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Business models for MTC in 5G

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Executive summary

In this report, we discuss business model innovation in relation to the 5G context and future business potential. Business model innovation involves changes to the different parts of the business model. When it comes to the business model and its definition, researchers and practitioners share consensus on the essence of "doing business," namely creating and delivering value so as to generate revenue and achieve a sustainable competitive position, while there is less agreement on the "model" part. The building blocks or model elements often differ according to different canvas models or tools for development.

The focus of the report is on two selected WIVE use cases and their subsequent business models or business potential. The WIVE use cases **eMBMS** and **feeder line protection** are presented further and analysed based on the STOF business model tool.

The business case for eMBMS is based on providing exclusive content to chosen target groups. The user of the technology may be event organizers, local actors or organizers of events, in which a large number of people consume content simultaneously (cultural event, concerts, sports events etc.). Different revenue model are linked to eMBMS, such as short-term contacts covering the time span of the event.

The business case for feeder line protection indicates a business model transitioning from a product -oriented to a service-oriented business model, i.e. offering feeder line protection as a service, potentially in cooperation with other actors. In this business model hardware and connectivity links are bundled into a service. A key component of the business model is an appropriate value network of actors contributing to the delivery of the service.

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Abbreviations

AI	Artificial intelligence
eMBMS	Evolved Multimedia Broadcast Multicast Services
IIoT	Industrial Internet of Things
MNO	Mobile Network Operator
MTC	Machine Type Communication

1. Introduction to the business model concept

The business model concept is used for conveying a picture of the core logic of a company [1] and for describing what a business does [2]. However, even though business models describe how firms do business, they are primarily concerned with value, (a) created for the customer, e.g., does the product or service solve the problem of the customer, and (b) captured by the firm, which can be monetary or related to efficiency or values (e.g., a cleaner environment) [3].

Business models specify which customer segments are being served, the customer value proposition, which activities should be performed in-house and which should be outsourced, how the firm configures its resources, how the firm sells and distributes its resources (creates value for customers), and how the firm profits from these activities (value capture mechanisms) [4]. A good business model is *viable*, i.e., offers value to both the company and the customers, *feasible*, i.e., is possible to be implemented in real life in terms of resources and competences, and finally, *sustainable*, i.e., continues to be viable or can easily be adapted if circumstances change [3].

On that note, it is evident that circumstances change continuously. Therefore, business model innovation is pinpointed as an important approach, referring to any fundamental change in the relationship between business model elements. Business model innovation can be driven by strategic change, technology development, or changing markets. In order to remain competitive, firms should constantly pursue business model innovation. *Primary business model innovation* refers to changing ("pivoting") the original business model completely, whereas *secondary business model innovation* indicates that the firm may have multiple business models concurrently, which are even partly conflicting. The choice of business model innovation depends on the industry and, more specifically, on how value is migrating within the industry [5]. Value migration indicates a shift in value-creating forces. An example would be the print news business, which, foremost due to digitalization, evolved towards a focus on news content online and content in digital format. Over time, the decreasing monetary value of advertising revenues and newspaper subscriptions forced changes to the business models. Today, the industry has implemented new business models that encompass digital subscriptions and new digital services.

Business model innovation can also be categorized according to *radicality*, i.e., how new the changes are, *reach*, i.e., to whom is the innovation new, and *complexity*, i.e., the number of building blocks changed simultaneously in the business model [6]. Business models can last for years or even decades, but they all have limited life spans. When changes are sensed in technology, consumer demand, or the competitive landscape, business model revision is needed. This, in turn, is best undertaken before the need for change becomes obvious.

As 5G networks are about to be rolled out and 5G connectivity envisioned to impact new industry areas, where it has not previously played a lead role, firms may see value migration occur in various

industry areas, or so-called vertical sectors (or verticals). 5G is considered a disruptive technology for providing local context-specific connectivity for users. When industries change structurally, firms must reinvent where and how they create and capture value. The business models developed by companies operating in the vertical sectors will have far-reaching implications across the whole economy, affecting, for instance, competition within the vertical sectors themselves [7]. While policymakers and consumers may welcome the innovation and competition associated with vertical sectors, it is yet unknown how these will shape the development of the wider ecosystem.

The report focuses on presenting an overview of recent research on business models related to 5G. In addition, two use case pilots from the WIVE project is presented and their subsequent business models described. The business models were co-created during a WIVE workshop in January 2019, focusing on business models and business model development, and builds upon previous workshops and interviews with key informants throughout the project period 2017-2018.

2. Business models and 5G - current viewpoints

The section briefly summarizes research and thoughts on business models, in which 5G constitutes a cornerstone. As 5G technology development is ongoing, the discussion on business models still deploy a scenario and future-based standpoint, in which the possible, or what is considered likely, is envisioned. Disruptions and business model innovation are a common denominator in current viewpoints on the evolution of 5G related business models. Concrete suggestions for how to plan business models around 5G are few. However, Table 1 summarizes a proposition by Jones et al. (2016) [8], which is in line with Chesbrough's (2007) original ideas on value creation and business models [9].

1. **Express value,** that is, what is the value created for a specific business by its 5G capabilities and the new advanced features it offers.

2. **Identify a market segment**, that is, who are the users of the 5G-related service and what is provided?

3. **Define the structure of the value chain** required by the operators, regulators, and users to create and distribute the service, and determine the complementary assets needed to support their respective position in this chain. Each stakeholder must consider their suppliers and customers, and their view of the system should extend from resources to the final customer.

4. **Specify the revenue generation mechanism(s)**, and estimate the cost structure and profit potential given the value proposition and value chain structure chosen.

5. Describe their **position within the 5G system**, holistically linking suppliers and customers, including identification of potential complementors and competitors.

6. **Formulate the competitive strategy** by which the innovations of the business will gain and hold advantage in the 5G environment over competitors and previous strategies stemming from earlier generations of mobile technology.

Table 1. Planning the 5G business model [8, p. 311, direct citation]

Next, a brief overview of research on business models, in which 5G determines the business model elements and/or subsequent business ecosystem, is presented.

The ecosystemic business model

The ecosystemic business model concept has been introduced by Ahokangas et al. (2018) [10] and deals with how new innovations and competition in the vertical sectors will shape the wider ecosystem. According to Ahokangas et al. (2018) the 5G development will change traditional business models and new ecosystems will emerge. This will also open possibilities for new local network operators, so-called micro operators. Ahokangas et al. (2018) present three subsequent value ecosystems, namely (a) the vertical ecosystem, (b) the horizontal ecosystem and (c) the oblique ecosystem (see Figure 1), developed from the micro operator's viewpoint or, more specifically, focusing on the role the micro operator plays in the 5G ecosystem.

In the *vertical ecosystem*, the local micro operator may combine its local operator activities closely with application/content providers', end user equipment manufacturers', and network infrastructure constructors' activities. In this way the micro operator may exercise control. The *horizontal ecosystem* is based on the mobile network operator (MNO) being the dominant player, and whose

services the local micro operator delivers locally to the operator's customers. In the *oblique ecosystem* any stakeholder willing to invest in designing, building, or maintaining local 5G infrastructures and services may adopt the local micro operator roles. A local micro operator may build a platform for delivering services locally, with the help of a network infrastructure constructor. The local operator may closely collaborate with the application and content providers, whose services may be run on its infrastructure. The micro operator is thus able to serve several types of end-user or prosumer customer segments, while also selling their service to facility owners as well as third-party application and content providers that serve the end customers.

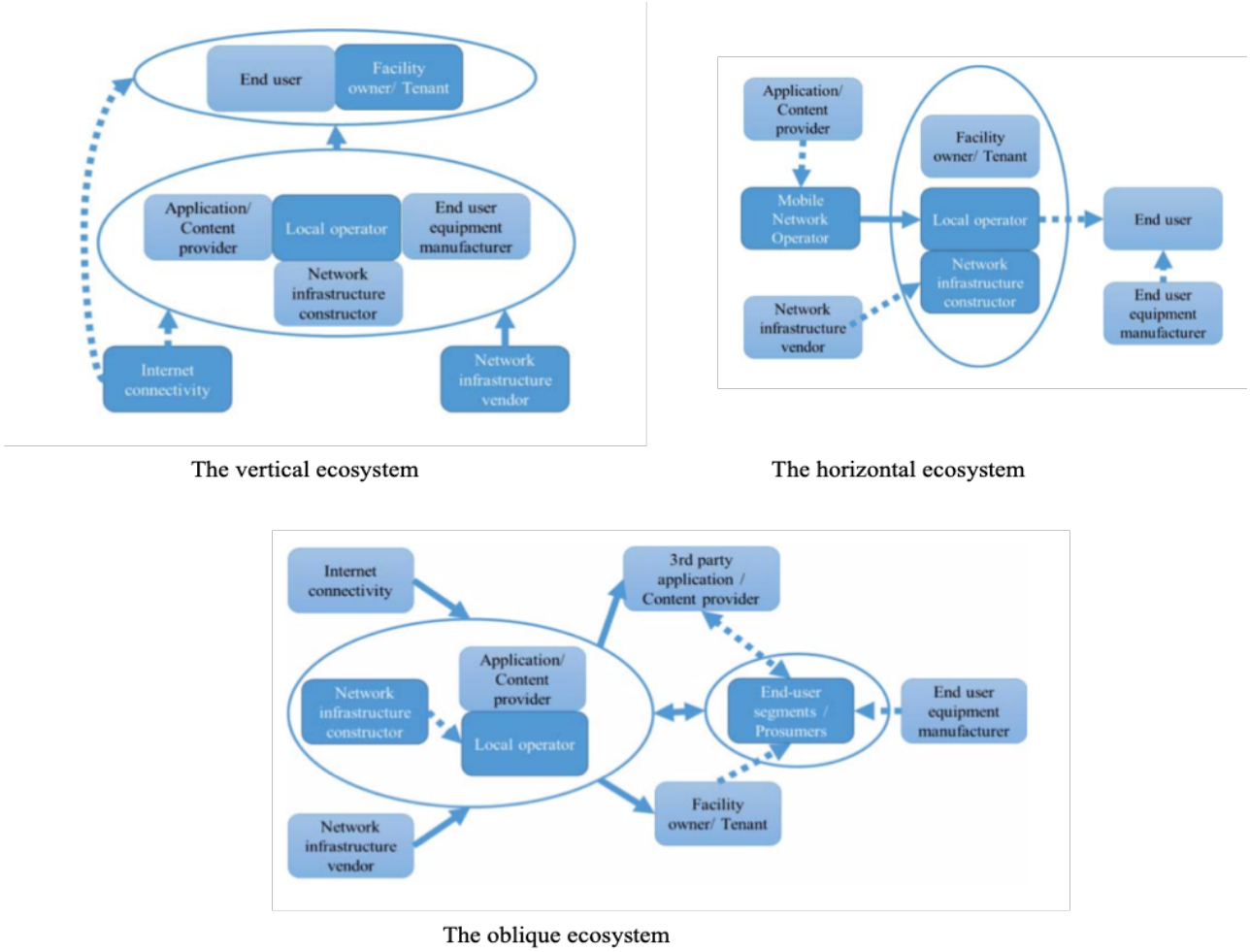

Figure 1. Three ecosystems [10]

The ecosystemic business model view is based on the what Moore [11] noted already in 1993, namely that competition is no longer so much firm against firm as it is ecosystem against ecosystem.

A business ecosystem contains a number of firms that work together (and also compete) to create and sustain new markets and new products. The co-evolution of the system is typically reliant on the technological leadership of one or two firms that provide a platform around which other ecosystem members, providing inputs and complementary goods, align their investments and strategies. The value capture component of a business model must thus find a balance between profits for the focal firm and the profitability of the firm's ecosystem partners.

Nonownership business models

Ehret and Wirtz (2016) [12] propose *nonownership business models* in the area of industrial internet of things (IIoT). The aim of such business models is to identify a promising position for the firm before making decisions on what unique value proposition to offer, which resources to own for capturing the value, and what kind of partners and complementors are needed for delivering the value. Nonownership contracts are introduced as the basis for business model design and are proposed as an architecture for the productive sharing of uncertainties in IIoT manufacturing networks.

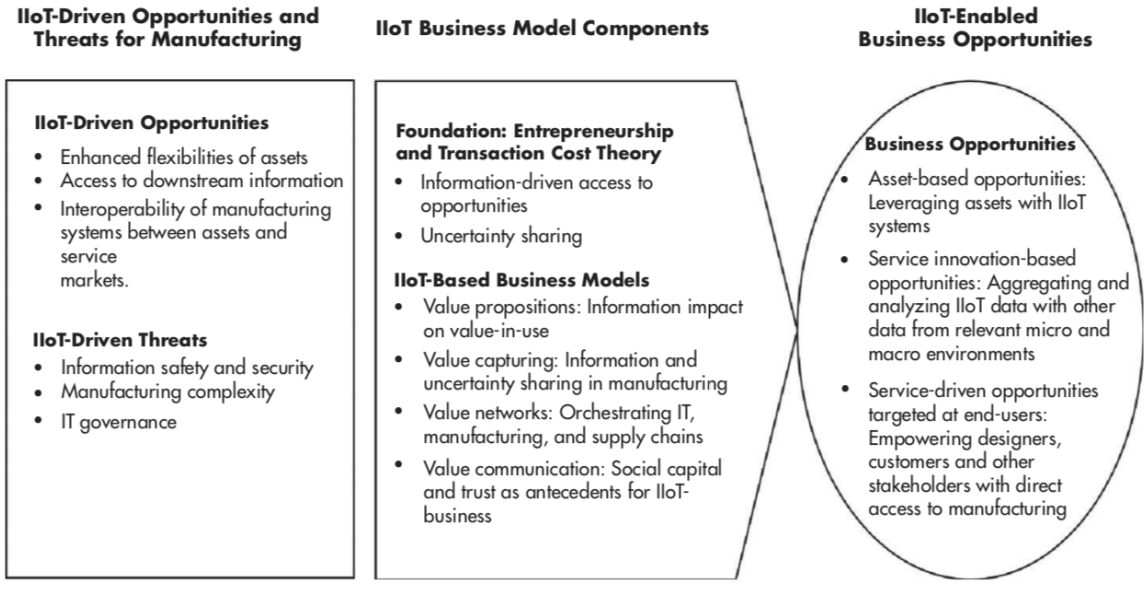

Figure 2. Business models - transforming IIoT promises into value [12, p. 113]

Three main types of IIoT-enabled business models were identified, namely (a) provision of manufacturing assets, maintenance and repair, and their operation, (b) innovative information and analytical services that help manufacturing (e.g., based on artificial intelligence (AI), big data, and analytics), and (c) new services targeted at end users (e.g., offering efficient customisation by integrating end users into the manufacturing and supply chain ecosystem). These business models are based on identifying service-driven opportunities (both in manufacturing and towards end-users). Figure 2 summarizes the IIoT-driven value potential and business opportunities linked to business models.

3. WIVE use cases and evolving business models: Feeder Line Protection and eMBMS

In order to explore selected WIVE use cases and their business models, the STOF business model [13] tool was used (see Figure 3). In STOF, the business model is described from four connected perspectives, namely (1) service, (2) technology, (3) organization, and (4) finance.

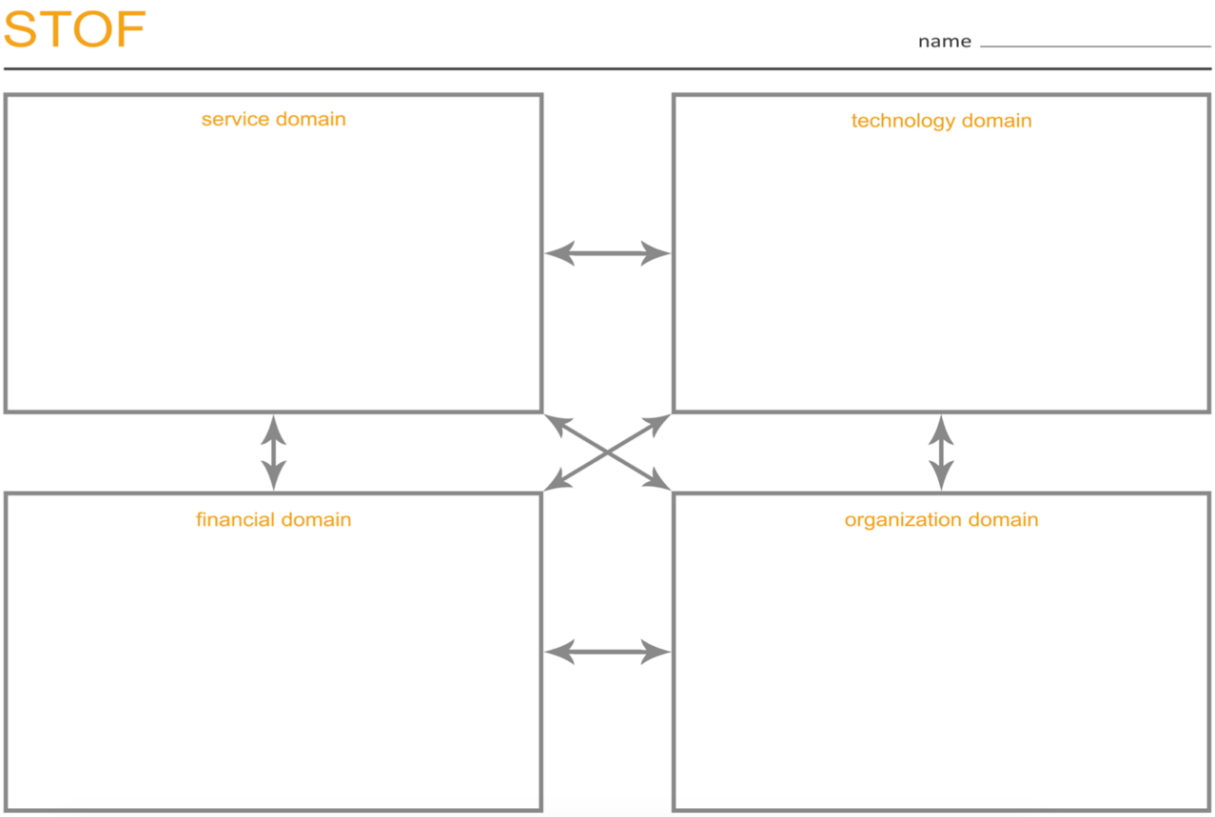

Figure 3. The STOF business model

The model thus highlights technology in a more prominent way, compared to many other models. It provides a checklist of relevant factors to consider, including the relationships between the factors. The four perspectives form domains, which are supported by a set of questions in order to explore the domain thoroughly (see Table 2). The STOF tool may help in identifying weaknesses, which may cause an emerging service to fail, but the tool also highlights strengths.

Service Domain	**Technology domain**
Customers and end-users • Who is the customer? Who will pay for the service? • Who is the end-user? Who will be using the service? Value proposition and service offering • In what specific situation(s) would people want to buy or use the service (use cases)? • What does the service do for the customer or end-user? What are the unique and distinguishing benefits of the service? • What is the actual offering provided to the customer or end-user? What are the distinguishable elements of the service?	Technical Functionality • What (business) functions does the service require? • What is the global architecture of the service offering? Applications (user applications running on the technological system) • What user applications should be running on the technological system (e.g. for communication, interaction, content distribution, transactions)? • How are customer profiles and privacy managed? • How is secure access to, and use of, services arranged?
Finance domain	**Organization domain**
Costs • What is the cost structure of the service? Investment costs, fixed costs and variable costs? Revenues • What is the revenue model behind the service or product? direct payments: one-off sale, subscriptions, licenses, pay-by-tweet, ... indirect payments: advertising, sponsoring, subsidies, commissions, ... Financial arrangements • How are investments, costs and revenues divided over the actors?	Actors • Which business roles are required to create and deliver the service? • Which actors can and want to cooperate and take up the business roles? Actors' resources & capabilities • What are capabilities and resources that these actors can or should provide? • Which resources and capabilities are critical? Hence which actors are preferable?

Table 2. Supporting questions for the STOF domains

Feeder line protection - a service-oriented business model

Introducing 5G in the energy domain signifies new business opportunities, as 5G is expected to provide the necessary support not only to the critical machine type communication (MTC) applications of energy grid protection and control, but also to the massive volume of MTC type

applications of the emerging smart metering. The goal of the feeder line protection use case was to utilize 4G/5G links to interconnect protection relays in electric power networks in order to achieve improved flexibility and cost savings, while simultaneously paving the way for wider usage of a distributed generation. The value-added service consists of protection (produced by ABB) and/or the connectivity link (provided by ABB, an MNO, or a third-party actor). The value proposition of the use case is to maintain and maximize the availability of electricity utilizing a cost-efficient solution, thus avoiding malfunctions. The benefits of such a service is flexibility and higher availability for the customer, as well as increased trust in devices and operations.

The options for the customer are to purchase connectivity as an add-on service or protection as a service, in which connectivity is included. The choice of service depends on the customer's role and capabilities as well as the potential impact from regulatory authorities. Connectivity can be offered by the main actor (in this case ABB), by an MNO, or by a third-party actor. The challenge in the latter case is to integrate operating systems. From the protection provider's perspective, a cooperative business model can be built, in which ABB delivers the protection device and another partner delivers the required connectivity over 5G networks. Cooperative patterns exist today, in which communication links are leased from MNOs, but a model for leasing wireless connectivity does not yet exist. The subsequent business model is also dependent on the environment in which wireless connectivity is to be enabled, e.g., a limited geographical area, industry area, or factory, and its specific requirements.

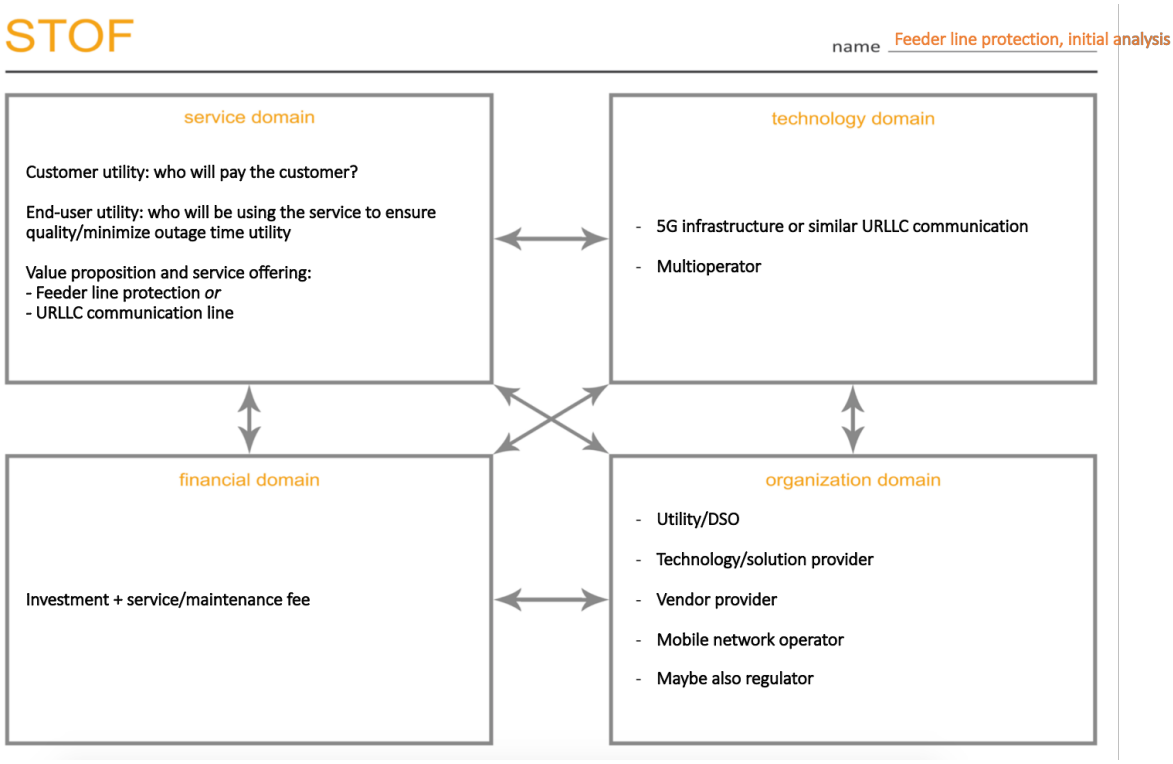

Figure 4. STOF analysis of feeder line protection

The technology domain requires multi-actor activities as new use cases are to be developed and implemented; there is a need to rebuild rather than retrofit activities related to 5G connectivity. The financial domain identifies required investments and finding a revenue model based on service and maintenance fees. In the organizational domain the following actors were identified: MNO, vendor provider, technology solutions provider, utility manager and, to some extent, the regulatory authorities as stakeholders in the ecosystem.

The business model linked to feeder line protection is based on a service-model, in which constant availability of electricity provides the main service. The hardware and connectivity links are bundled into a service. This requires a value network constellation, where each focal actor contributes based on respective core competence areas and role in the network. In addition, the portfolio of offerings may very well be extended by adding service elements to ensure customer retention. Transitioning from a product-oriented to a service-oriented business model requires re-evaluating value propositions and designing adequate processes for service co-creation between the company and its customer.

eMBMS - a two-sided business model

Evolved Multimedia Broadcast Multicast Services (eMBMS), also known as LTE broadcast, is a technology designed to provide efficient delivery of broadcast and multicast services. The main application area of eMBMS is, for instance, live video streaming services, mobile TV, and radio broadcasting. While eMBMS is not a main use case in the WIVE project, it was chosen as the area to develop from a business perspective. The main advantage of eMBMS is that the same content can be received by a large number of people simultaneously (content is delivered to multiple devices in the same area). The technology may provide consumers with equal access to streaming services of higher quality. The low capacity and high latency of the current 4G mobile network are often inadequate for high quality media distribution, particularly in the case of real-time streaming services with large numbers of users on the mobile network. However, eMBMS is challenging in terms of defining its business case. It is unclear which kind of profits the technology may generate, i.e., which economic model suits mobile and broadcast operators best.

The STOF analysis of eMBMS depicts the technology as dependable and invisible; the end-user benefits the most when he/she does not notice the technology behind the content delivery, i.e., does not experience delays, disruptions, or disturbances. The end-user is merely consuming content on a mobile device. Customers interested in deploying eMBMS are event organizers (festivals, music concerts, city events, sports events etc.), content producers, and potential local operators or actors in need of increased network capacity. Thus, the service domain of eMBMS is broad, but limited to use cases in which content is consumed simultaneously by a large number of people or data (content, notifications) should reach a large number of people simultaneously (such as alerts, warnings). Costs

for eMBMS include investments in networks, costs of usage and middleware, whereas potential revenues models may include leasing or pay-per-usage for short-term events (stadium events, concerts etc.). The financial domain is thus somewhat open, as it depends on the customers' needs and deployment areas. Nevertheless, the value generated relates to providing a functioning mobile network for end-users.

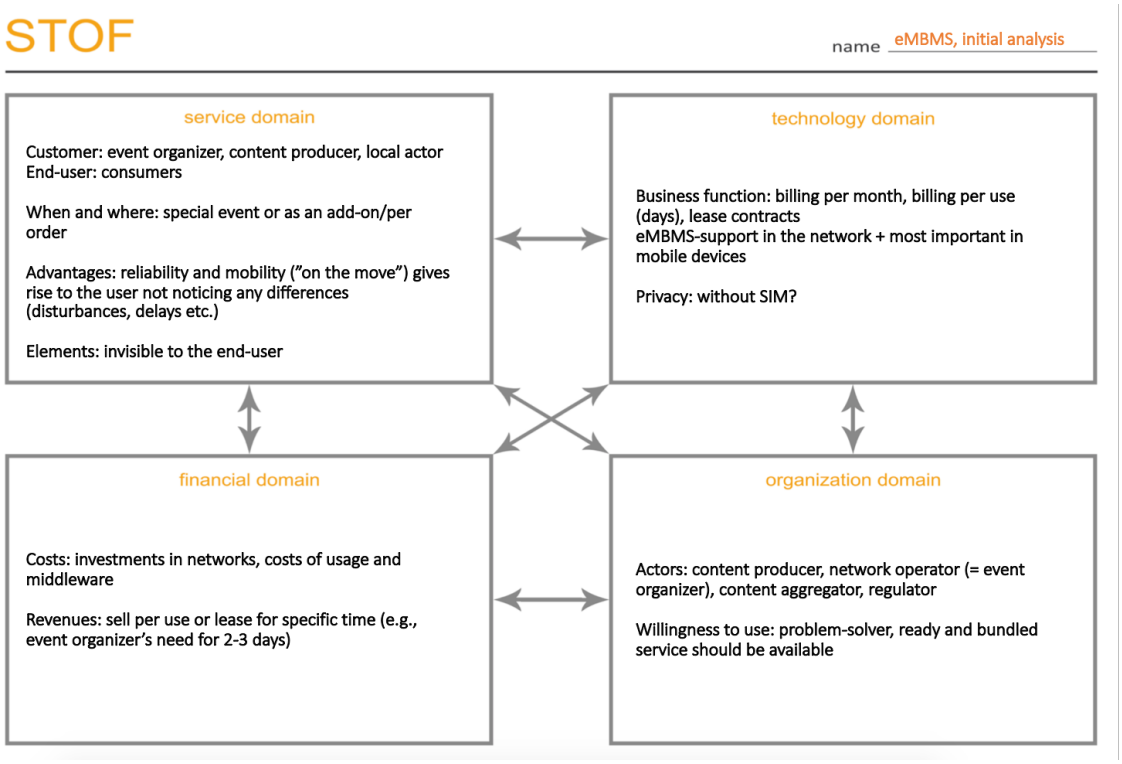

Figure 5. Summary of the STOF business model analysis of eMBMS

The technology domain includes open questions as regards privacy and eMBMS support in the network. The organizational domain, i.e., the actors interested in eMBMS are content producers, network operators, content aggregators (third party distributing content), and regulators. The willingness to use eMBMS depends on the availability of ready and bundled services, as well as choice and use of frequencies.

The eMBMS business model is complex, as the technology is not widely in use and there are few mobile terminals supporting the technology. Successful demonstrations of the technology have been conducted also in Finland within the area of mobile streaming in the 5G test networks [14]. The STOF business model analysis identifies actors potentially willing to pay for the use of eMBMS. Actors such as event organizers and local content producers may "lease" capacity enabled by the eMBMS technology, i.e., for the duration of the event or specific peak hours. This allows the end-

users to seamlessly and effortlessly use the mobile network while taking part in the event, contributing to a positive overall user experience. Also, the event organizer ensures that connectivity functions on site, caring for security issues. However, event organizers is potentially a niche market, and scalability is dependent on a wider deployment of the technology. The eMBMS business model leans towards a two-sided business model, in which both supply- and demand-sides are co-created in order to be useful: the event organizer must ensure connectivity in order to create a valuable experience while the end-user (event participant) requires good connectivity in order to access content on site.

4. Towards business model innovation and redesign – preparing for 5G

Foss and Saebi (2017) [15] have constructed a typology for business model innovation based on scope (modular versus architectural) and novelty (new to the firm versus new to the industry) (see Table 3). Evolutionary business model innovation refers to naturally occuring changes in the individual components of the business model, which happen over time. Adaptive business model innovation involves changes to the business model that are new to the firm, but not necessarily new to the industry. Both business models undergo changes as a result of changing industry structure and changes in the external environment. The focused business model innovation, on the other hand, involves the firm innovating within one area of the business model (e.g., focusing on new market segments). The complex business model innovation affects the business model in its entirety, with the potential to disrupt established industries. Examples of the latter include Airbnb in the accommodation industry and Uber in transportation.

		Scope	
Novelty		Modular	Architectural
	New to firm	**Evolutionary BMI**	**Adaptive BMI**
	New to industry	**Focused BMI**	**Complex BMI**

Table 3. Business model innovation typology

From the perspective of the presented use cases, eMBMS would be categorized as a focused business model innovation, whereas the feeder line protection use case can potentially be regarded as complex business model innovation, depending on the roles chosen by key actors.

In the IIoT era, effective business model design relies on four components [12], namely:

(1) The purpose of the value proposition is to *identify opportunities for value creation* before fixing actual product or service specifications. In the case of IIoT, potential value propositions for

manufacturers who currently buy or lease their machines could be linked to the benefits of transparency, real-time data, and remote access and control.

(2) The *value capturing mechanism* aims to translate value-in-use into financial value for the service provider. IIoT brings forth the opportunity to broaden potential revenue streams beyond the sales of manufacturing equipment. In particular, business models consider contracts that include leasing, renting, maintenance and repair, predictive modelling, process optimisation, licensing, and multi-sided markets where one market stimulates the cash flow of another side of the market. For example, manufacturers of industrial equipment are moving towards selling performance of the machine instead of selling the machine itself [16], i.e., a more service-oriented business model.

(3) A firm is rarely in the position to exploit an opportunity on its own, which requires *an ecosystem of suppliers, complementors, and stakeholders* to effectively serve its customers. Networking is key to the configuration of IIoT, as it resides on the co-creation of a wide range of players. Value network design thus becomes vital in the IIoT era.

(4) *Value communication* addresses the fact that co-creation of value resides on perceptions and interactions between actors in the value network. IIoT typically requires the co-creation of several players, which means that communication, social capital, and trust play a critical role in business model design.

Key principles for business models are [17] a *good business model design*. This, in turn, requires *deep knowledge of customer needs and the technological and organizational resources* that might meet those needs. Most new business model designs involve the hybridizations of others. When it comes to the question on how to implement business model change or innovation, established companies have a disadvantage compared to startups. The introduction of a new business model can become challenging because of a cultural mismatch, the ability of existing businesses to influence budgets, or other reasons that start-ups do not face. This is particularly the case when adding a next-generation business into a company that has been competing in more traditional ways. Teece and Linden (2017) [17] suggest to set the new business apart, with its own premises and possibly even a different incentive system. This can work provided there is high-level support for the new venture. The capability of an established firm to experiment with new businesses while not undermining its existing revenue sources is referred to as ambidexterity [18].

Business model implementation, like transformation more generally, involves *closing capability gaps* between the firm's current activities and those required to enact the new business model [20]. The gap identification process begins by examining the match between a proposed business model and the firm's existing capabilities. Such an analysis should be detailed and realistic, assuming an objective point of view. Teece (2019) [20] pinpoints the need to choose people correctly in terms of

skills, creativity, and readiness to learn, when building new capabilities in a firm. Even if much of the capability resides in a new piece of specialized equipment, it takes time for it to be fully understood and integrated into new routines, and then diffused to the divisions where it is needed. Many projects and programs fail because of an organization's inability to develop and integrate the capabilities needed to deliver on a new objective. Nevertheless, if well-built, they can be difficult for others to imitate and provide a basis for competitive advantage.

5. Links to development tools for business model innovation

Business Makeover: https://www.businessmakeover.eu/platform/home/

Value Proposition Canvas: https://www.strategyzer.com/canvas/value-proposition-canvas

Business Model Canvas: https://canvanizer.com/new/business-model-canvas

Business Model Toolbox: https://bmtoolbox.net/tools/

Lean Service Creation: https://koklaamo.fi/wp-content/uploads/2017/03/LSC_wall_by_Futurice_Koklaamo.pdf

Kokeilijan starttipaketti: http://shop.kuntaliitto.fi/product_details.php?p=3406&fbclid=IwAR3SKo27i6IzQOIkTqrUb8kZBevSyjyHcvOGYLRRWJSTxQbu10uU2UUUW5Y

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