth of mobile data and future LTE based applications;
- Automatic IVR recognition of fixed TV and Internet customers;
- Online self-service tools;
- Electronic invoice presentation;
- STK self-service menu;
- Automatic Push of OTA settings when handset receives MMS;
- Power Efficiency improvements in network infrastructure;
- Self-Organizing Network;
- Automated Customer Care;
- SDN, NFV, IP/OTN synergy, MPLS-TP, ODUflex;
- IOT, VoLTE, OTT, UCC;
- SIP based telephony Architecture;
- Migration to VM based telephony infrastructure;
- Mobile money, Machine-to-machine services, VEON;
- Workflow automation, Service portfolio, Delivery model, Execution model;
- BigData;
• RCS, 5G Cloud Radio Access Network, Advanced Communications and Messaging as a Platform (MaaP), Spam and Fraud Solutions, Telco-Web Communication Gateways;
• 5G radio access, virtualization of the mobile networks, internet of vehicles;
• vEPC, Vectoring, Predictive Analytics.

What should be noted, as a conclusion from the received answers, is that the respondents listed a vast variety from a mix of technologies that are still not commercialized to specific tariff plans. Going into deep details of the research, the answers to question about “What type of technology was part of the innovation realization?” are gathered in Figure 7.

It is worth to be noted that most respondents considered that the technology was an important element for successful acceptance of the innovation by the customers – 76% of the respondents (see Figure 8). However, as it is represented in Figure 7, the following type of technologies are identified:

• Infrastructure related technologies, which could be categorized as a production type of technology innovations;

<table>
<thead>
<tr>
<th>Telecom Operator</th>
<th>Services/Products Vendor</th>
<th>Equipment Vendor</th>
<th>System Integrator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small cell pre 5G</td>
<td>Real time charging</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LTE</td>
<td>Evolved communication suite</td>
<td>Policy control solutions</td>
<td></td>
</tr>
<tr>
<td>CSFB</td>
<td></td>
<td>Advanced traffic management</td>
<td></td>
</tr>
<tr>
<td>Power savings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G.fast</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hybrid technology access</td>
<td>SDN</td>
<td></td>
<td></td>
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<tr>
<td>Cloud technology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Virtual Core Network</td>
<td>NFV</td>
<td></td>
<td>New generation access networks</td>
</tr>
<tr>
<td>OTT Services</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RCS</td>
<td>Voice+, VoLTE, VoWiFi, Video</td>
<td>V2I</td>
<td></td>
</tr>
<tr>
<td>M2M apps, Predictive technologies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VoIP / Mobile Apps</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 7** What type of technology was part of the innovation realization?
Figure 8  Was the technology an important element for the successful adoption by the customers?

- Over-the-top services and/or products innovations based on a specific technology;
- Processes that are considered as an optimization type of technological innovations.

Another very interesting outcome is that more Information Technology related computing industry technologies considering the development, maintenance, and use of computer systems, software, and networks for the processing and distribution of data, are being considered as an important part of innovation realization. Split of the answers shown on Figure 7. This a real proof for the convergence trend between the Internet and Communication industries for delivering common services is already happening in the Businesses’ BMI projects (e.g. cloud technologies, etc.).

On the next question, “Did you continue to improve the originally applied technology after the innovation commercial launch?” majority of respondents provided positive reply (94% of the respondents). Results are visualized on Figure 9.

The last section of questions refers to the business aspect of launching an innovation. On the first question “What was the main innovation driver: the customer, the vendor, the partner, the Business itself?” the respondents revealed that for their Business the main driver for BMI is the customer with 40%, followed by the Business itself with 29%. It is a little bit vice versa for the Equipment vendor, where the Business itself triggers the BMI.
Figure 9  Did you continue to improve the originally applied technology after the innovation commercial launch?

It could be concluded, even with this number of respondents, that the pattern for vendor-centric BMI in the telecom sector. The last means that Telecom operator, being closer to the end customers, is very focused on BMI for covering customers need, but due to the technological and infrastructural dependencies on Equipment vendors this might not happen either on time, within identified need, or it is too expensive. The group of SPV providers shown typically for their profile results, meaning they are pure customer oriented because all of the BMIs were triggered by their customer needs. While the Telecom integrator are also usually customer driven, in the case of our respondent the innovation driver comes from the Business itself. More than one answer had been provided to this question and Figure 10 summarizes all the answers.

Going further with the next question, “Is there any external Network involved in the realization e.g. University, Business partner, etc.”, its answer shows that the majority of the respondents are realizing their innovations in collaboration with an external party. All the results are visualized on Figure 11.

When these results are mapped with the type of external Network, the group of Telecom operators is mainly doing innovations with partners and suppliers leading to 76% out of total responses within these groups. This is a
Figure 10: What was the main innovation driver: the customer, the vendor, the partner, the Business itself?

Figure 11: Is there any external Network involved in the realization e.g. University, Business partner, etc.

proof that the business model and BMI are still closed between the telecom operator and the vendor of new equipment and technologies. Moreover, some of the respondents explained the trend with the following reasons:
• Telecom operator: “Business model change (plus disruptive services and technologies)”
• Service vendor: “The customer (Telco operator) was the innovation driver. Having modern and effective networks, being simple and efficient at the same time, was the real innovation trigger of the SDN/NFV technology.”

Going further with the questions, on the next one “What kind of business model change had been triggered by the innovation?” the answers are also common in their categories. The results are shown in Figure 12. The predefined answers that are used are: Business model and/or process change, changes in optimization of existing value propositions, and changes in consolidation of existing value propositions. For the case of Telecom operator, we have answers in favour of both triggered changes in business model and changes in internal processes leading to optimizations. While the last is something, which the telecom can have a full control over its results, the change in business model is relied on the innovation done by the Equipment vendor (see outcome earlier). And what shows up is that Equipment vendors’ innovation have business impact over change in internal processes and new services portfolio, but not in focus of new business model. The group of OTT provider is typically focused on new business model and the group of Telecom integrator over the changes in their internal process as they are expected to be flexible toward what should be integrated and the client specific needs.

Figure 12  What kind of business change had been triggered by the innovation?
With the next question, “What percentage of overall Business budget had been invested in the development of the BMI?” a financial assessment was done. The results are populated in Figure 13. Almost one third of the respondents say that below 5% out of overall Business budget is dedicated for innovations, meaning the cost that Business dedicating for BMI projects considering the revenues that it is able to deliver over a certain period of time.

And the last question, “What was the ratio between the financial investment and the return from the introduced innovation?” refers to the profitability out of the BMI and results are visible on Figure 14. As from the results, it appears that majority of the respondents, saying a little bit above half of them, are not aware of the financial return from the investments their Business did. Circa 16% say that the profitability is less than 5 times the investment. Compared to the not so high investment in innovations, this could be considered as really very good process of management that leads to better return on the investment.
4 Characteristics of Radical and Disruptive BMI

As an outcome from the conducted research the respondents listed some technologies as disruptive innovations and they are analysed in terms of their characteristics first from theoretical point of view and then they are to be compared with the listed characteristics by the respondents.

Business characteristics of radical and disruptive innovation characteristics are generalized together with the research questions that interviewees had been asked. Similarly, to the technical characteristics technical ones are identified below. Both are presented in Figure 15.

As it could be seen from the results the formulated hypothesis for a radical technological innovation benchmark is based on the following characteristics:

- When a key element such as productivity, costs, etc. is placed against the time factor, there is a prerequisite for a disruptive technology. By considering the Value formula dimension from BMI framework, the results indicate that the technology should reduce costs, bring quality and time to market through new business processes to generate revenue.
- The impact on another technology must be constant over time, not a random one-time event. Here we have to consider new and unfamiliar to the Business technologies following the Competences dimension from BMI framework, e.g. high speed network, saved bandwidth capacity, ability to combine different networks, fixed-mobile convergence, data security.
- When a converged technology is targeted, there must be a convergence of more than one area.

<table>
<thead>
<tr>
<th>Business Features</th>
<th>Technology Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexible and Efficient</td>
<td>High speed network</td>
</tr>
<tr>
<td>Reduced cost for HW / infrastructure, maintenance</td>
<td>Saved bandwidth capacity</td>
</tr>
<tr>
<td>Easy to use</td>
<td>Ability to combine two different IP streams across different network types</td>
</tr>
<tr>
<td>Quality</td>
<td>Fixed-mobile convergence</td>
</tr>
<tr>
<td>Time to market</td>
<td>Data Security</td>
</tr>
</tbody>
</table>

Figure 15 Business and technology features.
Table 4  Summary of the key characteristics of 5 researched TO Businesses’ BMI projects

<table>
<thead>
<tr>
<th>Case</th>
<th>BMI Result</th>
<th>Complexity</th>
<th>Reach</th>
<th>Radicality</th>
<th>Key Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>TO1</td>
<td>Optimization</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>First commercial fully virtualised core network</td>
</tr>
<tr>
<td>TO2</td>
<td>Consolidation</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>LTE</td>
</tr>
<tr>
<td>TO3</td>
<td>Business model/process change</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Cloud based Fiscal Cash registers</td>
</tr>
<tr>
<td>TO4</td>
<td>Optimization</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Sales process automation</td>
</tr>
<tr>
<td>TO5</td>
<td>Business model/process change</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Hybrid technology access</td>
</tr>
</tbody>
</table>

In addition, SDN and NFV are those with highest match in the technical characteristics mainly because they are technology related innovations. In terms of business characteristics, it appeared that all the listed innovations have equal number of matched parameters. This could lead to a conclusion that SDN and NFV has the biggest potential to become a disruptive innovation based on the identified business and technological characteristics.

Summary of the first 5 researched Businesses that are in the group of **Telecom Operators** and their BMI projects is presented in the Table 4.

It could be highlighted that TO are focused on BMI projects that are not so Complex as they do not change more that 1 BM Dimension. Furthermore, the results are mainly in the Reach of the Business area – meaning that it is mostly new to the business. Same could be said in regard to the Radicality – 4 out of 5 TOs do incremental BMI project – meaning they only change very incremental the BM Dimension. It is not a surprise that only 2 TO considered their BMI project as a change in their BM. Results are visually presented on Figure 16.

Next 5 researched Businesses that are in the group of **Service/Product Vendors** are presented in the Table 5 together with their BMI projects.

Even though the group of SPV did not show much difference about Complexity dimension compare to the TO (they also do not change more than one BM Dimension in their BMI project), this is the group that shows a high level of Radicality to the extent of disruptive BMI project (3 out of 5 respondents). Having that said, this is the only group that has Reach to the market/industry of its BMI project (3 out of 5). For example, the implemented projects like cloud technologies, data analytics solution and the evolved communication suite were recognized as positively impacting
Figure 16  A summary of the 3 dimensional BMI framework for TOs’ results.

Table 5  Summary of the key characteristics of 5 researched SPV Businesses’ BMI projects

<table>
<thead>
<tr>
<th>Case</th>
<th>BMI Result</th>
<th>Complexity</th>
<th>Reach</th>
<th>Radicality</th>
<th>Key Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPV1</td>
<td>Business model/ process change</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>IoT detection and management for inbound and outbound roaming M2M devices</td>
</tr>
<tr>
<td>SPV2</td>
<td>Business model/ process change</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>Cloud technology</td>
</tr>
<tr>
<td>SPV3</td>
<td>Optimization</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>Predictive Technologies</td>
</tr>
<tr>
<td>SPV4</td>
<td>Business model/ process change</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>ByteMobile Insight, a big data analytics solution designed to provide immediate, actionable intelligence for mobile operator monetization, marketing and customer care organizations.</td>
</tr>
<tr>
<td>SPV5</td>
<td>Business model/ process change</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>Evolved communication suit, a full evolution of IP/4G messaging engines.</td>
</tr>
</tbody>
</table>

In other words, Businesses considered the results as a direct change in the Business model leading to more value for entire organization. Furthermore, the outcome is depicted as a graph on Figure 17.
In regard to the group of **System Integrators**, the researched 3 Businesses and their BMI projects could be found in the Table 6.

Figure 18 summarizes the results listed on Table 6. Complexity dimension is also very little presented by this group of SI. However, System integrators

**Table 6** Summary of the key characteristics of 3 researched SI Businesses’ BMI projects

<table>
<thead>
<tr>
<th>Case</th>
<th>BMI Result</th>
<th>Complexity</th>
<th>Reach</th>
<th>Radicality</th>
<th>Key Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>SI1</td>
<td>Consolidation</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>Highly scalable and customizable platform for New generation access networks.</td>
</tr>
<tr>
<td>SI2</td>
<td>Consolidation</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>Innovation department. It is an internal initiative where company employees generate ideas for applications (mostly mobile) and the company supports them in the realization.</td>
</tr>
<tr>
<td>SI3</td>
<td>Business model/ process change</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>Product for continuous automation and deployment of middleware products.</td>
</tr>
</tbody>
</table>
execute mainly radical BMI project, and their Reach goes for market/industry area. Only one representor did identify BM change as a result, compared to the rest of two that did consolidation of existing value propositions.

In the Table 7, a summary of 3 researched Businesses that are **Telecom Consultants** and their BMI projects is presented:

<table>
<thead>
<tr>
<th>Case</th>
<th>BMI Result</th>
<th>Complexity</th>
<th>Reach</th>
<th>Radicality</th>
<th>Key Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC1</td>
<td>Optimization</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>Social media apps to expand brand and awareness of services.</td>
</tr>
<tr>
<td>TC2</td>
<td>Business model/process change</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>Smart lens steerable antennas enable electronic beam steering with scanning angles up to 10 degree that is not available for existing systems on the market.</td>
</tr>
<tr>
<td>TC3</td>
<td>Business model/process change</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>Innovation management academy – which represents new business line for innovation services.</td>
</tr>
</tbody>
</table>
As it is shown in the table, Telecom consultants changed only one business model dimension from the Complexity dimension as all the other groups till now. Their Reach dimension though vary between Business itself, market/industry, and one example for significance to the World BMI project. Also, two of the Businesses realized radical project, and one managed to work over disruptive BMI together with changes in their BM. When it comes to the radical projects, both of them when they are leading to incredible results by applying untraditional approach (one in the brand and service awareness, and the other in the business model itself). The disruptive one is for implementation of a technology that brings a product, which does not exist on the market. A 3 dimensional BMI framework is visualized for TCs on Figure 19.

Last but not least, the group of 3 researched Equipment Vendors together with their BMI projects are depicted in the Table 8.

The last group of Equipment vendors managed to execute BMI project only in significance for the market/industry, as well as with two radical and one disruptive results. As it goes to the Business model change 2 out of 3 project were achieved. Complexity dimension stays as the other groups with only once changed building block. The results for this group are presented on Figure 20 as a graph of 3 dimensional BMI framework.
Table 8  Summary of the key characteristics of 3 researched EV Businesses’ BMI projects

<table>
<thead>
<tr>
<th>Case</th>
<th>BMI Result</th>
<th>Complexity</th>
<th>Reach</th>
<th>Radicality</th>
<th>Key Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>EV1</td>
<td>Optimization</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>Machine Learning for Fraud Detection.</td>
</tr>
</tbody>
</table>
| EV2  | Business model/ process change | 2          | 2     | 3          | Intelligent Traffic Control and Communication Solution demonstrates V2I capabilities to sense, think, act and communicate including:  
- Direct sensing of road users such as vehicles and pedestrians via cameras and RADAR.  
- Direct sensing and communicating beyond line of sight of road user with V2X, and  
- Indirect sensing via Cloud provided information. |
| EV3  | Business model/ process change | 1          | 2     | 2          | Products in the area of network function virtualization (replacement of HW with SW). |

Figure 20  A summary of 3 dimensional BMI framework for EVs’ results.

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All the research results in relation to BMI projects are summarized on the Figure 21.

As a summary from all the researched groups it could be highlighted that TOs are mainly focused on incremental BMIs. On the other side, SPVs are the most radically oriented as they achieved disruptive BMI project (3 out of 5 respondents) with positive impact on the market and the industry itself. This is almost valid for SIs since they deliver also mainly radical BMI project with Reach for market/industry. When it goes to TCs, their Reach dimension vary between Business itself, market/industry, and one example for significance to the World BMI project. And the last group, the Equipment vendors, they execute only BMI project that are leading to change for market/industry with radical and disruptive results. For all of the groups it is valid that they changed mainly one business block from the Complexity dimension regardless to the results of other BMI dimensions.

5 Conclusions

As it was previously known from analysis done by other researchers, the participants herewith also proved the fact that BMI is an integral part of business strategy. In regard to the type of last launched BMI, also the representatives...
gave mainly typical for their group answers and verified that they are focused on BMI types that they have more competence and capabilities currently to realize. Being specific, Equipment vendors and System integrators are doing innovative services, while Telecom Operators and Service/Product vendors are delivering innovations in infrastructure.

Another outcome is that majority of researched businesses are doing mainly externally oriented BMI – network is involved in high degree in the BMI. When a split between radical and incremental innovation is done, the groups also followed the industry patterns. Those that are doing radical BMI in regard to their technological products or infrastructure appeared to be the Service/Product vendors and the Telecom operators. Those that do radical BMIs are EV, SI, and TC. And those that are focused more on disruptive BMI projects are SPV. Out of all groups only TO perform mainly incremental BMIs.

Furthermore, a list of most important technological features for successful acceptance of the BMI by the customers was gathered and analysed for their specifics. The research outcome also proves that majority of the companies are not just targeting to launch something radically new, but they continue to innovate about it. The reasons for doing so are quite different.

As a main driver for the BMI activities, the Businesses identified different drivers for this. For the group of Telecom operators, the main driver for BMI is the customer, followed by the Business itself. It could be concluded, even with this number of respondents, that the pattern for vendor-centric BMI in the telecom sector. The last means that telecom operator, being closer to the end customers, is very focused on BMI covering customers need. Due to the technological an infrastructure dependencies on Equipment vendors the research showed that the businesses struggled with fulfilling these customers’ demands on time, within identified need, or within the budget cost range. The group of SPV responded that they are mainly pure customer service oriented, which is proved by the examples of BMI projects they are execution with main focus on their customer needs.

As a practical matter, however, all the respondents registered that the innovations they are doing are based on collaboration with external parties mainly. The relationship in this process between the Equipment vendor and the Telecom operator can be characterised in a very tight collaboration. Also, it was clearly identified that less than 5% of these groups business’ budget is invested in innovations.

An important result of the whole research is also the identification of the most Business and Technical characteristics and their comparison with the theoretical definitions. As an outcome, the listed technological innovations
in regards to the Service Defined Network (SDN) and Network Function Virtualization (NFV) have the biggest potential to become a disruptive within the industry as it was listed by the respondents majority of the time.

All the above could be summarized as follows:

- The need to BMI is a must for the entire lifecycle stage of the telecom BMES.
- Telecom businesses are focused to innovate mainly in infrastructure projects, confirming the tendency to take on the role of infrastructure businesses pushed by the need to optimize their investment.
- System integrators and Equipment vendors are focused on BMI mainly in OTT services, as Telecom businesses expect greater and faster returns from investment in a toolbox and only through the value it can afford to do.
- Successful BMI is always a combination of business need and technological feasibility – and bridging technology to business.
- Formed outcome for radical BMI is in favour of Telecom Infrastructure as a Service model.
- Disruptive BMI Innovation was found in our research only in some groups of the Businesses.

6 Future Research

The first group of recommendations for further research is related to the value chain and the interviewed respondents. Herewith only SPV, Equipment vendor, Telecom operator, Telecom consultant and System integrator had been included as an absolute minimum of representatives. But there are other parties that could influence the BMI activities within the industry. One of them is the regulation body, which appeared to be corner stone because the telecommunication industry is strictly regulated. Another group is the standardization organizations and especially how the cycle of producing new standards responds to market needs.

What else could be in the area of future research is the hypothesis that was indicated as a conclusion out of the research results. One direction could be to investigate further whether the business model of System integrators is moving into a direction of more strategic role in the process of innovation. Another research could be executed towards the outcome that Equipment vendors’ BMI are mainly technological. As it is typical for this group, when more deep research is done an interesting outcome could be revealed explaining the reason for this.
References


**Biographies**

**Tsvetoslava Kyoseva** is a Ph.D. student at Technical University, Sofia, Faculty of Telecommunications. Her research field is in the area of disruptive innovations in the telecommunication industry. She graduated Master Degree of Telecommunications in Technical University, Sofia and holds an MBA in Innovation and Entrepreneurship at the University of Vienna. Mrs. Kyoseva is an experienced Innovations & Business Development practitioner, whose 15-year career path encompasses numerous managerial positions in renowned international telecom and tech companies. She was the lead of the first Telco
Innovation Center in Bulgaria and has since worked with a large number of knowledge incubators and universities in the field of product innovation, beta-testing and market validation. She joins Methodia – a company providing innovative solutions for Utility and Telecom industries – in the spring of 2014 leading the Business Development, Projects & Innovations Department, while currently she heads the company as a CEO.

Peter Lindgren is Associate Professor of Innovation and New Business Development at the Center for Industrial Production, Aalborg University, Denmark. He holds B.Sc. in Business Administration, M.Sc. in Foreign Trade and Ph.D. in Network-based High Speed Innovation. He has (co-)authored numerous articles and several books on subjects such as product development in network, electronic product development, new global business development, innovation management and leadership, and high speed innovation. His current research interest is in new global business models, i.e. the typology and generic types of business models and how to innovate them.

Professor Vladimir Poulkov Ph.D., received his M.Sc. and Ph.D. degrees at the Technical University of Sofia (TUS), Bulgaria. He has more than 30 years of teaching, research and industrial experience in the field of telecommunications, starting from 1981 as an R&D engineer in industry, and developing
his carrier to become a full professor at the Faculty of Telecommunications, Technical University of Sofia. He has successfully managed and realised numerous industrial and engineering projects related to the development of the transmission and access network infrastructures in Bulgaria, as well as many R&D and educational projects. His fields of scientific interest and expertise are related to interference and resource management in NGN and IoT. He is author of more than 100 scientific publications and tutors B.Sc., M.Sc. and Ph.D. courses in Information Transmission Theory and Next Generation Access Networks. He is head of the “Teleinfrastructure R&D” laboratory at the Technical University of Sofia, Chairman of the Bulgarian Cluster of Telecommunications and Vice-Chairman of the European Telecommunications Standardization Institute (ETSI) General Assembly. He is a Senior IEEE Member.