Mapping platform business models for 5G mobile operators

Authors' names and affiliation

Petri Ahokangas[1], Seppo Yrjölä[2,3], Marja Matinmikko-Blue[2], Irina Atkova[1] and Marika Iivari[1]

1) University of Oulu, Oulu Business School, Martti Ahtisaari Institute, Finland
2) Center of Wireless Communications, University of Oulu, Finland
3) Nokia, Oulu, Finland

Abstract

Mobile networks are the digitalization backbone of modern society. This paper reviews the platform-based business models identified for 5G mobile operators and provides a strategy-technology -framework to map their business model configurations.

Keywords

Business model, platform, 5G, mobile network operator

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Introduction

Mobile networks have become the backbone for the digitalization of society, making mobile network operators (MNOs) one of the key players of the modern digitalized society (Li & Whalley, 2002). For MNOs, the primary business model (BM) has been to monetize mobile connectivity for consumer and corporate end-users—bundled with dealership of digital content and/or equipment—differentiated by the quality of service, coverage, or data rates/quotas, based on exclusive use of spectrum (Ahokangas et al., 2021a). The BMs employed by the MNOs to offer ubiquitous mobile connectivity radiate their impact on all current digital services. Without connectivity, no digital content could be sent and received; without the abundance of content, digital context services such as search engines or combining data, user, and location information would be of low value; and commerce platforms would lack merchandise.

However, the above-described primary BMs of the mobile network operators will be disrupted by the fifth generation of mobile communications (5G) currently being introduced. One example of this disruption is the emergence of the local (or micro) operator concept that complements the traditional nationwide MNO services through local and often private networks for tailored use (Matinmikko et al., 2017). Adding on the enhanced mobile broadband of the present 5G technology, the increasing softwarization and cloudification of 5G networks will help in the future to serve the varying needs of new types of users such as machines, autonomous vehicles, drones, robots, and communities in critical and massive machine-to-machine communications, using also shared spectrum. Higher frequencies with higher bandwidth used in 5G mean smaller cell sizes that enable local and private 5G networks for different verticals that have specific requirements (Ahokangas et al., 2021b), also indoors. Consequently, it has been argued that the whole MNO-centric ecosystem, its stakeholders, and the BMs therein will be changed in the future 5G (Matinmikko et al., 2018), giving the floor to a variety of operator concepts. As the term "mobile network operator" as a telecommunications service provider is subject to specific regulatory rights and obligations (Matinmikko et al., 2017) that might not exist in all cases of local networks, this paper uses the generic term "mobile operator" when discussing future BMs in the 5G context. The above-described disruptive changes call for exploring and understanding what 5G means in the business model context and its implications for the business model content, structure, and governance (Amit & Zott, 2001).

Approach

The business model (BM) has become the contemporary paradigm for exploring and exploiting different business-related ideas and conceptualizations. Even in the absence of a commonly accepted definition, extant literature depicts the business model as a universally adaptable, boundary-

spanning, multi-purpose, and futures-oriented vehicle for designing, doing, and discussing digital business. For example, Massa et al. (2017) see business models addressing how firms do business, how this is interpreted, or how a business model could be represented through formal conceptualizations.

The traditional way to look at businesses in mobile communications has been to pay attention to changes in the regulative and technological domains, both having a significant impact on business decisions, especially the BMs employed by the operators (Ahokangas et al., 2013). Spectrum and competition regulation have played a pivotal role regarding the BMs applied by the operators, either allowing, delimiting, or protecting/safeguarding certain BMs. Technology, in turn, has been the BM enabler and a driver for competitive edge and competition with new and improved services while also "pushing" the operators to innovate and diversify their offerings. However, up to the fourth generation of mobile communications (4G) networks whose deployments started around 2010, the primary BMs applied by leading operators have remained surprisingly unchanged (Lehr et al., 2021), although they have been seriously challenged by the content-owning, cloud-based over-the-top (OTT) internet giants. Becoming challenged by the OTTs, many operators' margins and revenue have started to deteriorate.

As operators are struggling with whether and how to innovate their BMs in practice, the question arises what kind of an approach would be appropriate to understand future operators' BMs in 5G and what these novel BMs could be. As new forms of operators are expected to emerge in the future (Matinmikko et al., 2017), it becomes crucial to map the factors according to which the emergence of these operators and their respective BMs could be outlined. First, building on earlier research, we see operators' BMs accumulating value on platforms and ecosystems. Second, we consider 5G as a dynamic connectivity platform that is converging with various (other) digital platforms, thus forming a platform ecosystem comprised of complementary BMs that are not necessarily hierarchically controlled by any of the stakeholders of the emerging ecosystem. Third, as superior BMs can help successfully commercialize mediocre technologies (Chesbrough, 2010), technology can be considered as an antecedent to the BM. From these starting points, this paper aims at contributing by analyzing what technology means for BMs in the 5G context and answer the research question "*How does technology translate into a business model in the 5G platform context?*"

Key insights

Despite the somewhat siloed nature of BM research, several key concepts form the basis for theorizing in the field. The scholars appear to be unanimous that the primary function of a BM is to explore and exploit a business opportunity. In turn, the opportunity sets the logic for the organization of the value-related processes. Together, the opportunity and value processes set the stage for

formulating the competitive advantage (Zott & Amit, 2010; Chesbrough, 2010). In turn, the sustainability of competitive advantage is contingent upon its replicability (Chaharbaghi & Lynch, 1999). Additionally, digitalization and proliferation of the ecosystemic approach in the BM literature have brought BM scalability into the discussion (Juntunen et al., 2018).

In the mobile communications context, Al Debei and Avison (2011) present a BM framework comprising the dimensions of value proposition, architecture, network, and finance. As one of the early works on this topic, the paper followed the traditional BM approach of the time. BMs' classification for the internet 2.0 (Wirtz et al., 2010) lends well to characterize mobile communications businesses from the digital business perspective. Within mobile communications, this connectivity, content, context, and commerce BM typology can be interpreted as nested layers where lower layer BMs of connectivity and content are required as enablers and value levers for the higher layer BMs, the context and commerce ones, to exist. Traditionally, mobile network operators have offered connectivity in a mass-produced mode, with price, data rates, quotas, or coverage as differentiation (Ahokangas et al., 2021a). Additionally, some operators have started to offer bundled content—such as entertainment—or equipment as a dealer. Personalized or tailored services such as context (i.e., location-based, service-specific, or data-based) or commerce (i.e., platform-enabled ubiquitous services) BMs have often been separated from connectivity business. The only exception to tailored services have been big enough industrial customers with vertical-specific needs; these have often been served in collaboration with network equipment vendors, network constructors, and service integrators. There also exist operators that specialize in servicing industrial customers and their IoT (internet-of-things) needs.

Mobile networks can be regarded as connectivity platforms or ecosystems, depending on the perspective. Technically the platform can be divided into centralized core and geographically distributed access networks; the core network takes care of the services and billing while the access networks—which can comprise several technology generations from 2G up to 5G—provide the radio access from a variety of user devices to the networks. With 5G, the mobile platforms are increasingly becoming combined or converged with various digital platforms of cloud service and OTT internet service providers, enabling platform ecosystems (e.g., Gawer & Cusumano, 2014) or the sharing economy (e.g., Ahokangas et al., 2021a). This relationship between BMs builds on platforms, and several researchers have addressed the networked or ecosystemic nature of the business environment.

A review of earlier research on MNOs' BMs reveals the fundamental technical starting points of extant research. A widely used BM approach within mobile communications is the "as-a-service" logic (Ives & Learnmonth, 1984) that can be divided into scalable infrastructure-as-a-service (IaaS), platform-as-

a-service (PaaS), software-as-a-service (SaaS), and data-as-a-service (DaaS) up to everything/anything-as-a-service (XaaS) models (c.f., Duan et al., 2015) with extensive use of algorithms. In the same technical line of research, Noll and Chowdhury (2011) introduced technology-enabled collaborative BMs, Rasheed et al. (2015) applied the brokerage BMs to 5G businesses, and Zhang et al. (2015) discussed a cloud-assisted BM. Beyond technicalities, all these represent two primary mobile operator BMs, connectivity service provider and its differentiation toward content services. Rao and Prasad (2016) identified the mobile broadband (MBB) BM, the target expansion BM with a focus on other than consumer customers, and the outsourced managed services BM where the network infrastructure providers offer the network as a service (NaaS). Rao and Prasad (2016) also identified the virtual network operator BM where a separate entity, often a mobile network operator's subsidiary, offers segmented services by using the infrastructure of a "real" operator. Furthermore, they saw the evolution of 5G BMs to go toward digital business models in the forms of various connectivity providers and partnership BMs.

Lindgren (2016) discussed persuasive BMs by paying attention to the physical, digital, and virtual dimensions of the 5G BMs. Camps-Aragó et al. (2019) examined mobile network operators' 5G BMs. They presented a classification of a micro-operator BM, the cloud-based XaaS/NaaS BM, the BM of a use case enabler for business-to-business customers, the ecosystem orchestrator BM, and the pervasive platforms BM. Kukliński et al. (2018) discussed BMs of network slicing, proposing technical role-based BMs of the infrastructure broker, network slice broker, and service broker. Hmoud et al. (2020) discussed mobile network operator BMs targeted for two-sided markets and presented big data-driven (i.e., based on crowdsourced data), advertising application (i.e., based on advertising platform), and mobile sensing (i.e., monitoring users' equipment for location or activity) based BMs. Finally, Sacoto-Cabrera et al. (2020) analyzed mobile network and mobile virtual network operators' monopolistic and strategic BMs by game-theoretic modeling, concluding that both business models are economically sustainable.

Another stream of literature on 5G business models has adopted a more strategy-oriented approach, classifying mobile operators' business models based on the scale and scope and looking at their scalability, replicability, and sustainability. Matinmikko et al. (2017) proposed that local micro-operators could run bundled connectivity (i.e., local connectivity), content (e.g., locally tailored services), context (e.g., secure local networks for vertical-specific needs), or commerce (e.g., my data operator services) BMs. Ahokangas et al. (2019) discussed vertically, horizontally, and obliquely structured BMs and respective ecosystems for local micro-operators. Ahokangas et al. (2021a) identified two types of future mobile network operator BMs: general bit-pipe and segmented specialized service BMs, thus drawing a line between connectivity- and content-based BMs. In

addition, the authors identified the wholesale service, retail service, context service, and vertical service BMs for local operators.

Discussion and conclusions

Up to date, the majority of the above-presented 5G BMs call for future development and deployment. However, the discussion gives rise to a framework that depicts (Figure 1) the BM discussions in the 5G context. The answer to the research question "*How does technology translate into a business model in the 5G platform context?*" can be approached from strategy and technology viewpoints. The strategy viewpoint comprises two perspectives: the traditional *opportunity* and *value* elements of BMs that highlight the role of novel *advantages* required for 5G businesses, and the traditional *connectivity* element that is complemented with the novel *content*, *context*, and *commerce* elements of 5G businesses. The technology viewpoint comprises the need to consider the *scalability* and *replicability* of BMs, giving rise to the increased importance of *sustainability* aspects in BMs. The technology viewpoint emphasizes the increasing role of 5G in supporting, fostering, and driving the scalability and replicability of BMs. Greater scalability and replicability of the 5G-enabled BMs help to incorporate further and realize sustainability goals. In addition, the technology viewpoint considers the platform perspective—that traditionally covers *components* and *interfaces*—to also include *data* and *algorithms*. Overall, it can be concluded that 5G BMs are not easy to understand. Making sense of the technology-oriented business model literature requires an understanding of the technological concepts behind the discussion.

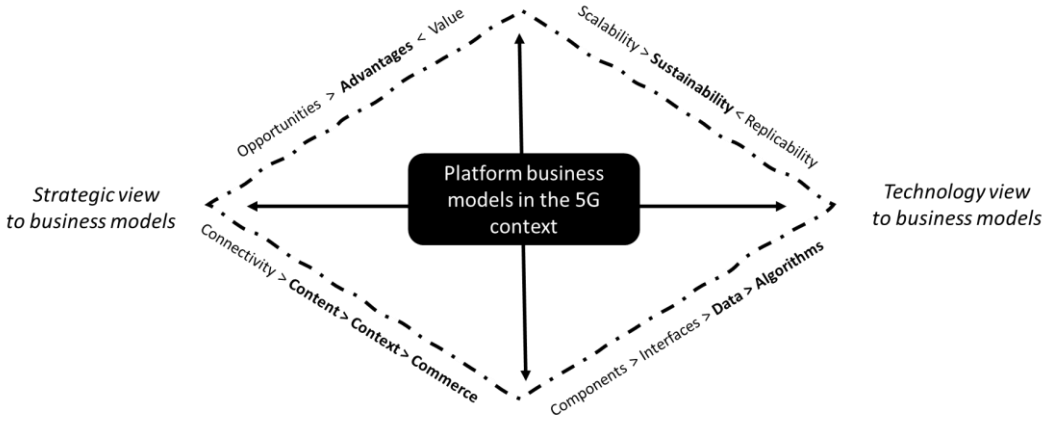

Figure 1. Combined strategy-technology view to 5G platform BMs.

As the modern 5G BM context can increasingly be characterized as a VUCA environment: volatile, uncertain, complex, and ambiguous (Bennett & Lemoine, 2014), it means that the challenges of dealing with the dynamism of the BMs in their respective changing business environments have become increasingly crucial. BMs are always functioning in a context, and therefore need to be

calibrated to their respective business context (Teece, 2010). The presented model provides a tool for understanding and building successful future BMs in the 5G context.

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